



**MULTIPLE APPROACHES TO MEASURING SUICIDE
RESEARCH PROGRESS:
UPDATES FROM THE NATIONAL RESEARCH ACTION PLAN
& THE PRIORITIZED SUICIDE RESEARCH AGENDA
PORTFOLIO ANALYSES**

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Discussants: Phil Satow, MA
Carl Castro, Ph.D.

American Association of Suicidology Meeting, April 10, 2014



THE PRIORITIZED RESEARCH AGENDA FOR SUICIDE PREVENTION PORTFOLIO ANALYSIS

Jane Pearson, Ph.D.

Lead, Staff Support

Research Prioritization Task Force

National Action Alliance for Suicide Prevention

Chair, Suicide Research Consortium

Division of Services and Intervention Research

NIMH

Presenter Disclosure

Jane Pearson

The following personal financial relationships with commercial interests relevant to this presentation exist:

No relationships to disclose



Research Prioritization Task Force

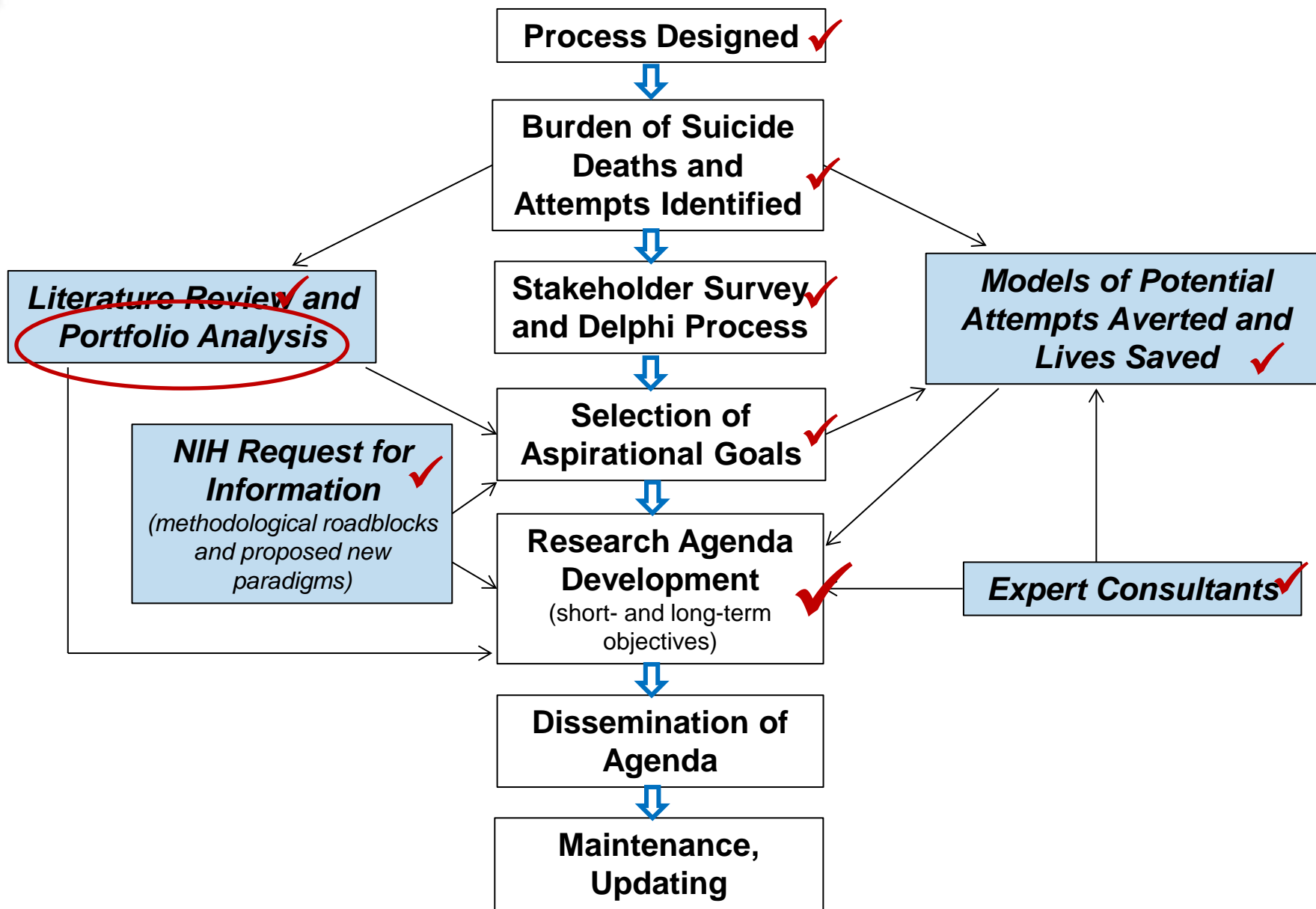
Overarching Goal

Overall U.S. rates of suicide deaths have not decreased appreciably in 50 years. Each year, over 678,000 individuals report that they received medical attention for a suicide attempt; each year, more than 30,000 individuals die by suicide.

RPFT Goal: To develop an agenda for research that has the *potential* to reduce morbidity (attempts) and mortality (deaths) each, by at least 20% in 5 years, and 40% or greater in 10 years, if implemented successfully.



Research Prioritization Task Force Agenda Development Process





Suicide Research Portfolio Analysis: Goals

- Promote research collaborations
- Consider how future studies can leverage existing efforts
- Identify investigators of funded studies to promote knowledge sharing early in the research process
- Determine where research investments have already been made
- Determine research gaps



6 Key Questions & 12 Aspirational Goals (AGs)

Question 1: Why Do People Become Suicidal?

Aspirational Goal 1: Know what leads to, or protects against, suicidal behavior, and learn how to change those things to prevent suicide.

Question 2: How Can We More Optimally Detect/Predict Risk?

Aspirational Goal 2: Determine the degree of suicide risk (e.g., imminent, near-term, long-term) among individuals in diverse populations and in diverse settings through feasible and effective screening and assessment approaches.

Aspirational Goal 3: Assess who is at risk for attempting suicide in the immediate future.

Question 3: What Interventions Prevent Individuals From Engaging in Suicidal Behavior?

Aspirational Goal 4: Ensure that people who are thinking about suicide but have not yet attempted, receive interventions to prevent suicidal behavior.

Aspirational Goal 5: Find new biology treatments and better ways to use existing treatments to prevent suicidal behavior.

Aspirational Goal 6: Ensure that people who have attempted suicide can get effective interventions to prevent further attempts.



6 Key Qs and 12 AGs (continued)

Question 4: What Services Are Most Effective for Treating the Suicidal Person and Preventing Suicidal Behavior?

Aspirational Goal 7: Ensure that health care providers and others in the community are well trained in how to find and treat those at risk.

Aspirational Goal 8: Ensure that people at risk for suicidal behavior can access affordable care that works, no matter where they are.

Aspirational Goal 9: Ensure that people getting care for suicidal thoughts and behaviors are followed throughout their treatment so they don't fall through the cracks.

Aspirational Goal 10: Increase help-seeking and referrals for at-risk individuals by decreasing stigma.

Question 5: What Other Types of Preventive Interventions (Outside Health Care Settings) Reduce Suicide Risk?

Aspirational Goal 11: Prevent the emergence of suicidal behavior by developing and delivering the most effective prevention programs to build resilience and reduce risk in broad-based populations.

Aspirational Goal 12: Reduce access to lethal means that people use to attempt suicide.

Question 6: What Existing Infrastructure Can Be Better Utilized, and What New Infrastructure Needs Must Be Met In Order to Further Reduce Suicidal Behavior in the United States?



Plan for Initial Portfolio Analysis

- Initial report will include coding based on Key Questions and Research Objectives
 - Will track progress by number of studies per Research Objectives (similar to how the IACC does it for Autism research)
- Create and post online a searchable Excel table for 2008–2013 studies, including:
 - Project Title
 - Principal Investigator Name
 - Project Abstract
 - Funder
 - Total Funding Amount
 - Associated Key Question
 - Associated Short- and Long-term Objective
- Capacity to search studies



Status of Coding and Memorandums of Agreement (MOAs)

UNDER DISCUSSION

Key Questions 1–5 coded for all unique suicide studies (grants, contracts, cooperative agreements, intramural research) with funding through 2013 among the following:

	N =	MOA Status
NIH	148	
CDC	13	In review at CDC
VA	21	Signed
DoD	43	In review at DoD
SAMHSA	3	Signed
AFSP	99	Signed
BBRF	17	Signed
AHRQ	1	In review at AHRQ
DOT/FRA	4	In review at DOT
NIJ	~2	In review at NIJ
DARPA	~3	In review at DARPA
NSF	7	In review at NSF

Total: Over 350

10

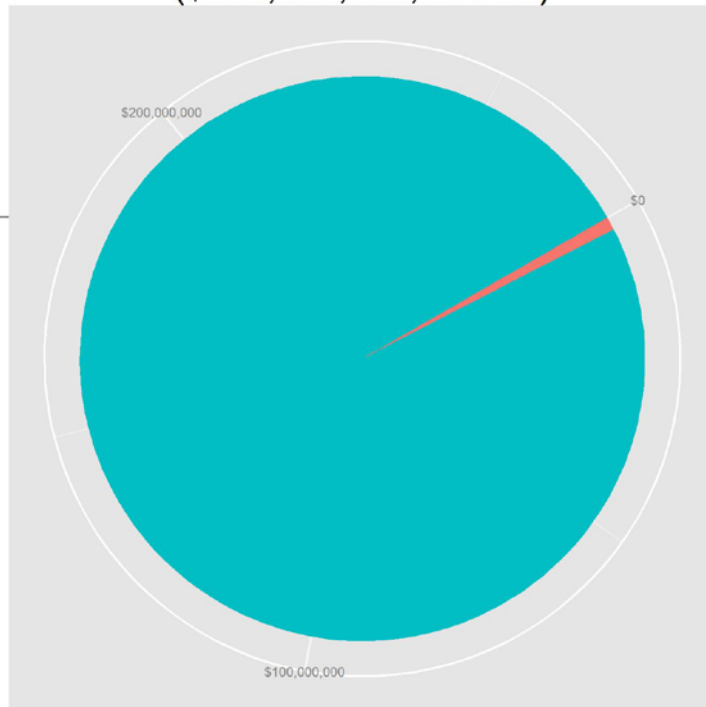


U.S. Suicide Research Investments (2008-2012)

(Partial List; 2013 data still being compiled)

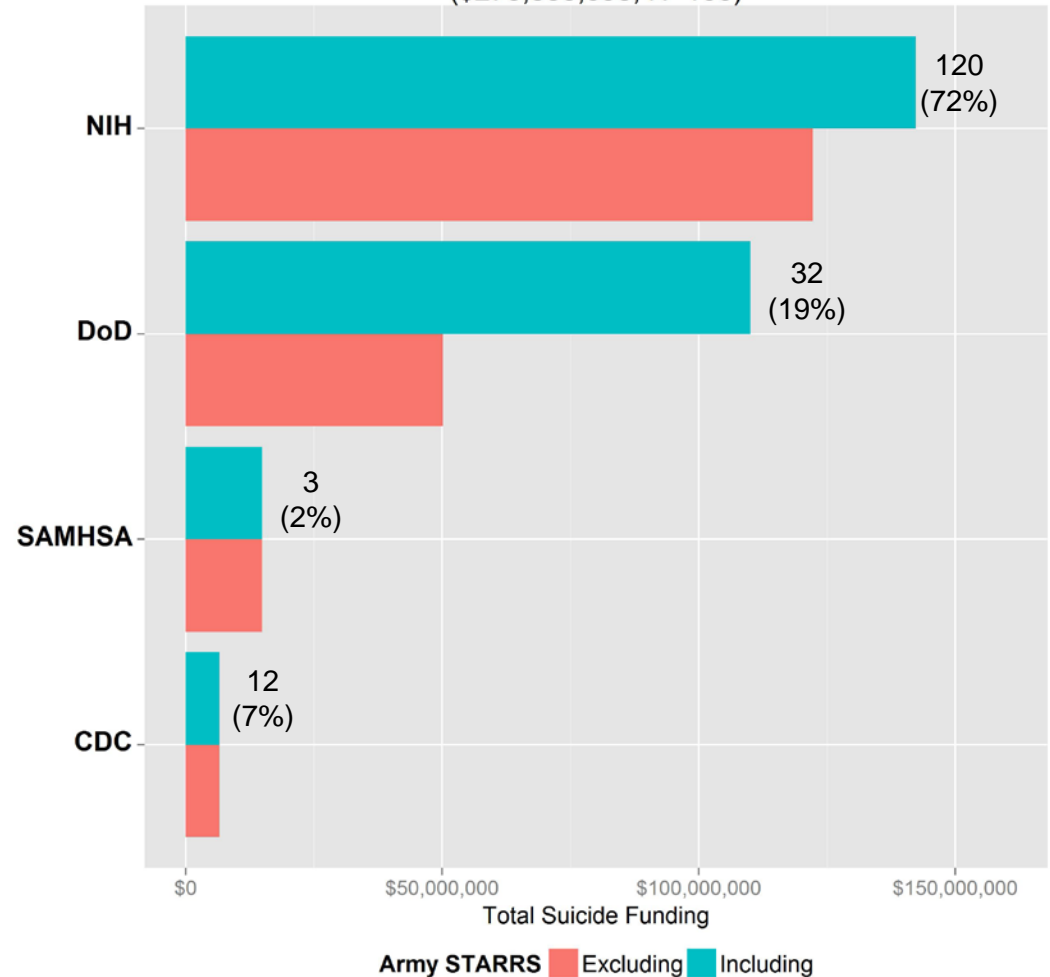
IN DEVELOPMENT

Private vs. Federal
(\$275,930,455, N=210)



Source ■ Private (N=43) ■ Federal (N=166)
\$2,094,758 \$273,835,698

Investments by Federal Agency
(\$273,835,698, N=166)



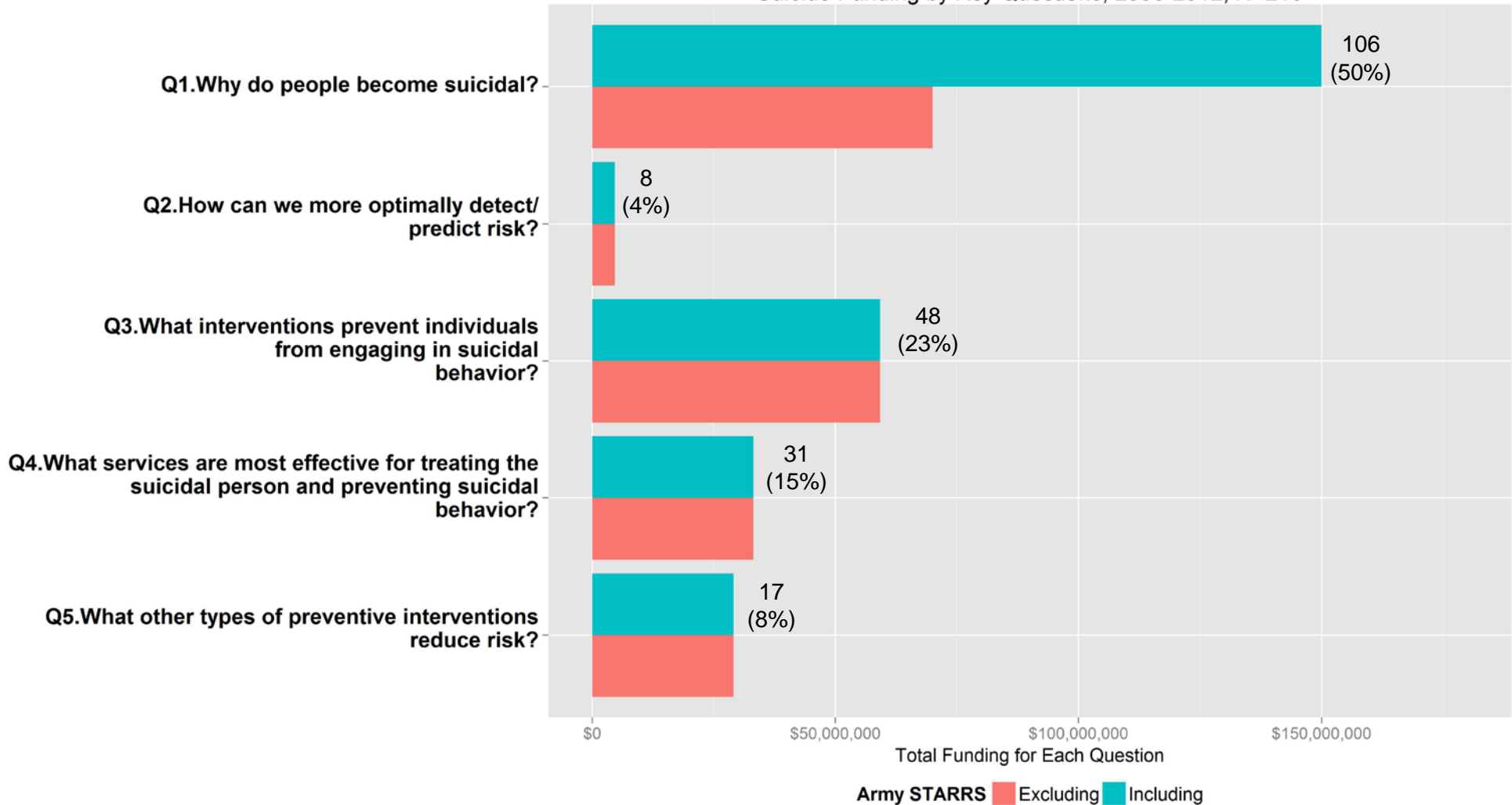
* Percentage of total studies are reported along with total number of studies. These figures do not include AFSP awards from 2008–2009 and VA, AHRQ, DOT, NIJ, DARPA and NSF grants for all years. Total costs are reported. ARRA funds are included.



U.S. Suicide Research Investments by Key Questions 1-5 (Partial List; 2013 data still being compiled)

IN DEVELOPMENT

Suicide Funding by Key Questions, 2008-2012, N=210



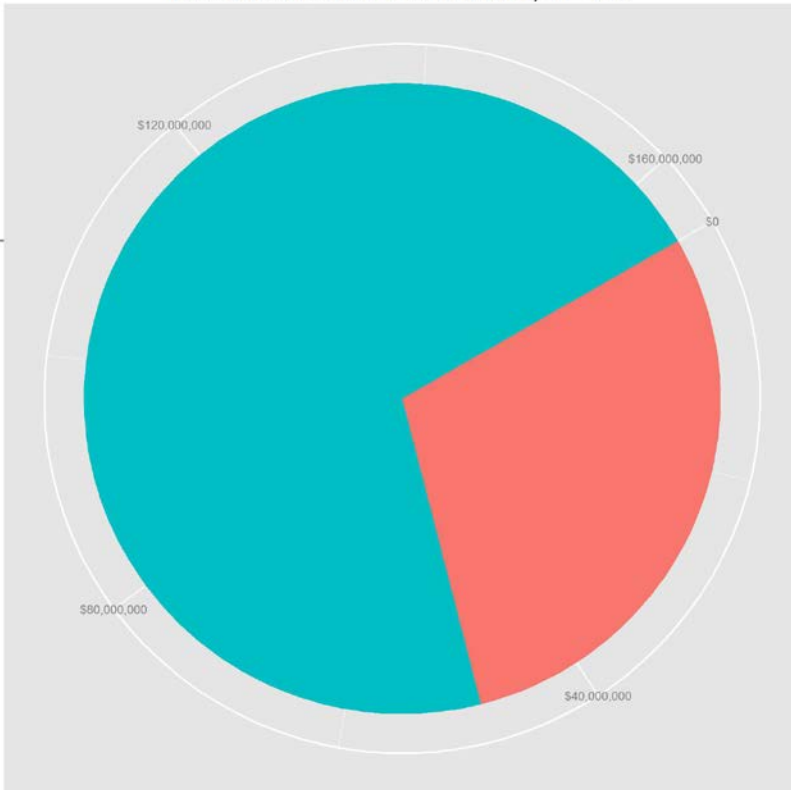
* Percentage of total studies are reported along with total number of studies. These figures do not include AFSP awards from 2008–2009 and VA, AHRQ, DOT, NIJ, DARPA and NSF grants for all years. Total costs are reported. ARRA funds are included.



U.S. Suicide Research Investments—Key Question 6: Grants Indicating the Use of Infrastructure (Partial List; 2013 data still being compiled)

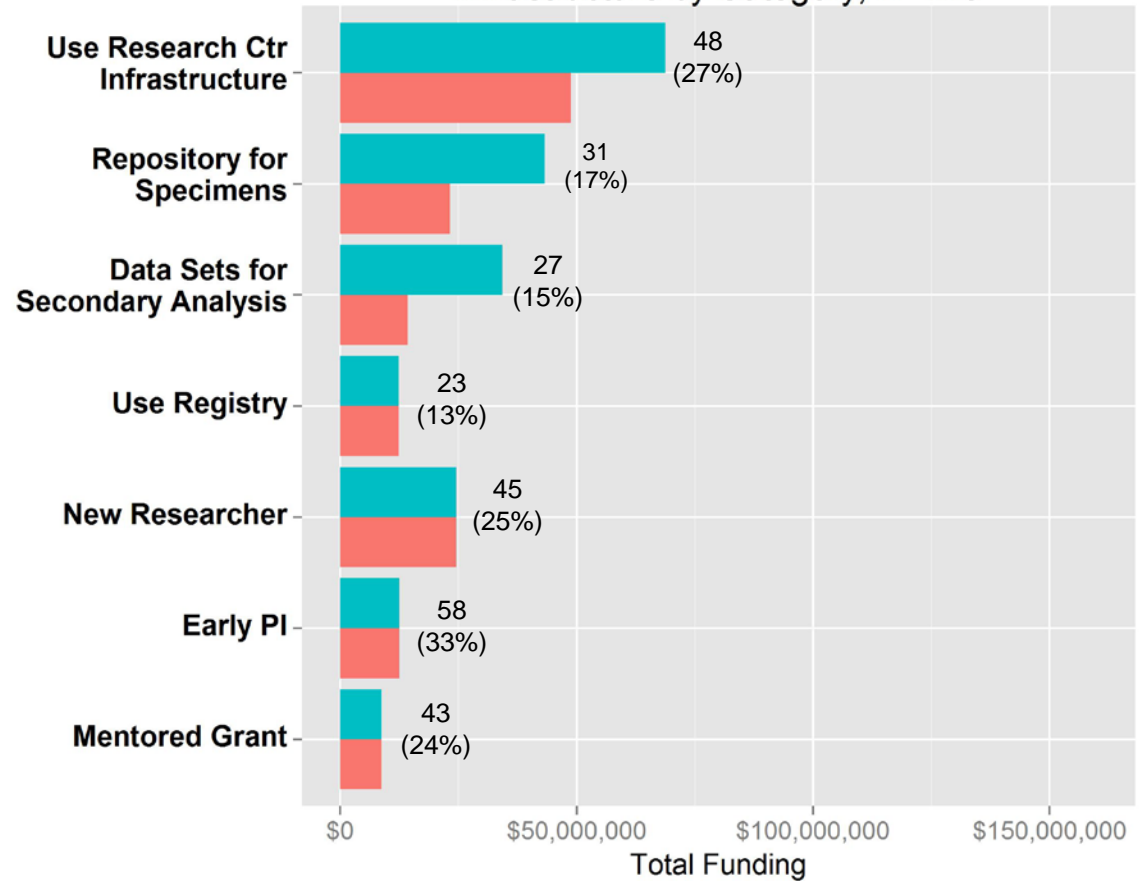
IN DEVELOPMENT

Investments in Infrastructure, N=178



Infrastructure ■ No (N=39) ■ Yes (N=139)
 \$48,675,405 \$117,151,556

Infrastructure by Category, N=178



Army STARRS ■ Excluding ■ Including

* The figures do not include grants from DoD (N=32) or VA, AHRQ, DOT, NIJ, DARPA, and NSF for all years, and AFSP from 2008–2009. Infrastructure categories are not mutually exclusive. Percentage of total studies are reported along with total number of studies. Total costs are reported. ARRA funds are included.



Plan for Future Portfolio Analysis Reports

- Goal for future reports: Link Portfolio Analysis to PFC Survey Database allowing viewers to determine searches of interest based on over 70 variables. Example categories include:
 - Demographic Characteristics of Study Population
 - Methodology
 - Assessment Tools
 - DSM Diagnosis
 - Individual and Social Risk and Protective Factors
 - Intervention Strategies (treatment and prevention) and Settings
 - Services Research Topics
 - Infrastructure



Portfolio Analysis Online Tool

PortFolio Coding::View Survey

Home RSS Print Page Safety Tools

Suicide Research Portfolio Analyses

Welcome to the Suicide Research page of the NIMH Portfolio Coding project. Responding to these questions implies permission for allowing PI names, study titles, and abstracts to be public information. All other information you supply will be private, viewable only by the staff at NIMH and by persons associated with your organization. Outcome analysis results will be presented only in the aggregate, with all identifying characteristics removed. The threshold for including an agency or foundation is investments of \$100,000 or more of a total suicide-related portfolio in any one calendar year from 2008 going forward (e.g., four grants of \$25,000 each would reach this threshold). This survey is intended for any funded study that received any dollar amount from 2008 going forward (regardless of start date). Thank you for adding details about your Suicide Research to this database. Your efforts will help guide future research initiatives.

*1. What type of study is this?

*2. Enter the official study title:

*3. Enter the Study Abstract:

*4. Contact Principal Investigator Name:

*5. Is the U.S. Government the *primary* financial support of this study? (i.e. the corresponding organization contact): Yes No

If yes, please specify:

- 71 questions for each study to be coded
 - These questions align with *A Prioritized Research Agenda for Suicide Prevention: An Action Plan to Save Lives* and can be queried for other purposes, e.g., National Research Action Plan



Sample Questions from PFC Online Tool

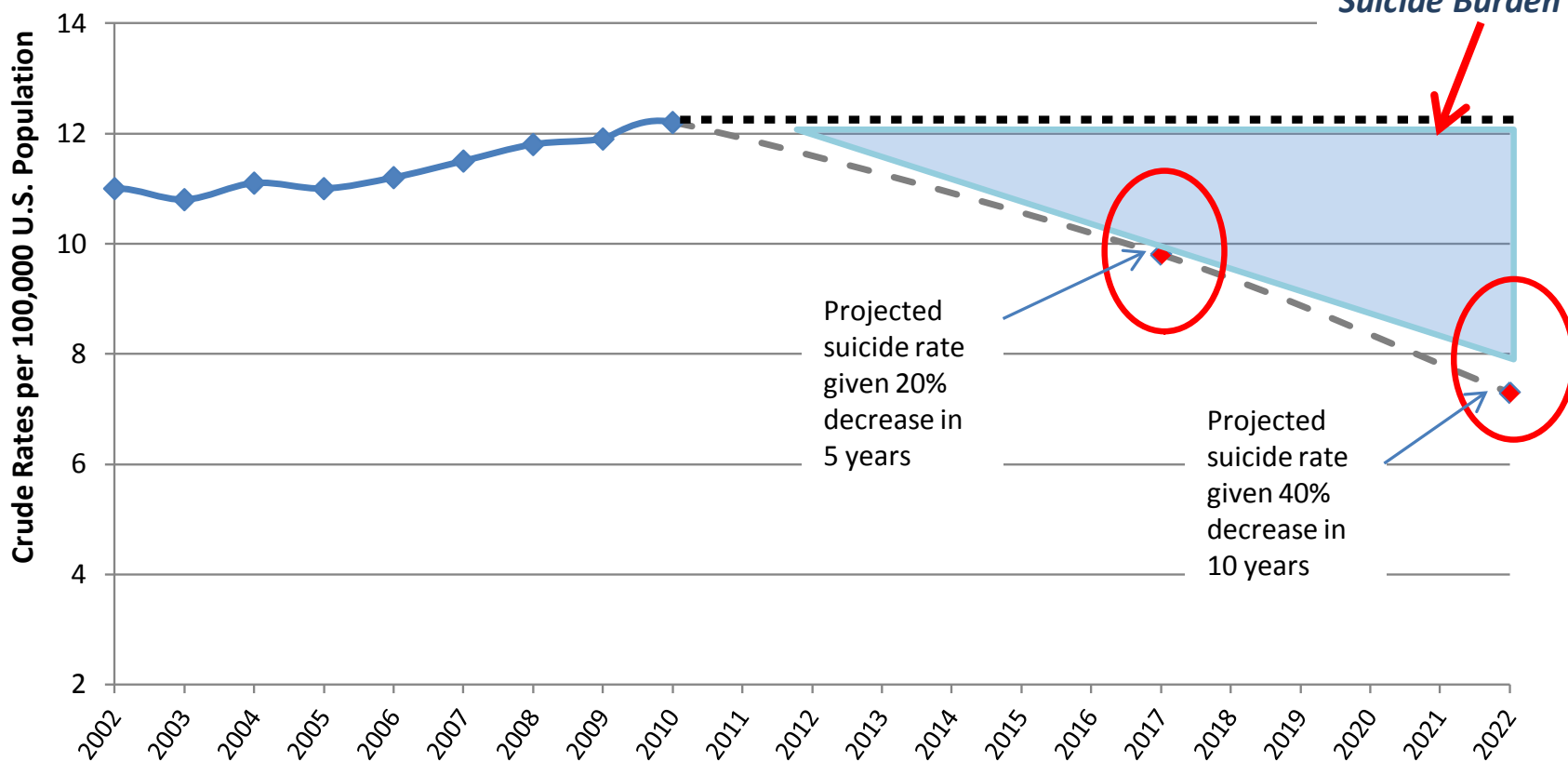
- If this study involves the use of human subjects, what variables related to suicide are used?
- Does this study include and collect information on former military personnel?
- Does this study include and collect information on active duty military?
- Does this study include measures to assess if participants meet criteria for a DSM psychiatric diagnosis?
- Does this study collect data on life events?
- As an aim or hypothesis, does this study address surveillance of suicide deaths (e.g., quality of data; rapid estimates of subpopulations; bias of collection methods)?
- Is one of the primary aims investigating risk factors for suicidal behavior?
- Is one of the primary aims to investigate factors that prevent or reduce the risk of suicide (protective factors)?
- Is one of the primary aims to improve access to suicide prevention services?



Ultimate Goal of a Prioritized Research Agenda for Suicide Prevention

Annual U.S. Suicide Rates, 2002-2010 & Projected Impact of Research Informed Prevention Strategies

Meeting Short-term and Long-term Objectives in a Research Agenda Have Potential to Reduce Suicide Burden





Possible Intermediate Outcomes of Progress

- Reducing gaps in prioritized research areas
- Increased use of common data elements
- Increased banking and sharing of data
- Actions by federal and private organizations that are consistent with the *Prioritized Research Agenda* (e.g., more states tracking suicide attempts in substance use and mental health service provision data)
- Increase in federal agencies and/or professional guilds using research-informed (if not empirically based) training/interventions in suicide prevention
- Collaborative/complementary efforts among research funders
- Research/donation interest by additional funders



Questions? Suggestions? E-mail us: Jpearson@nih.gov

Research Prioritization | National Action Alliance for Suicide Prevention - Windows Internet Explorer

http://actionallianceforsuicideprevention.org/task-force/research-prioritization

Action Alliance
FOR SUICIDE PREVENTION

The Public-Private Partnership Advancing the National Strategy for Suicide Prevention

ABOUT US ACCOMPLISHMENTS MEDIA NSSP RESOURCES LEADERSHIP TASK FORCES

Home page

Research Prioritization Task Force

www.suicide-research-agenda.org

The Research Prioritization Task Force meeting following the National Action Alliance for Suicide Prevention Executive Committee (EXCOM) February meeting at the Key Bridge Marriott in Arlington, Virginia. Members and staff pictured include, clockwise from upper left: Ira Katz, Kathy O'Leary, Gemma Weiblinger, Jane Pearson, Mary Durham, Robert Mays, Sherry Molock, Beverly Pringle, Dan Reidenberg, Chelsea Booth, Cynthia Claassen, Lanny Berman, Philip Satow.

The National Action Alliance for Suicide Prevention Research Prioritization Task Force (RTF) was initiated in November 2010. The RTF is comprised of 11 organizations, representing the public and private sectors in research, advocacy, and practice.

What's New!

- RFI: Pediatric Suicide Prevention in Emergency Medicine Settings
- NIMH Looks at a New National Strategy for Suicide Prevention
- Stakeholder Survey Summary: Brief Results
- A Call to Identify Key Methodological Roadblocks and Propose New Paradigms in Suicide Prevention Research
- 2012 American Association of Suicidology

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DoD Suicide Prevention Research And the National Research Action Plan

Presented to
The American Association of Suicidology

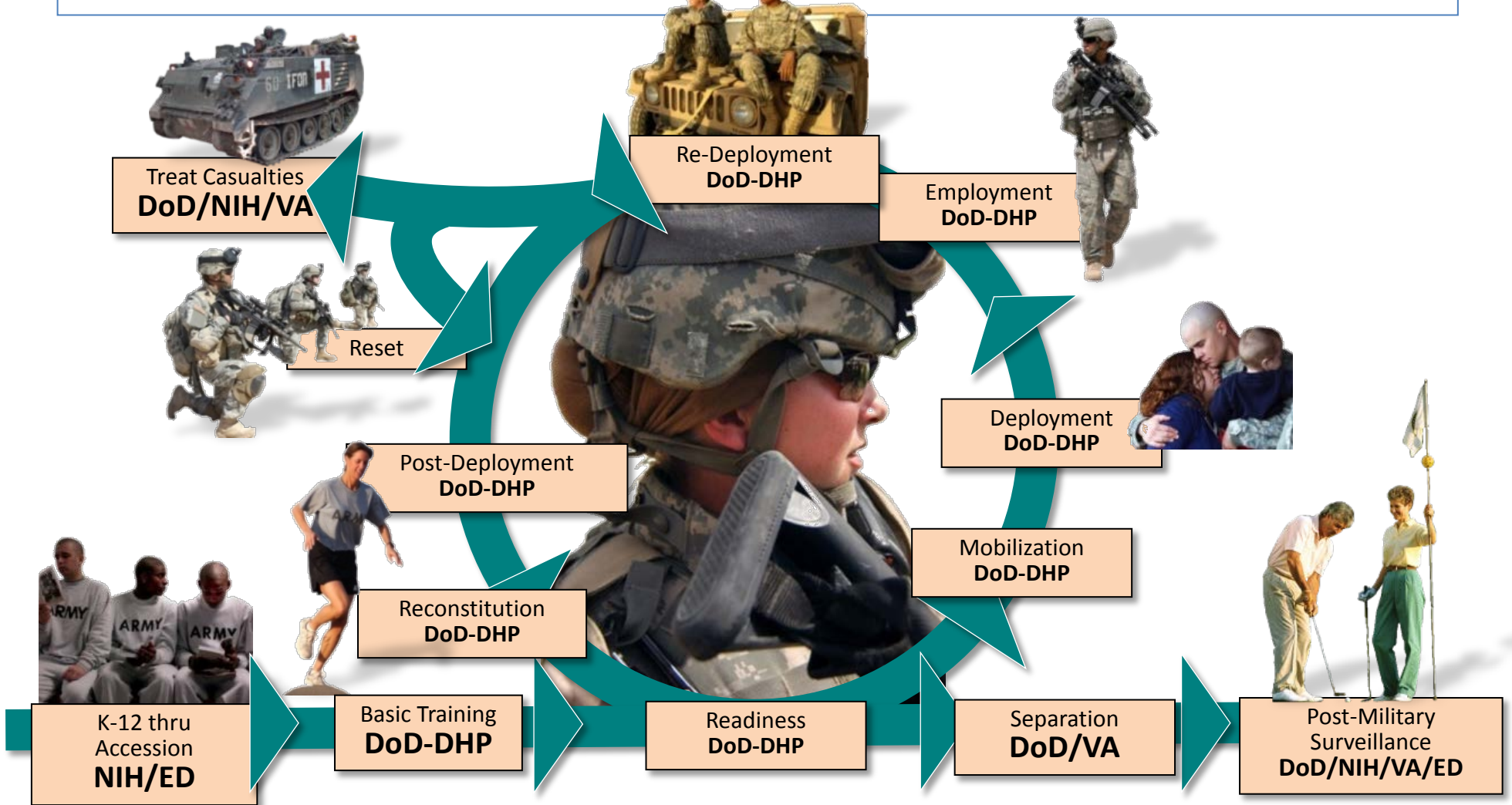
Kate Nassauer, Ph.D.
*Psychological Health and Resilience Portfolio Manager
US Army Medical Research and Materiel Command,
Military Operational Medicine (MOM) Research Program*

April 10, 2014

The views expressed in this presentation are those of the presenter and do not represent the official policy or position of the U.S. Army Medical Command or the Department of Defense.

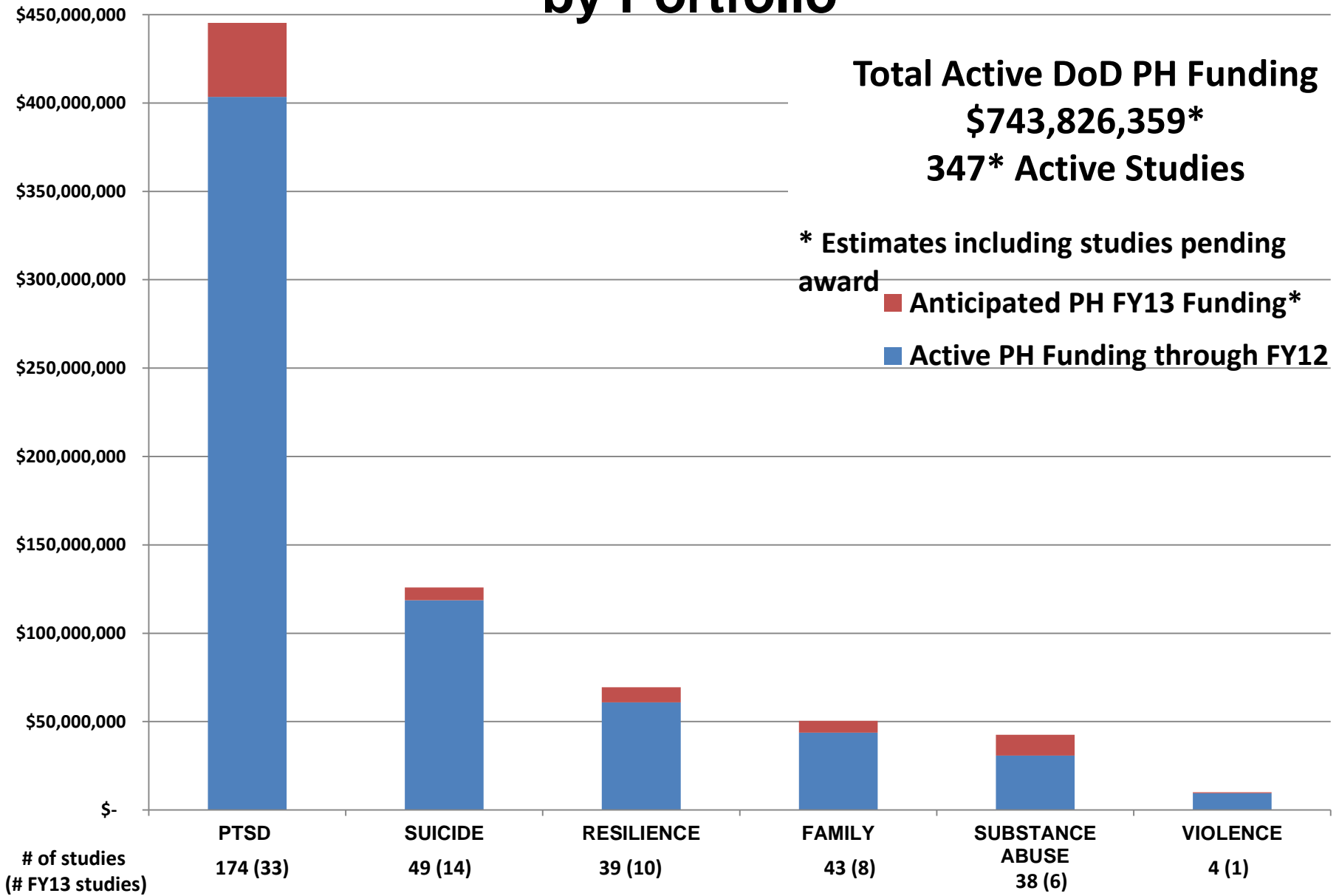


FOUNDATIONAL AND CLINICAL RESEARCH: PAVING THE WAY FOR PREVENTION, RECOVERY AND CURE ACROSS THE MILITARY LIFESPAN

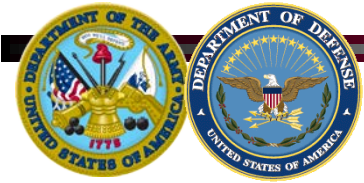




Active DoD PH Research (2007-present) by Portfolio



Data do not represent official DoD estimates and are not GAO auditable



Highlighted DoD Efforts



Army Study to Assess Risk and Resilience in Service members (Army STARRS)

- Largest study of suicide among military personnel (>100,000 Soldiers enrolled)



Military Suicide Research Consortium (MSRC)

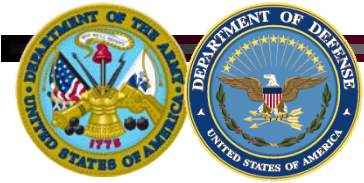
- 22 research studies aimed at delivering evidence-based prevention interventions
- Actionable findings anticipated within 1-2 years; pilot work has led to larger trials

Suicide Treatment Research

- Other Screening and Intervention/Treatment studies

Defense Suicide Prevention Office (DSPO)

- Translation Implementation of Evaluation and Research Studies (TIERS)
- DSPO, USAMRMC, Military Services, VA, NIMH collaboration



Interagency Psychological Health Research Continuum

Understand

Intervene

Implement

Foundational Science

Basic discovery science

Epidemiology

Population-level (to include at-risk) descriptive and characterization in nature; the study of the distribution of associations between health related states

Etiology

Neurobiological mechanisms of the disease to include possible causes of disorder

Prevention and Screening

Population, indicated prevention intervention at different stages of illness; screening measures; assessment tools and measurement; training

Treatment

Aimed at symptom amelioration (includes psychotherapies and drugs) at different stages of illness including refractory, chronic, relapse, relapse prevention; address co-morbidities; follow-up

Services Research

Focused on system of care improvements and provider and non-healthcare provider



Suicide Prevention Integrated Research Approach



Agencies Objectives

<ul style="list-style-type: none"> • Genomic, molecular modeling, & neuro-imaging detection • Focus on precursors of healthy functioning 	<ul style="list-style-type: none"> • Risk factors & measures of underlying dysfunction • Developmental pathways, mediating & moderating factors • Impact of deployment • Integrated surveillance database 	<ul style="list-style-type: none"> • Neurobiological mechanisms of suicide process(es) & possible precursors • Risk factors & risk estimation 	<ul style="list-style-type: none"> • Risk Reduction • Resilience Development • Effective prevention education and training • Efficient, effective, coordinated screening and assessment across varied settings • Validated leader training 	<ul style="list-style-type: none"> • Novel, rapidly delivered interventions for varied settings • Medications to reduce suicidal thoughts & behaviors • Related Comorbidities • Effective Inpatient & Outpatient Psychotherapy • Follow-up & Postvention Protocols • Recovery and Return-to-duty Standards • Collaborative Case Management • Rescreening and Outpatient Care 	<ul style="list-style-type: none"> • Coordination & consistency of clinical treatment • Ongoing process & research Improvement • Ongoing evaluation of care • Valid training tools for in service, VA and community providers
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Total / new studies

2/0 (NIH) 5/1 (VA) 0/0 (DoD) N= 7/1	28/7 (NIH) 2/0 (VA) 10/1 (DoD) N=40/8	12/2 (NIH) 4/0 (VA) 1/1 (DoD) N=17/3	18/5 (NIH) 0/0 (VA) 13/6 (DoD) N=31/11	17/4 (NIH) 4/1 (VA) 17/5 (DoD) N=38/10	1/0 (NIH) 6/1 (VA) 2/0 (DoD) N=9/1
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Presidential Executive Order 31 Aug 2012: Improving Health Care for Veterans, Service Members, and Military Families

Sec. 5. Improved Research and Development

- **DoD, VA, HHS, and Dept of Ed** in coordination with OSTP shall establish a National Research Action Plan to improve the coordination of agency research on TBI, PTSD, and other mental health conditions to reduce the number of affected men and women through better prevention, diagnosis, and treatment.

Vision to Advance Suicide Prevention Research

- Achieve a significant reduction in attempted and completed suicides through evidence-based prevention and treatment advances



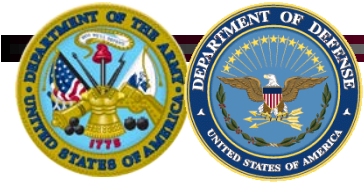
National Research Action Plan* (NRAP) Action Items

- Enhanced understanding of mechanisms → new treatments
- Biomarker focus--Consortium to Alleviate PTSD (CAP)
- Improve data sharing
 - DoD use of eRA commons → pilot feasibility effort
 - Common Data Elements
 - Biorepository data
 - Make use of Electronic Health Records for research
- Strategies supporting collaborative suicide prevention research
 - Army STARRS and MSRC

* www.whitehouse.gov

Search for NRAP and Interagency Task Force on Military and Veterans

Mental Health



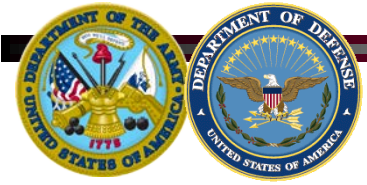
NRAP and NAASP Alignment



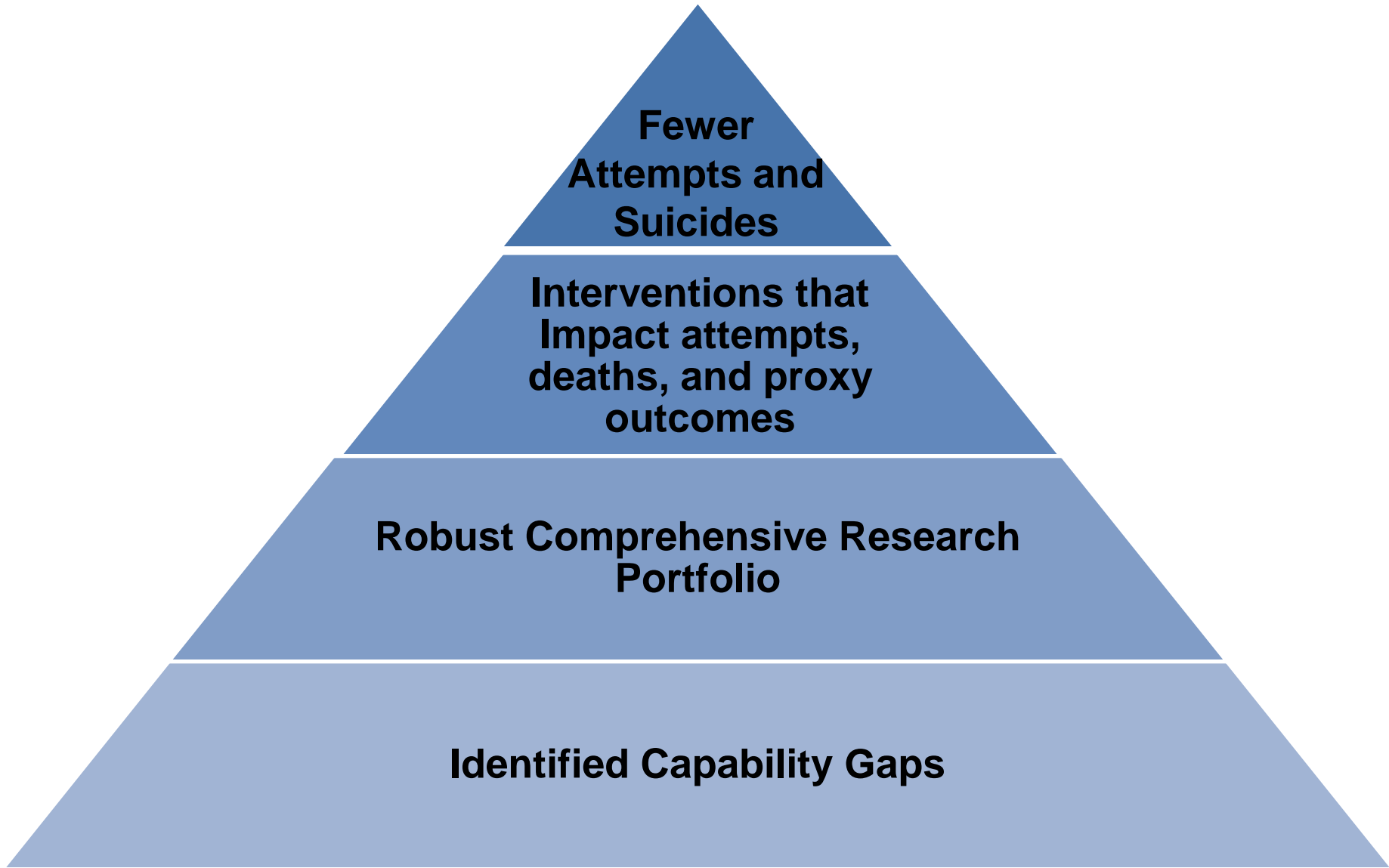
NRAP Approach

NAASP Approach

- **Foundational Science** → 1. Why Do People Become Suicidal?
- **Epidemiology** → 2. How Can We More Optimally Detect/Predict Risk?
- **Etiology** → 2. How Can We More Optimally Detect/Predict Risk?
- **Prevention & Screening** → 3. What Interventions Prevent Suicidal Behavior?
- **Treatment** → 4. What Services Are Most Effective for Treating the Suicidal Person and Preventing Suicidal Behavior?
- **Follow-up Care** → 4. What Services Are Most Effective for Treating the Suicidal Person and Preventing Suicidal Behavior?
- **Services Research** → 5. What Preventive Interventions (Outside Health Care Settings) Reduce Suicide Risk?
- 6. What Existing Infrastructure Can Be Better Utilized, and What New Infrastructure Needs Must Be Met In Order to Further Reduce Suicidal Behavior in the United States?



Suicide Prevention Research Measuring Success





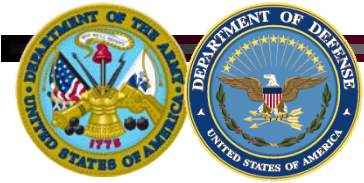
Funded Award Information

- **Defense Technical Information Center (DTIC)- DoD award technical reports**
 - http://www.dtic.mil/dtic/search/advanced_search.html
- **Congressionally Directed Medical Research Program- funded awards**
 - <http://cdmrp.army.mil/search.aspx>
- **NIH RePORTER- NIH and VA awards**
 - <http://projectreporter.nih.gov/reporter.cfm>
- **Military Suicide Research Consortium**
 - <https://msrc.fsu.edu/>
- **Army STARRS**
 - <http://www.armystarrs.org/>
- **Military Health System Research Symposium (MHSRS)- annual**
 - <https://mhsrs.amedd.army.mil/SitePages/Home.aspx>



USAMRMC Funding Opportunities

- **Periodic Funding Opportunities**
 - www.grants.gov, enter 12.420 in the CFDA field under the basic search option
- **USAMRMC Open Broad Agency Announcement (Open BAA)**
 - http://www.usamraa.army.mil/pages/baa_forms/index.cfm
- **FED BIZ OPPS**
 - <https://www.fbo.gov>
- **Small Business Innovation Research & Small Business Technology Transfer (SBIR/STTR)**
 - <http://www.acq.osd.mil/osbp/sbir/>



More Questions?

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Multiple Approaches to Measuring Suicide: Research Progress

Lisa Brenner, PhD, ABPP
VISN 19 MIRECC

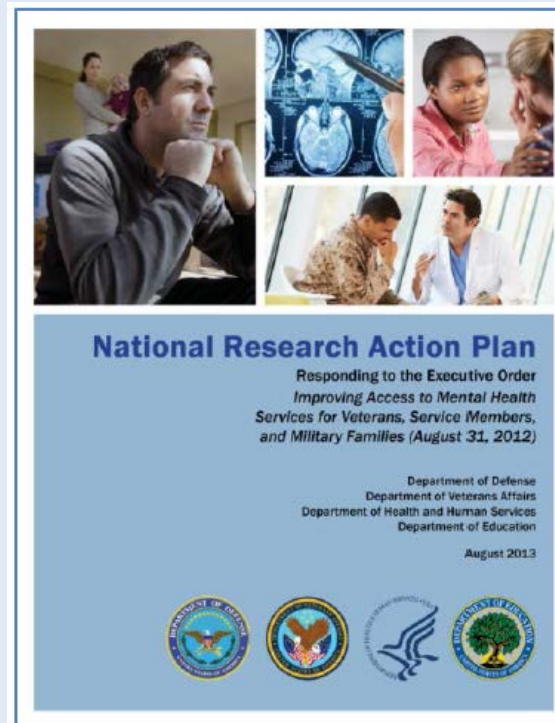
Departments of Psychiatry,
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Disclosure

This presentation is based on work supported, in part, by the Department of Veterans Affairs, but does not necessarily represent the views of the Department of Veterans Affairs or the United States Government.

Executive Summary

On August 31, 2012, President Obama issued an Executive Order (the Order) directing the Departments of Defense (DoD), Veterans Affairs (VA), Health and Human Services (HHS), and Education (henceforth referred to as “the agencies”), to develop a National Research Action Plan (NRAP) on posttraumatic stress disorder (PTSD), other mental health conditions, and Traumatic Brain Injury (TBI) “to improve the coordination of agency research into these conditions and reduce the number of affected men and women through better prevention, diagnosis, and treatment.”



Vision for Moving PTSD Treatment Research into Practice

The aspirational vision is to provide practitioners with the most effective ways to prevent or treat PTSD in the civilian and military populations, including service members, Veterans, and their families. Individuals exposed to traumatic events would routinely participate in systematic evaluation on broad dimensions of risk with progressively intensive diagnostic evaluations. Individualized and staged interventions would be

planned to minimize severity of acute stress and prevent weighted/combined in an automated algorithm to detect (especially substance related) to inform care and follow-up at mitigating negative psychological symptoms and conduct undergo a thorough medical, psychiatric, and substance profile indicative of the underlying cause/type of impairment receive treatment known to target/address the specific a course of treatment, effectiveness of any administered

Vision to Advance Suicide Prevention Research

The aspirational vision for suicide prevention research is to achieve a significant reduction in attempted and completed suicides in the civilian, military, and Veteran populations through evidence-based prevention and treatment advances. There is hope that with new knowledge gained from research

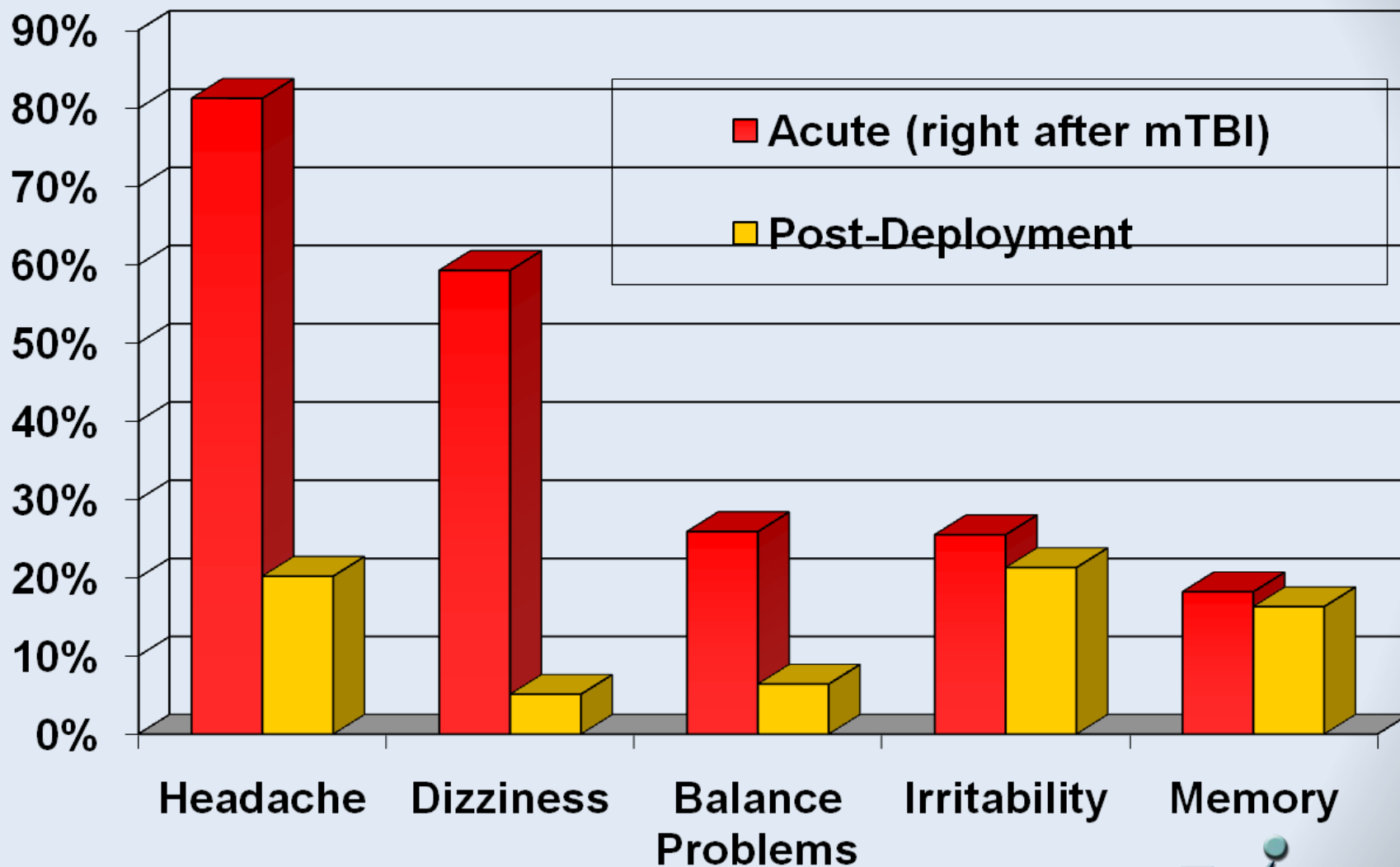
Prevention, Treatment, Minimize Symptoms, Maximize Health and Function

Vision for Accelerating TBI Research and Outcomes

The aspirational vision for TBI research is to identify maximizing short- and long-term health and function persons with TBI in civilian and military populations, including service members, veterans, and their families. Effective treatments, including rehabilitation treatments, would be personalized to address the specific type of injury and co-occurring conditions (especially substance related), considering patient preferences for care. A clinically relevant classification system for TBI across the spectrum of injury severities, age, gender, and chronic conditions, including mild single and repetitive injuries would be available to advise patients about their diagnosis, prognosis, and treatment options. More sensitive, reliable, and efficient tools (“gold standards”) would be available for evaluating the effectiveness of treatments on an individual’s physical, cognitive, and psychosocial functioning and quality of life.

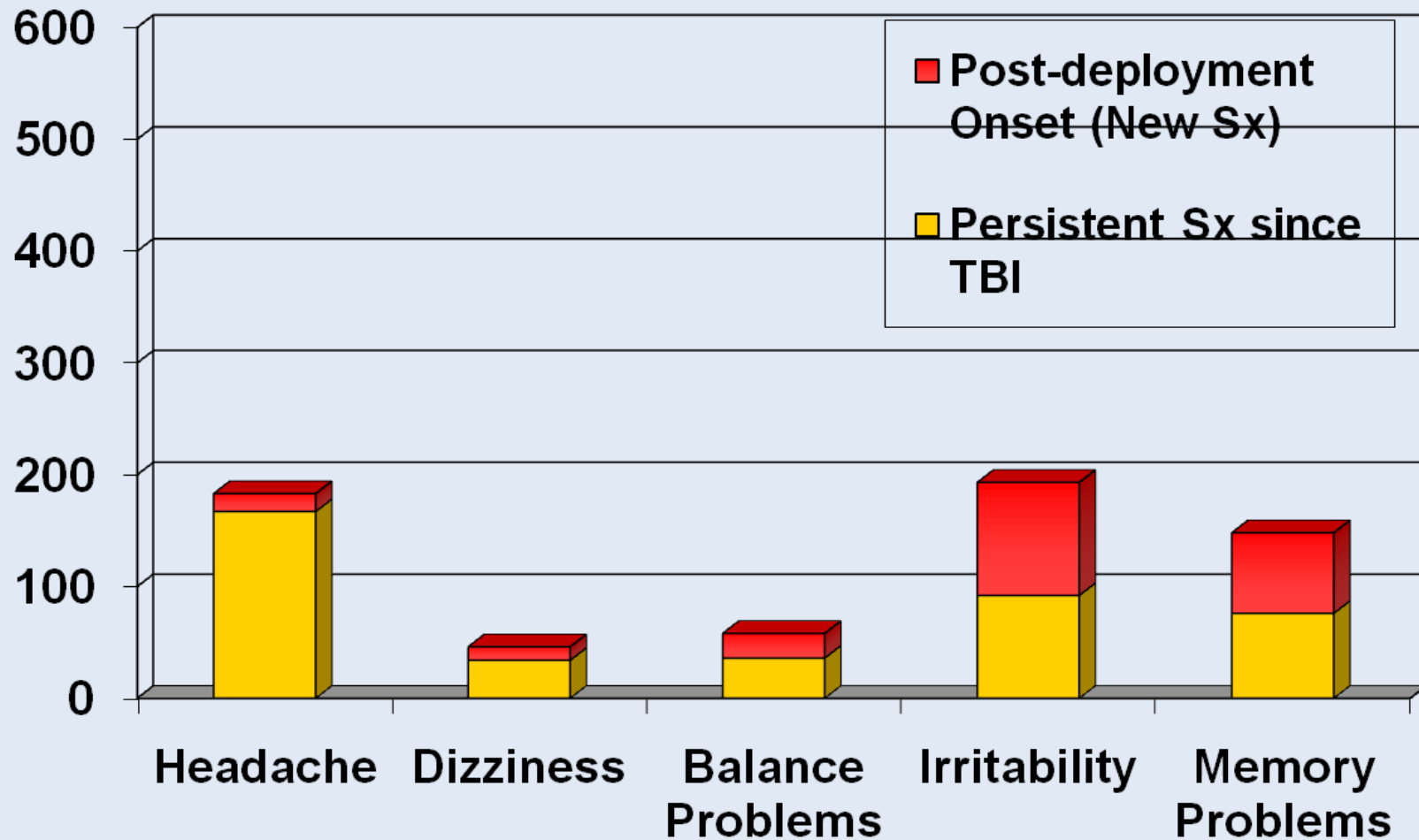
factors (e.g., reduced substance use and improved problem solving) could be targeted to avert reattempts. Evidence-based prevention programs that build resilience, reduce risk, and prevent the emergence of suicidal behaviors would be implemented in diverse systems of care and populations, with positive impact on suicide prevention.

Ft. Carson: Post-Deployment Data (n = 907)



Terrio H, Brenner LA, Ivins B, Cho JM, Helmick K, Schwab K, et al. Traumatic brain injury screening: Preliminary findings regarding prevalence and sequelae in a US Army Brigade Combat Team. *Journal of Head Trauma Rehabilitation*. 2009; 24(1):14-23.

Currently Symptomatic: Onset of Symptoms (n = 844)



Terrio H, Brenner LA, Ivins B, Cho JM, Helmick K, Schwab K, et al. Traumatic brain injury screening: Preliminary findings regarding prevalence and sequelae in a US Army Brigade Combat Team. *Journal of Head Trauma Rehabilitation*. 2009; 24(1):14-23.

Potential Clinical Presentation

PTSD

TBI

Flashbacks

Nightmares

Attentional
problems

Depression

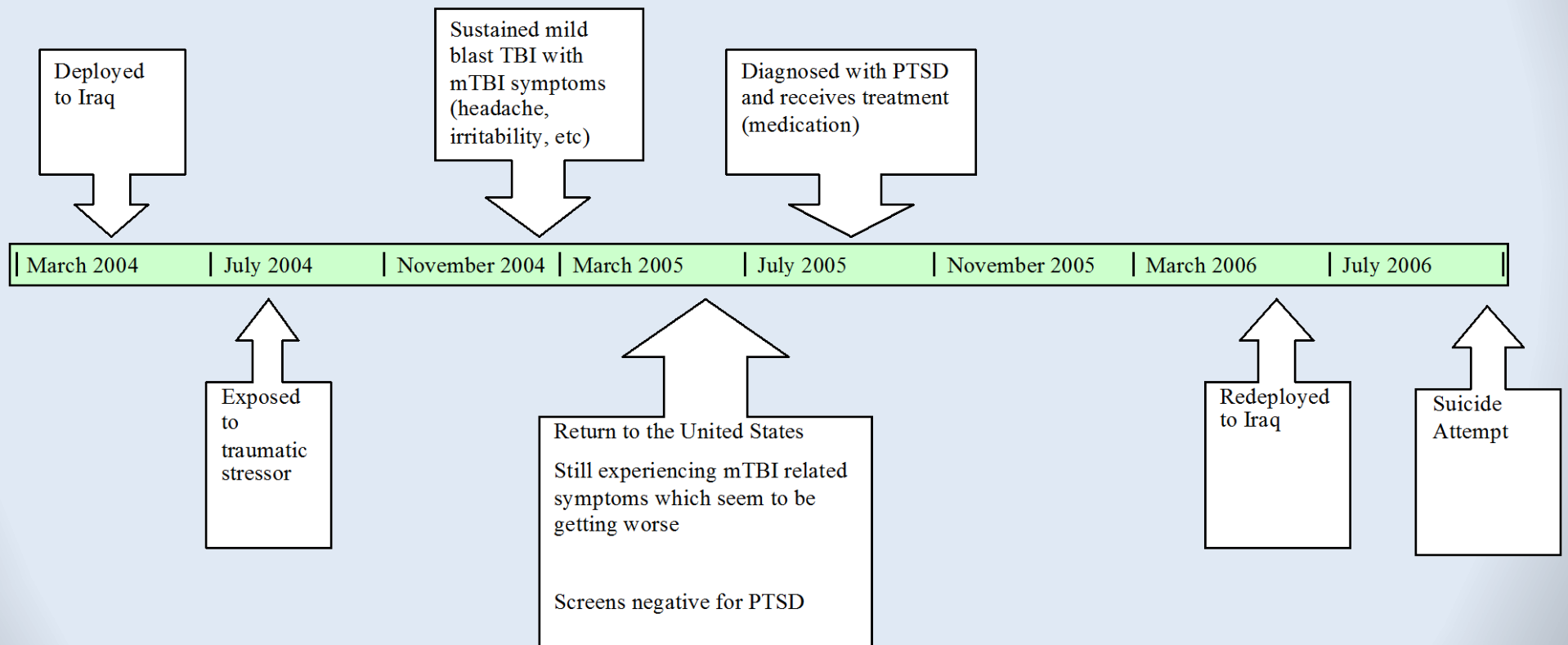
Anxiety

Headaches

Dizziness

Irritability

Case Example: Co-Occurring PTSD and mTBI



Suicidal Ideation and Behaviours after Traumatic Brain Injury: A Systematic Review

Nazanin H. Bahraini,^{1,2} Grahame K. Simpson,^{3,4} Lisa A. Brenner,^{1,2} Adam S. Hoffberg,¹ and Alexandra L. Schneider¹

¹ Veterans Integrated Service Network (VISN) 19 Mental Illness Research Education and Clinical Center (MIRECC), Denver, Colorado, USA

² University of Colorado, School of Medicine, Aurora, Colorado, USA

³ Liverpool Brain Injury Rehabilitation Unit, Liverpool Hospital, Sydney, Australia

⁴ Rehabilitation Studies Unit, Sydney School of Medicine, University of Sydney, Australia

Traumatic brain injury (TBI) is prevalent among many populations and existing data suggest that those with TBI are at increased risk for death by suicide. This systematic review serves as an update to a previous review, with the aim of evaluating the current state of evidence regarding prevalence and risk of suicide deaths, post-TBI suicidal ideation and suicide attempts, and treatments to reduce suicide-related outcomes among TBI survivors. Review procedures followed the PRISMA statement guidelines. In all, 1014 abstracts and 83 full-text articles were reviewed to identify 16 studies meeting inclusion criteria. Risk of bias for individual studies ranged from low to high, and very few studies were designed to examine a priori hypotheses related to suicide outcomes of interest. Overall, findings from this systematic review supported an increased risk of suicide among TBI survivors compared to those with no history of TBI. Evidence pertaining to suicidal thoughts and attempts was less clear, mainly due to heterogeneity of methodological quality across studies. One small randomised controlled trial was identified that targeted suicide prevention in TBI survivors. Further research is needed to identify the prevalence of post-TBI ideation and attempts, and to establish evidence-based suicide prevention practices among TBI survivors.

Keywords: suicide, suicide attempt, suicide ideation, traumatic brain injury, systematic review

Suicide is a rare but devastating outcome post traumatic brain injury (TBI). However, death by suicide is only the tip of the iceberg, as much larger numbers of people with TBI make suicide attempts or report suicidal ideation. Historically, suicides after TBI were first documented among brain-injured Veterans from the First and Second World Wars (e.g., Russell, 1951). Early reports of civilian suicides were contained in broader TBI

outcome studies conducted in the United Kingdom and Europe (e.g., Heltkanen & Sipponen, 1970; Lewin, Marshall, & Roberts, 1979). Since then, continued efforts to empirically investigate the prevalence of suicide and the impact of TBI on suicide risk have contributed to a growing body of literature on suicide-related outcomes among TBI survivors. Although studies examining prevalence of suicidal ideation, behaviour and death by

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Disclaimer: This article is based on work supported, in part, by the Department of Veterans Affairs, but does not necessarily represent the views of the Department of Veterans Affairs or the United States Government. Drs Brenner and Simpson would also like to acknowledge that they are authors on 6 of the 16 papers reviewed. Efforts were made to reduce conflicts (i.e., other members of the team reviewed their articles in terms of risk of bias).

KQ1. Among adult survivors of TBI, what is the association between history of TBI and post-TBI death by suicide, suicide attempts or suicidal ideation? KQ1 specifically investigated the prevalence of the suicidal behaviours (i.e., death by suicide, suicide attempts and suicidal ideation) and the extent to which the presence of TBI increased risk for suicidal thoughts and behaviours.

KQ2. What interventions are effective in reducing suicide-related outcomes in adult survivors of TBI?

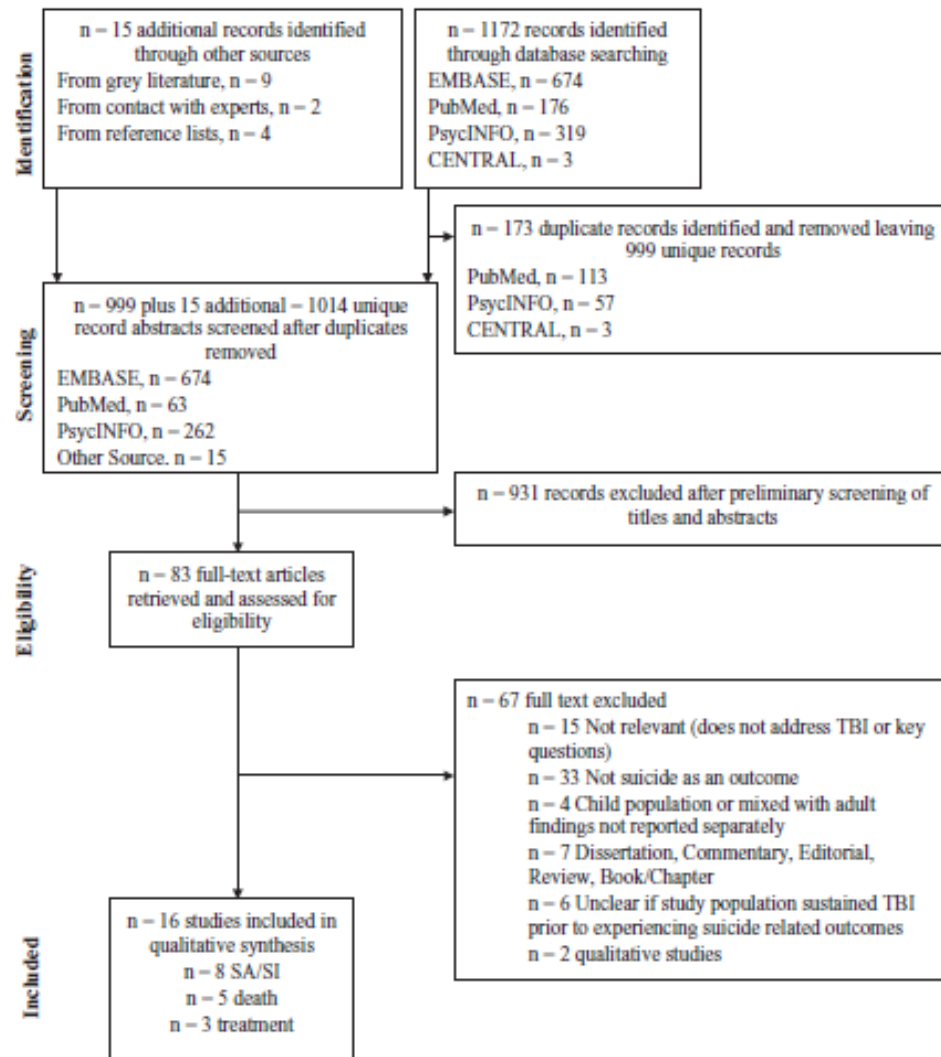


FIGURE 1
Literature flow diagram.

January 2007 –
October 2012

1014 Abstracts
83 Full Text

16 studies
n=5 death
n=8 SA/SI
n=3 treatment

Suicide

TABLE 2
Prevalence and Risk of Suicide After TBI

Source	Design ^a	Population/ sample	Study admission	TBI	Reference population	Prevalence of suicides	SMR or OR (95% CI)	Risk of bias (category of bias) ^b	
Brenner et al., 2011c Veteran, United States	Retrospective cohort	N = 49,626 All VHA users with TBI	2001–2006, 6 years	Concussion Contusion/ TH	12,159 39,623	5% random sample of VHA users without TBI N = 389,583	105 observed	All* 1.55 (1.24, 1.92) Mild** 1.98 (1.39, 2.82) Mod-Sev [†] 1.34 (1.09, 1.64)	Rating: low risk of bias Outcome assessors not blinded to exposure (DB) Use of ICD-10 less accurate for injuries in which medical attention was not sought (DB)
Harrison-Felix et al., 2009 Civilian, United States	Retrospective cohort	N = 1678 Persons with TBI admitted to an adult rehabilitation hospital and survived ≥ 1 year	1961–2003, 40 years	Loss of consciousness None 1 day 2–7 days 8–129 days	129 495 360 568	Federal US mortality rates by age, sex and race	10 observed, 3.39 expected	All* 2.95 (1.42, 5.43)	Rating: moderate risk of bias External comparison group not selected based on TBI status (SB & CON) Outcome assessors not blinded to exposure (DB) Cause of death unknown or missing for 12 cases (AB) Presence of TBI in reference group (CON)
Himonen et al., 2011 Civilian, Finland	Retrospective cohort	N = 192 All referrals for neurological or NP A's at a university hospital	1950–1971, 24–30 years	Mild Moderate Severe Very severe	65 68 53 5	General population	3/75 deaths, 4.2%	NR	Rating: moderate risk of bias External comparison group not selected based on TBI status (SB and CON) Outcome assessors not blinded to exposure (DB) TBI severity not based on standard criteria (DB) Validity and reliability of data source for suicide is unclear (DB) Presence of TBI in reference group (CON)

SHARIL ARTISTINA

TABLE 2
Continued

Source	Design ^a	Population/ sample	Study admission	TBI	Reference population	Prevalence of suicides	SMR or OR (95% CI)	Risk of bias (category of bias) ^b	
Mainio et al., 2007 Civilian, Finland	Cross-sectional	N = 1877 All general population suicides in single province	1988–2004, 16 years	Concussion Laceration [†]	83 20	Subset of 1877 suicides with no identified TBI	103/1877 5.5%	NA	Rating: moderate risk of bias Assessors of TBI exposure not blinded to suicide (DB) TBI status was based on ICD-9 codes for inpatient treatment or hospitalization only (DB) mTBI likely underrepresented or misclassified (CON)
Skopp et al., 2012 Military personnel, United States	Case control	N = 1764 All general population suicides in US military active service	2001–2009	Mild Moderate Severe Unclassified	97 25 5 2	Random selection, matched 4:1 ratio to cases by service, gender, race, age, date of entry active service, length of military service	129/1764 7.3%	Mild (OR) 1.1 (0.88, 1.42)	Rating: moderate risk of bias Assessors of TBI exposure not blinded to case/control status (DB) Use of ICD-10 less accurate for injuries in which medical attention was not sought (DB) Risk for moderate to severe TBI not reported due to limited cases; only mTBI analyzed and reported (RB and PRE) Differences in length of time from injury to death not addressed (CON)

SMR, Standardized Mortality Ratio; OR, Odds Ratio; CI, Confidence Interval; VHA, Veterans Health Administration; TBI, Traumatic Brain Injury; TH, Traumatic Intracranial Hemorrhage; Mod, Moderate; Sev, Severe; ICD-10, International Statistical Classification of Diseases-10; NP A's, Neuropsychological Assessment; NR, Not Reported; NA, Not Applicable.

^aDetermined using the Taxonomy of Study Design Tool (Hartling et al., 2010).

^bRTI Risk of Bias Tool (Moher et al., 2012); potential sources of bias include selection bias (SB), detection bias (DB), performance bias (PB), reporting bias (RE), attrition bias (AB), confounding (CON) and precision (PRE).

[†]SMR reported as statistically significant but p value not provided.

[†]Injuries classified as lacerations included cerebral contusion and intracranial hemorrhage.

[†]p < .0001, adjusted model. **p < .0002, adjusted model. †p < .006, adjusted model.

5 Studies
Purposes of the studies
varied

Suicide and Traumatic Brain Injury Among Individuals Seeking Veterans Health Administration Services

Lisa A. Brenner, PhD, ABPP; Rosalinda V. Ignacio, MS; Frederic C. Blow, PhD

Objective: To examine associations between history of traumatic brain injury (TBI) diagnosis and death by suicide among individuals receiving care within the Veterans Health Administration (VHA). **Method:** Individuals who received care between fiscal years 2001 to 2006 were included in analysis. Cox proportional hazards survival models for time to suicide, with time-dependent covariates, were utilized. Covariance sandwich estimators were used to adjust for the clustered nature of the data, with patients nested within VHA facilities. Analysis included all patients with a history of TBI ($n = 49,626$) plus a 5% random sample of patients without TBI ($n = 389,035$). Of those with a history of TBI, 103 died by suicide. Models were adjusted for demographic and psychiatric covariates. **Results:** Veterans with a history of TBI were 1.3 (95% confidence interval [CI], 1.24-1.37) times more likely to die by suicide than those without a history of TBI. Analyses by TBI severity were also conducted, and they suggested that in comparison to those without an injury history, those with (1) concussion/cranial fracture were 1.98 times more likely (95% CI, 1.39-2.82) to die by suicide and (2) cerebral contusion/traumatic intracranial hemorrhage were 1.34 times more likely (95% CI, 1.09-1.64) to die by suicide. This increased risk was not explained by the presence of psychiatric disorders or demographic factors. **Conclusions:** Among VHA users, those with a diagnosis of TBI were at greater risk for suicide than those without this diagnosis. Further research is indicated to identify evidence-based means of assessment and treatment for those with TBI and suicidal behavior. **Keywords:** suicide, traumatic brain injury, veterans

AMONG MEMBERS of the general population, individuals with a history of traumatic brain injury (TBI) are at increased risk for suicidal behavior as compared with those without an injury history.¹ Silver and colleagues² found that those with a TBI reported a higher frequency of suicide attempts, 8.1% versus 1.9%

in the general population. In a seminal study, Teasdale and Engberg³ reviewed hospital admission records and found that the incidence of suicide among those with concussion, cranial fracture, and cerebral contusion/traumatic intracranial hemorrhage were increased relative to the population on whole.

These findings are particularly relevant in light of the high rate of TBI being sustained by military personnel serving in Iraq and Afghanistan^{4,5} and concerns regarding suicidal behavior among members of the armed forces and veterans.^{6,7} Estimates of military personnel serving in current conflicts who have either screened positive or been diagnosed with clinician-confirmed mild TBI range from 11% to 23%.^{4,5,8,9} In addition, recent studies suggest a high rate of TBI among individuals seeking Veterans Health Administration (VHA) mental health and substance abuse treatment services.¹⁰

According to a recently published report by the Department of Defense Task Force on the Prevention of Suicide by Members of the Armed Forces,³ between 2005 and 2009, more than 1100 individuals in the military died by suicide. These numbers reflect a sharp increase in the rate of suicide among marines and soldiers, with the rate of suicide among army personnel more than doubling.³ Moreover, in comparison with members of the general population, suicide rates among

Individuals who received care between FY 01 and 06

Analyses included all patients with a history of TBI ($n = 49,626$) plus a 5% random sample of patients without TBI ($n = 389,035$)

Suicide - National Death Index (NDI) compiles death record data for all US residents from state vital statistics offices

TBI diagnoses of interest were similar to those used by Teasdale and Engberg

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Preliminary data regarding traumatic brain injury (TBI), all confirmed, and suicidal were presented at the International Brain Injury Association's Eighth World Congress on Brain Injury. An abstract of the presentation will appear in the journal *Brain Injury*. This abstract is approximately 400 words. A VHA memo containing similar information was distributed and disseminated to all providers. The data regarding TBI severity have not been previously presented.

Dr Brenner and Blow and Ms Ignacio report no competing interests. The authors thank Drs. De Koe, Anker, and Jim McCarry for their assistance in obtaining and analyzing data presented in this manuscript.

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DOI: 10.1097/TRR.0b013e318216b6

Suicide by TBI Severity – VHA Users FY 01-06

- 12,159 with concussion or cranial fracture, of which 33 died by suicide
- 39,545 with cerebral contusion/traumatic intracranial hemorrhage of which 78 died by suicide
- Of those with a history of TBI, 105 died by suicide

Challenges associated with this type of research and
need for collaboration
(~8 million records reviewed)



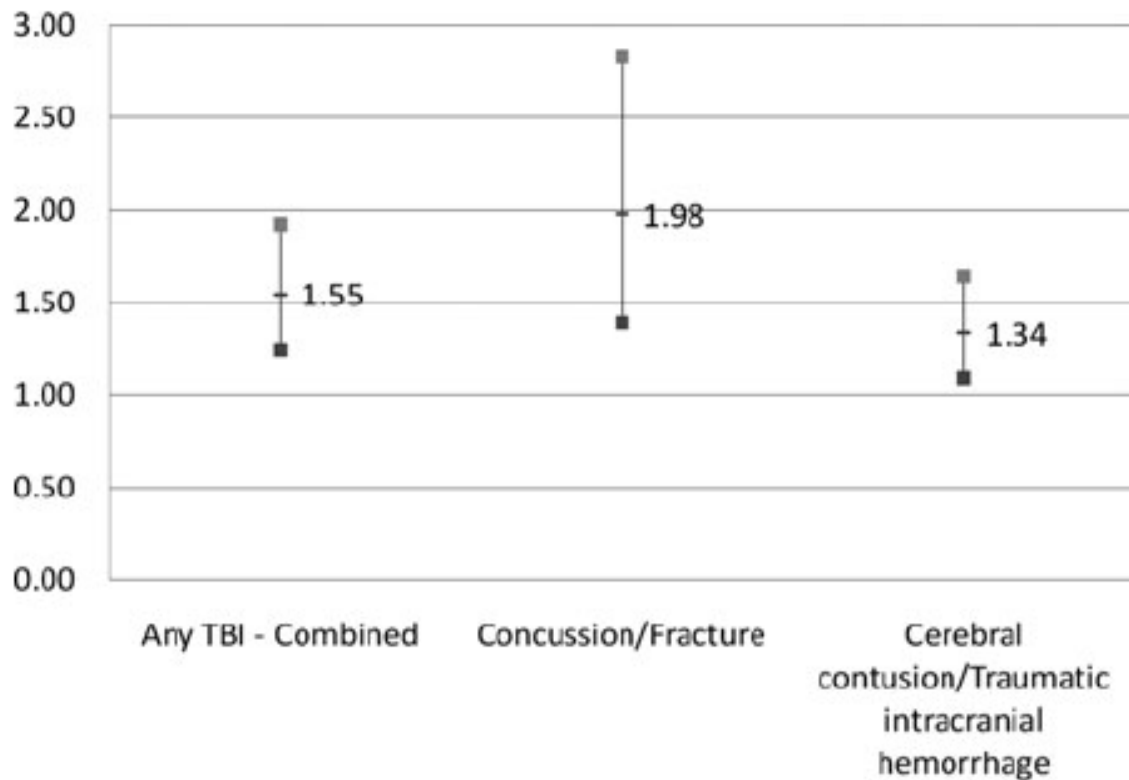


Figure 2. Hazard ratios for suicide by traumatic brain injury severity adjusted for sex, age, and psychiatric conditions.

ICD-9 codes:
 1) concussion (850),
 cranial fracture—fracture
 of vault of skull (800),
 fracture of base of skull
 (801), and other and
 unqualified skull fractures
 (803)
 (2) cerebral laceration
 and contusion (851);
 subarachnoid,
 subdural, and extradural
 hemorrhage after injury
 (852); other and
 unspecified intracranial
 hemorrhage after injury
 (853); and intracranial
 injury of other and
 unspecified
 nature (854).



Cox proportional hazards survival models for time to suicide, with time-dependent covariates, were utilized. Covariance sandwich estimators were used to adjust for the clustered nature of the data, with patients nested within VHA facilities.

Diagnosis	All		Those who died by suicide		Those who did not die by suicide		P
	N	Col%	N	Col%	N	Col%	
VHA users with any TBI (combined)							
All	49 626	100	105	100	49 521	100	
Substance abuse	8368	16.86	32	30.48	8336	16.83	.0002
Bipolar I/II	2265	4.56	10	9.52	2255	4.55	.0292
MDD	4,464	9	24	22.86	4440	8.97	<.0001
Other depression, no MDD	7616	15.35	23	21.9	7593	15.33	.062
Other anxiety	4326	8.72	16	15.24	4310	8.7	.0177
PTSD	4880	9.83	23	21.9	4857	9.81	<.0001
Schizophrenia/schizoaffective disorder	2287	4.61	6	5.71	2281	4.61	.4875
VHA users with concussion/fracture ←							
All	12 159	100	33	100	12 126	100	
Substance abuse	2087	17.16	9	27.27	2078	17.14	.123
Bipolar I/II	588	4.84	2	6.06	586	4.83	.6731
MDD	1198	9.85	10	30.3	1188	9.8	.00092 ←
Other depression, no MDD	1831	15.06	7	21.21	1824	15.04	.3271
Other anxiety	1148	9.44	7	21.21	1141	9.41	.0316 ←
PTSD	1376	11.32	7	21.21	1369	11.29	.0912
Schizophrenia/schizoaffective disorder	519	4.27	1	3.03	518	4.27	.9999
VHA users with cerebral contusion/traumatic intracranial hemorrhage ←							
All	39 545	100	78	100	39 467	100	
Substance abuse	6728	17.01	25	32.05	6703	16.98	.0004 ←
Bipolar I/II	1802	4.56	8	10.26	1794	4.55	.0256 ←
MDD	3490	8.83	17	21.79	3473	8.8	<.0001 ←
Other depression, no MDD	6142	15.53	17	21.79	6125	15.52	.1263
Other anxiety	3377	8.54	11	14.1	3366	8.53	.0785
PTSD	3757	9.5	17	21.79	3740	9.48	.0002 ←
Schizophrenia/schizoaffective disorder	1869	4.73	5	6.41	1864	4.72	.4199

Suicide Attempt

TABLE 3
Prevalence of Suicide Attempts (SA) After TBI

Source	Design ^a	Sample/setting	Sample sex/ age	TBI severity	SA source/time frame	Time-post injury	Prevalence of SA	Risk of bias (category of bias) ^b	
Breshears et al., 2010 Veteran, United States	Retrospective cross-sectional	N = 154 Archival data of interdisciplinary TBI team evaluations, recruit NA	149M, 5F Age M (SD) = 30.30 (11.57)	Mild 42 Mod 44 Sev 68	27.3% 28.6% 62.4%	Medical record review, clinical determination of presence of SA, post-TBI	14 yrs post	7.1%	Rating: moderate risk of bias Outcome assessors not blinded to exposure (DB) Use of keyword searches instead of diagnostic codes to classify SA (DB) Limited to SA that occurred within 2 years post diagnostic evaluation (DB)
Gutierrez et al., 2008 Veteran, United States	Retrospective case-series	N = 22 Attended TBI interdisciplinary team, archival data of all with H'x of IP psychiatric admission, recruit NA	21M, 1F Mdn = 51 yrs (range 38–65 yrs)	Mild 1 Mod 11 Sev 10	4.5% 50.0% 45.5%	SA documented in psychiatric discharge summaries, post-TBI	Mdn = 15 yrs	27.3%	Rating: moderate risk of bias Those whose hospitalisations occurred prior to computerised records were not included (SB) Outcome assessors not blinded to exposure (DB) Validated measure of SI not used (DB) Data regarding SI limited to hospital discharge records (DB)

TBI, Traumatic Brain Injury; Mod, Moderate; Sev, Severe; M, Male; F, Female; H'x, History; IP, Inpatient; M, Mean; Mdn, Median; NA, Not Applicable; SD, Standard deviation; yrs, years.

^aDetermined using the Taxonomy of Study Design Tool (Hartling et al., 2010).

^b RTI Risk of Bias tool (Viswanathan & Berkman, 2012); potential sources of bias include selection bias (SB), detection bias (DB), performance bias (PB), reporting bias (RB), attrition bias (AB), confounding (CON), and precision (PRE).

2 studies – both retrospective

Suicide Ideation

TABLE 4
Prevalence of Suicidal Ideation (SI) After TBI

Source	Design ^a	Sample/setting	Sample sex/ age	Injury severity	SI source/ time frame	Time-post injury	Prevalence of SI	Risk of bias (category of bias) ^b
Tsaousides et al., 2011 Civilian, United States	Retrospective cross-sectional	N = 356 Community-dwelling, diverse sources	186M, 170F Age M (SD) = 44.5 (15.2) yrs	Mild Mod-Sev	37.6% 62.4%	Score ≥ 1 on SI item on BDI-II last 2 weeks	M (SD) = 5.9 (9.2) yrs	28.3% Rating: low risk of bias Outcome assessors not blinded to exposure (DB) Single-item measure of SI not validated (DB)
Gutierrez et al., 2008 Veteran, United States	Retrospective case series	N = 22 Attended TBI interdisciplinary team, archival data of all with H'x of IP psychiatric admission, recruit NA	21M, 1F Age Mdn = 51 yrs (range 38–65 yrs)	Mild 1 Mod 11 Sev 10	4.5% 50.0% 45.5%	Reference to suicide ideation in psychiatric discharge summaries, post-TBI	Mdn = 15 yrs	72.7% Rating: moderate risk of bias Those whose hospitalisations occurred prior to computerised records were not included (SB) Outcome assessors not blinded to exposure (DB) Validated measure of SI not used (DB) Data regarding SI limited to hospital discharge records (DB)

TBI, Traumatic Brain Injury; Mod, Moderate; Sev, Severe; M, Male; F, Female; BDI-II, Beck Depression Inventory-II; M, Mean; SD, Standard deviation; Mdn, Median; H'x History; IP, Inpatient; NA, Not Applicable; yrs, years.

^aDetermined using the Taxonomy of Study Design Tool (Hartling et al., 2010).

^bRTI Risk of Bias tool (Viswanathan & Berkman, 2012); potential sources of bias include selection bias (SB), detection bias (DB), performance bias (PB), reporting bias (RB), attrition bias (AB), confounding (CON), and precision (PRE).

2 studies – both retrospective

Treatment

TABLE 6
Treatment Studies

Source	Design ^a	Sample, setting	Sex, age	Injury severity/time post-injury	Primary outcome, intervention	Measure of suicide ideation (SI)	Attrition, T'x Outcome	Risk of Bias (category of bias) ^b
Simpson et al., 2011 Civilian, Australia	RCT	N = 17, Brain injury community rehabilitation service	16M, 1F Age M (SD) = 39.7 (19)	Sev 17 M (SD) yrs 6.3(6.8) T' X7.6 (4.6) waitlist	Hopelessness, Beck Hopelessness Scale 20-h manualised Group CBT programme, 20 hours	Secondary outcome Beck Scale for Suicide Ideation range 0-38	16 complete T'x, T'x gp n = 8 M (SD) 7.8 (10.7) Pre-T'x 5.1(8.9) Post-T'x NS repeated measures analysis	Rating: low risk of bias PEDro Rating: 8/10 Therapists and patients not blinded to treatment condition (DB) Small sample limited power to detect treatment effect for SI (PREC)
Rapoport et al., 2008 Civilian, Canada	Before-After Study	N = 65 Mild-moderate TBI clinic, tertiary trauma care centre	38M, 27F Age M (SD) = 39.7 (19)	Mild 33 Mod-Sev 32, time post-injury NR	Depression First wave, n = 29 fixed dose citalopram, 20 mg/day, 6 weeks Second wave, n = 36 flexible dose citalopram, Start 20 mg/day, titrating to max. 50 mg/day, 10 wks	Secondary outcome suicide ideation item, Hamilton Depression Scale, range NR	54 complete 6 wks of T'x, Specific suicide ideation values NR	Rating: unclear risk of bias Outcome assessors not blinded to intervention (DB) Single-item measure of SI not validated (DB) Numeric values for SI not reported (RB) Impact of loss to follow-up not assessed (AB) Partially accounted for important confounders (CON)
Rees & Bellon, 2007 Civilian, Australia	Before-After Study	N = 20, Brain injury community rehabilitation service, 20% of admitted clients over previous 10 yrs	10M, 10F Age M (SD) = 31.2 (11.2)	Post Concussion Syndrome, GCS 13-15 Rancho Los Amigos scale 5-7, time post-injury NR	Post Concussion Syndrome symptoms (NSI) Individual client-centred counselling + CBT, minimum 62 h over 2 yrs	Secondary outcome Suicide ideation item, Beck Depression Inventory-II, range NR	20 complete T'x, Yr 1 0.8 ± 0.6 Yr 2 0.3 ± 0.6, Paired Hests t = 3.9*	Rating: high risk of bias Unclear if eligibility criteria was uniformly applied across patients (SB) Outcome assessors not blinded to intervention (DB) Single item measure of SI not validated (DB) Important aspects of the intervention not described (PB)

3 studies – 1 RCT and 2 Before and After Studies

PTSD and SI/SA

- **Ideation** - two meta-analyses (Krysinska and Lester 2010; Panagioti, Gooding and Terrier 2012) and one systematic review (Pompili et al. 2013) – **increased risk**
- **Attempt** - **the association between PTSD with SAs remains significant after controlling for other psychiatric diagnoses** (Krysinska and Lester 2010; Panagioti, Gooding and Terrier 2009; Panagioti, Gooding and Terrier 2012)

PTSD and Suicide

- Bullman and Kang (1994) found that, among male Vietnam Vets, **those with PTSD were significantly more likely to die by suicide** (relative risk = 3.97; 95% confidence interval = 2.20 - 7.03) than those without PTSD.
- Ilgen et al. (2010) - Veterans with a diagnosis of PTSD were **1.93 times more likely to die by suicide** (95% confidence interval for hazard ratios: 1.79 – 2.08), compared to Veterans without PTSD.

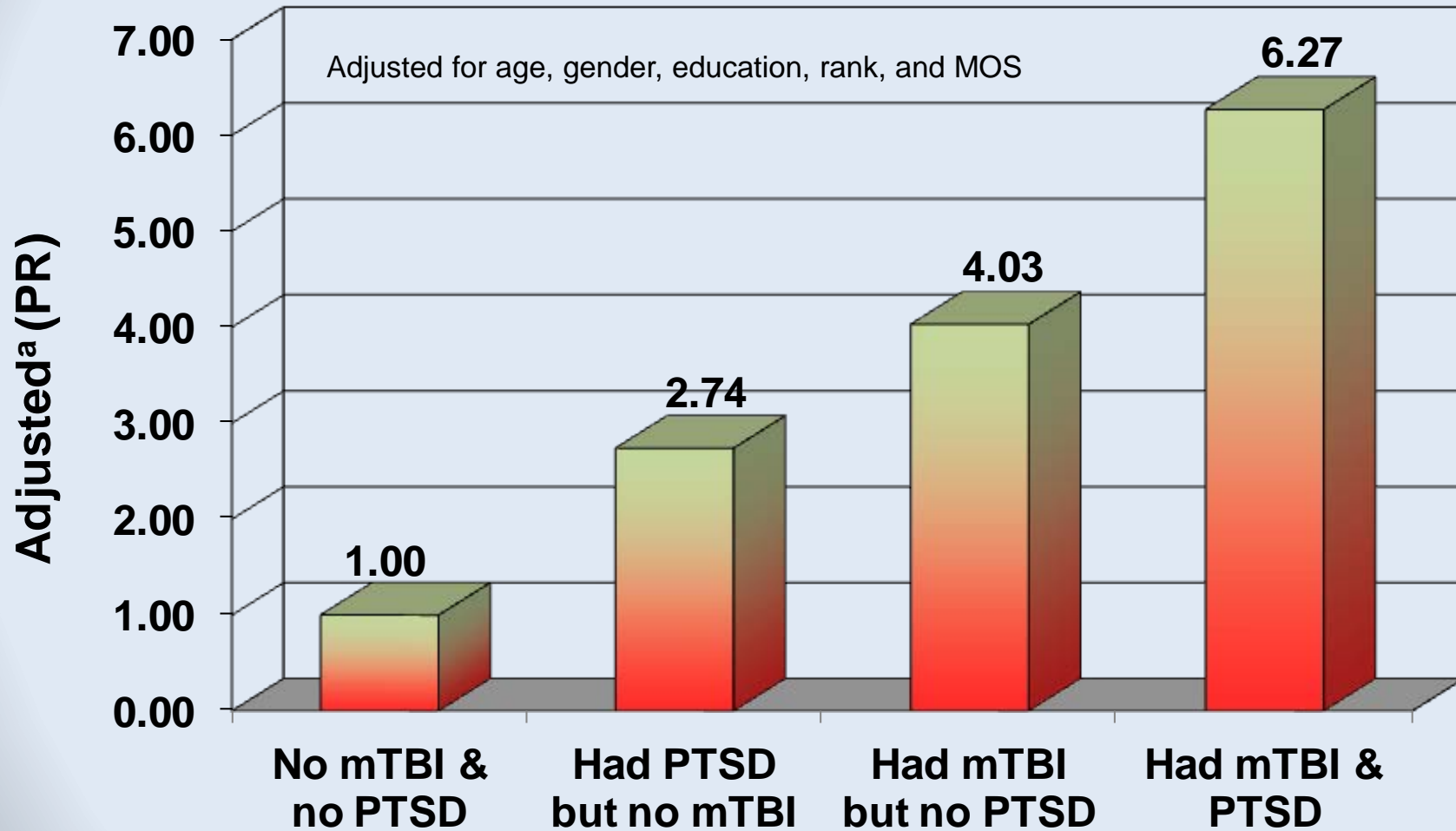
PTSD and Suicide

- **Three recent studies with varying populations and methodological approaches did not find PTSD to be significantly associated with suicide** (Desai, Dausey and Rosenheck 2005; LeardMann et al. 2013; Zivin, Kim and McCarthy 2007).
 - LeardMann and colleagues (2013) conducted a prospective cohort study with former and current military personnel using data from the Millennium Cohort Study. PTSD (i.e., a positive PTSD screen or self-reported lifetime diagnosis of PTSD) **was not significantly associated with suicide in unadjusted or adjusted** (i.e., age and sex) analyses.

TBI and PTSD: Suicide

- Traumatic Brain Injury (TBI) and Post Traumatic Stress Disorder (PTSD) as Risk Factors for Suicidal Thoughts and Behaviors
 - Sarra Nazem, PhD; Eryn Lonquist, MD; Lindsey L. Monteith, PhD; & Lisa A. Brenner, PhD, ABPP
- **Suicide.** No studies were identified that examined the impact of co-occurring PTSD and TBI on suicide.

Any Post Concussive Symptom (n = 389)



Total no. of soldiers (N = 1247)



Assessment and Diagnosis of Mild Traumatic Brain Injury, Posttraumatic Stress Disorder, and Other Polytrauma Conditions: Burden of Adversity Hypothesis

Lisa A. Brenner

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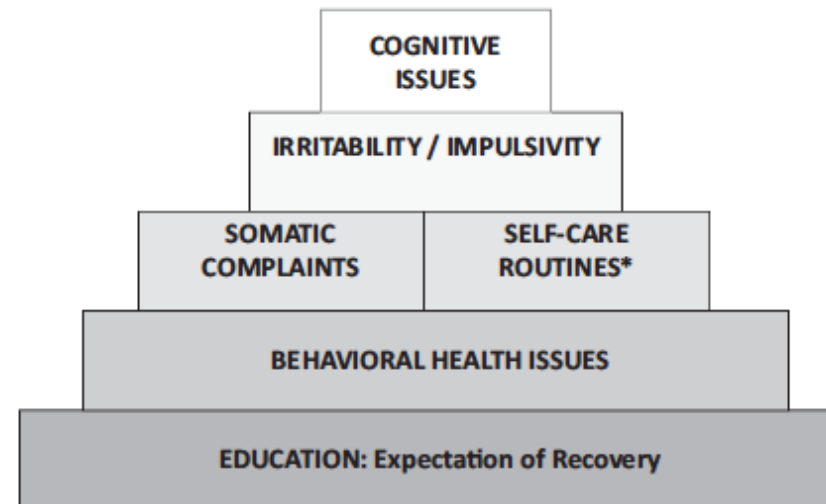


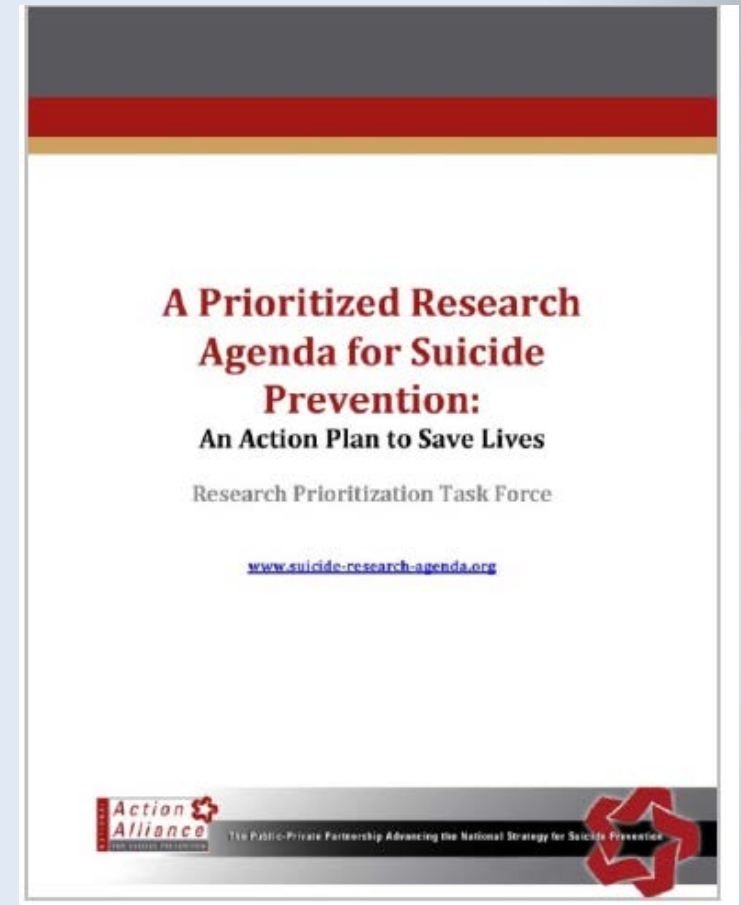
Figure 3. Traumatic brain injury step-care treatment model. *Includes sleep hygiene, diet, exercise, and avoiding further traumatic brain injury.

Question 3: What Interventions Prevent Individuals From Engaging in Suicidal Behavior?

Aspirational Goal 4: Ensure that people who are thinking about suicide but have not yet attempted, receive interventions to prevent suicidal behavior.

Question 5: What Other Types of Preventive Interventions (Outside Health Care Settings) Reduce Suicide Risk?

Aspirational Goal 11: Prevent the emergence of suicidal behavior by developing and delivering the most effective prevention programs to build resilience and reduce risk in broad-based populations.



Indicated

Members of a given population with
SPECIFIC RISK CONDITIONS

Selected

Sub-populations who may be
AT ELEVATED RISK

Universal

ALL MEMBERS of a given
population regardless of risk



Levels of Prevention

Use Your Smartphone to Visit the VISN 19 MIRECC Website

Requirements:

1. Smartphone with a camera
2. QR scanning software (available for free download just look at your phones marketplace)



www.mirecc.va.gov/visn19

