

Evaluating Measures of Combat Deployment Available in Population-Level Administrative Data



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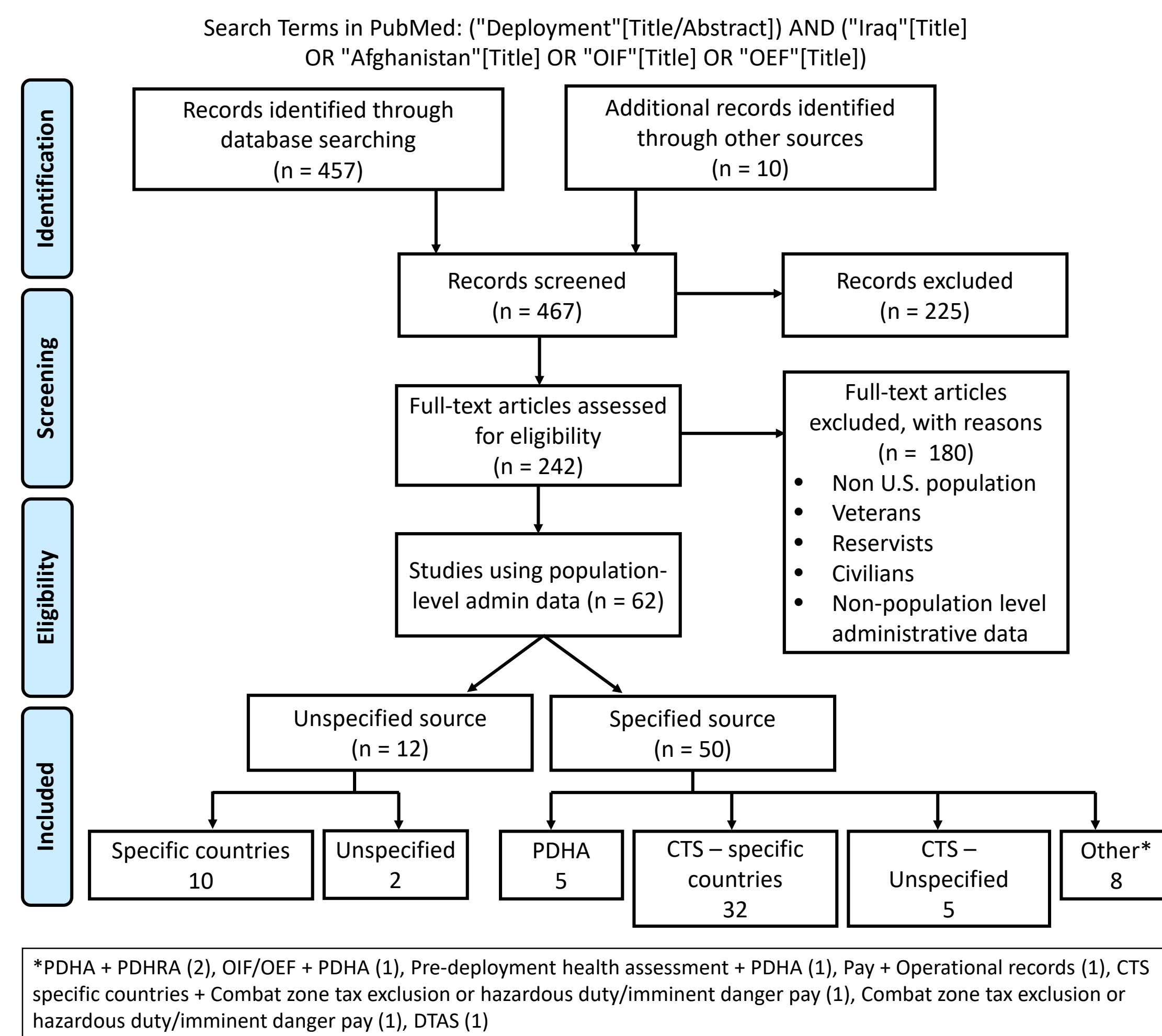


Background

Many gaps exist in understanding the full psychological health effects of deployment to an active war zone (heretofore called combat deployment). One of the challenges in addressing this gap is accurate identification of service members who are combat deployed. When conducting surveillance and/or research using population-level administrative data in the Military Health System, researchers often utilize routinely collected measures to identify service members who are combat deployed. However, no gold standard measure exists for identifying combat deployments, and to our knowledge, available measures have not been directly compared nor validated. This study will identify combat deployment measures used in the literature, and will assess agreement and validity of those measures to help inform decisions about optimal measures for identifying combat deployments.

Combat Deployment in the Literature

We conducted a systematic search of the literature to identify measures available in population-level administrative data that researchers have utilized to identify combat deployments in support of Operations Enduring Freedom (OEF), Iraqi Freedom (OIF), and New Dawn (OND). Twelve of 62 (19%) studies did not specify the source for how combat deployment was measured while seven of 62 (11%) did not specify the measure. Among studies that specified the source, the most common measures included: 1) country of deployment from the Defense Manpower Data Center (DMDC) Contingency Tracking System (CTS), 2) country of deployment from the Post-Deployment Health Assessment (PDHA), 3) combat exposure from the PDHA (encountered dead/wounded, discharged a weapon, and felt in danger of being killed), and 4) combat zone tax exclusion or hazardous duty pay/imminent danger pay. Among studies using country of deployment, most only included Iraq and Afghanistan (86%).



Combat Deployment Measures

Table 1. Measures of combat deployment evaluated in this study

Measure	Description
CTS 1	CTS Country: Iraq/Afghanistan (IZ/AF)
CTS 2	CTS Country: Iraq/Afghanistan/Kuwait (IZ/AF/KU)
PDHA 1	PDHA Country: Self-reported Iraq/Afghanistan (IZ/AF)
PDHA 2	PDHA Country: Self-reported Iraq/Afghanistan/Kuwait (IZ/AF/KU)
PDHA 3	PDHA Operation: Self-reported OEF/OIF/OND
PDHA 4	PDHA Combat Exposure: Any of the following endorsed (encountered dead/wounded, discharged weapon, felt in danger of being killed)
PDHA 5	PDHA Combat Exposure: All of the following endorsed (encountered dead/wounded, discharged weapon, felt in danger of being killed)

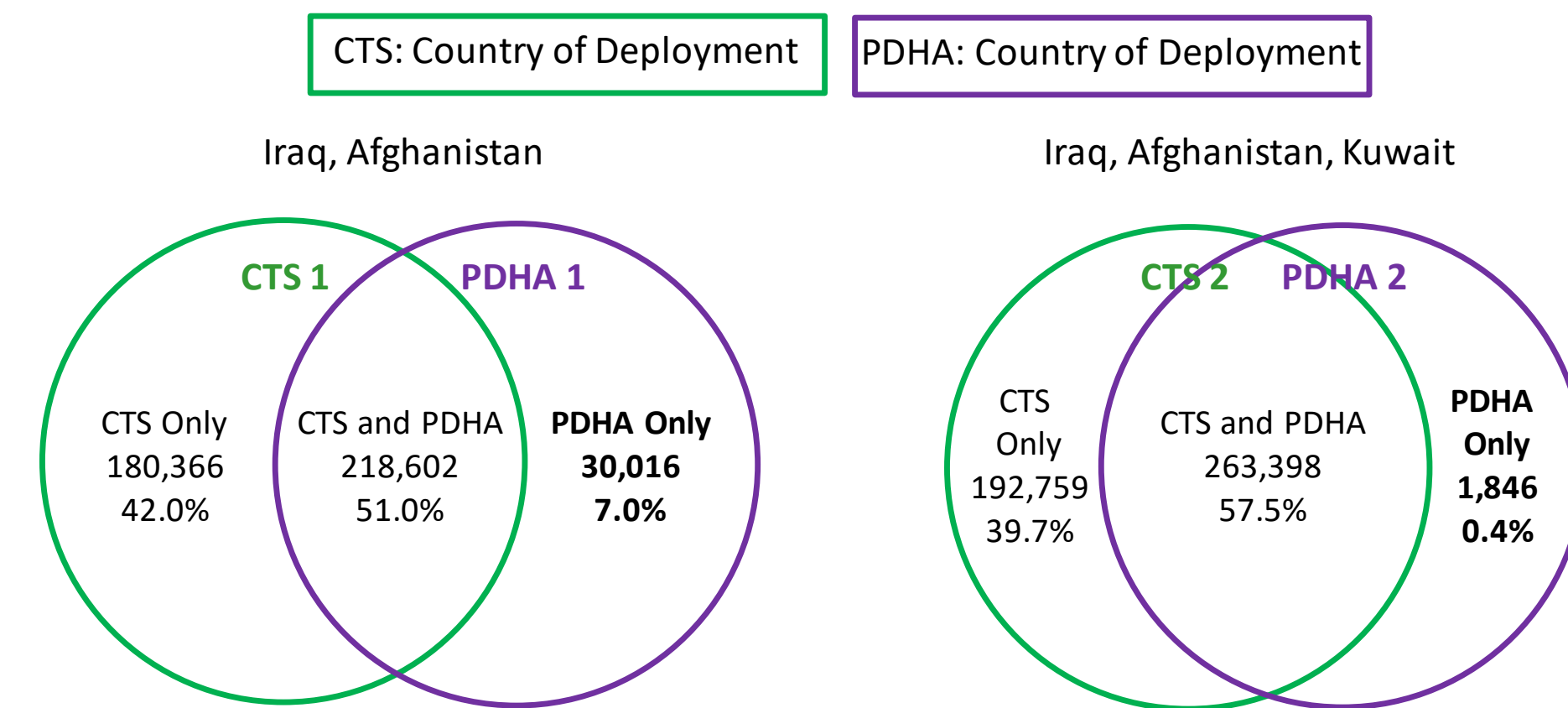
Methods & Results

We evaluated commonly-utilized measures available in population-level administrative data to identify combat deployments to OEF/OIF/OND among active duty Army personnel (table 1). We identified deployments from CTS in three 1-year periods (N=549,086), then merged in PDHAs using start, end, and completion dates (15% did not match to a PDHA). Each deployment was assigned a yes/no value for each measure, which we compared in three ways:

1. Agreement: assessing the extent to which soldiers are differentially identified as combat deployed via each measure;
2. Validity: calculating the sensitivity of each measure in capturing instances of specific criterion measures; and
3. Corroboration: examining how each measure predicts subsequent incidence of traumatic brain injury (TBI) and posttraumatic stress disorder (PTSD).

1a. Agreement: Country of Deployment Comparison

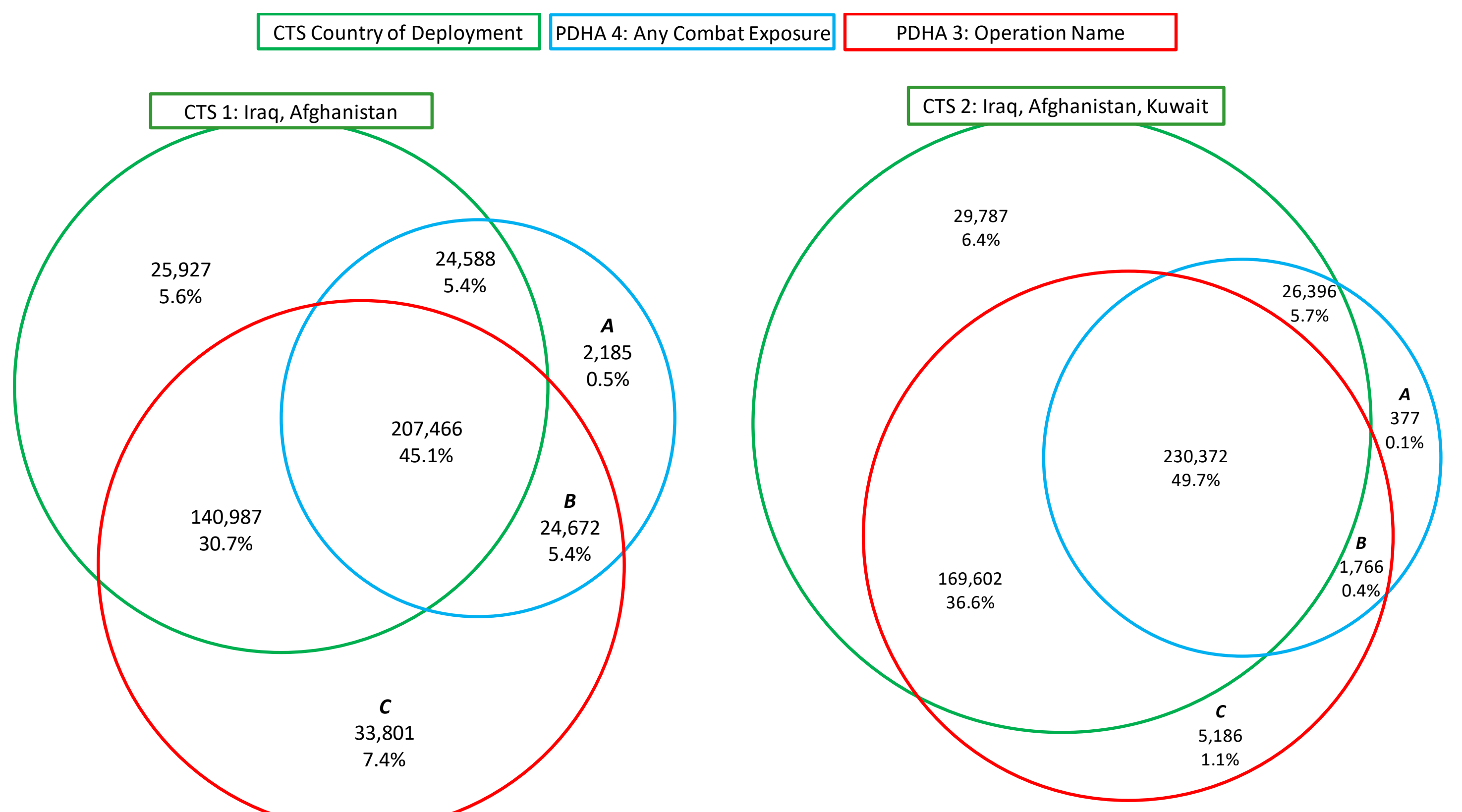
We first compared countries of deployment listed in the CTS records with countries listed in the soldier’s PDHA to assess agreement between data sources. The left diagram includes only Iraq and Afghanistan (IZ/AF; CTS 1 vs. PDHA 1 [table 1]), and the right diagram further includes Kuwait (CTS 2 vs. PDHA 2).



Agreement between CTS and PDHA country locations ranges between 51 and 58%. However, PDHAs are frequently missing country location, contributing to the large “CTS Only” sections above. Conversely, when PDHA lists IZ/AF but CTS does not (“PDHA Only” in left diagram), 95% of those list Kuwait in CTS. The addition of Kuwait to each measure improves agreement.

1b. Agreement: Measures of Combat Deployment

We then compared the CTS country of deployment measures (CTS 1 on left, CTS 2 on right) to additional measures of combat deployment, including combat exposure via the PDHA and the self-reported operation from the PDHA. Note, only the CTS country measure changes below.



We see moderate agreement between each pair of definitions, however, less than 50% of deployments met all three measure definitions. More than 60,000 deployments had self-reported combat exposure and/or an operation of OEF/OIF/OND from the PDHA, but did not list IZ/AF in CTS (see A, B, and C in left diagram). Of those, 90% were captured by simply adding Kuwait to the CTS country definition (see reduced A, B, and C in right diagram).

2. Validity: Sensitivity Calculations

We then assessed the sensitivity (and 95% confidence interval [CI]) of each measure in detecting the presence of a battle injury among deployed service members. Data are not yet available for the criterion measure indicating presence of a combat badge; future efforts will assess sensitivity in detecting this criterion.

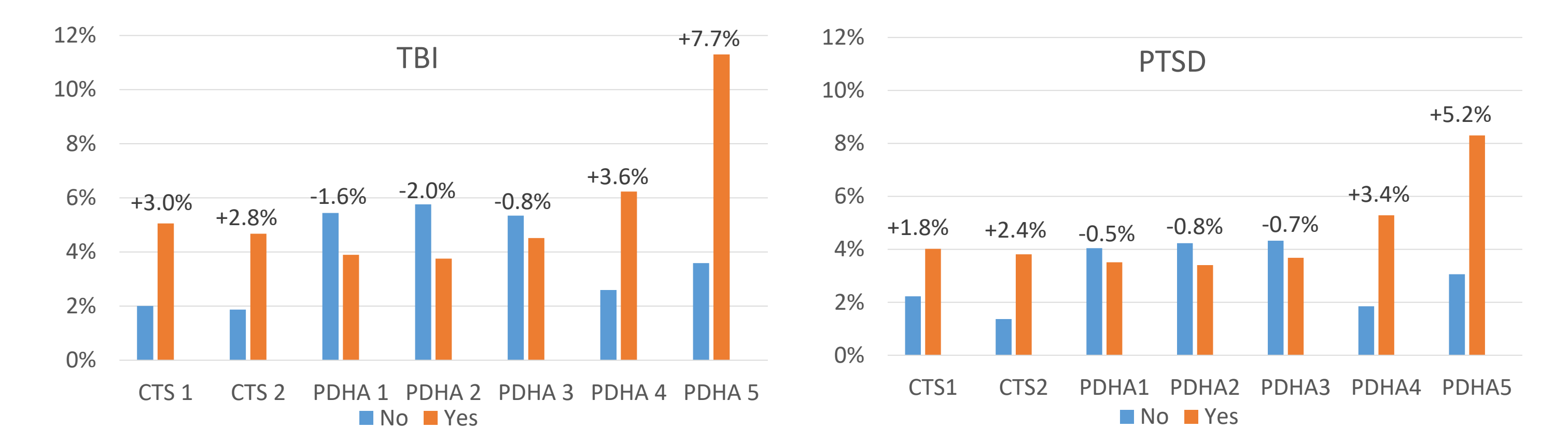
Measure	Criterion Measure			
	Battle Injury		Combat Badge	
	Sensitivity	95% CI	Sensitivity	95% CI
CTS 1	94.6%	94.0-95.3%		
CTS 2	99.8%	99.7-99.9%		
PDHA 1*	78.7%	76.9-80.6%		
PDHA 2*	80.6%	78.8-82.4%		
PDHA 3*	88.2%	86.9-89.6%		
PDHA 4*	95.3%	95.2-96.8%		
PDHA 5*	56.7%	54.1-59.3%		

*Among deployments with a matching PDHA

CTS country measures had high sensitivity in capturing battle injuries, with the addition of Kuwait (CTS 2) further improving sensitivity. PDHA 4 (any self-reported combat exposure) also had high sensitivity for detecting this criterion.

3. Corroboration: Combat-Related Outcomes

Lastly, we assessed the difference in incident TBI and PTSD diagnoses between soldiers whose deployment met the definition for each measure compared to those whose deployment did not (table 1). Diagnoses must have occurred during or within 1 year of deployment.



Deployments that met CTS country measures had higher incident TBI and PTSD diagnoses than those that did not. Conversely, deployments that met PDHA country measures had lower incidence than those that did not, though PDHA countries are frequently missing and therefore unreliable. Deployments meeting PDHA combat exposure measures (PDHA 4 and 5) had the highest difference in incidence than those that did not, suggesting that these measures are more predictive of combat-related outcomes. However, soldiers who endorse combat exposures on a PDHA (compared to those that do not) may be more likely to receive follow-up care, screening, and a diagnosis as a result, which may not be indicative of the exposure itself.

Summary & Conclusions

Administrative data offer several measures for defining combat deployment. However, such measures show wide variability in the deployments they capture. We found that CTS-identified deployments to Iraq, Afghanistan, and/or Kuwait captured over 98% of combat deployments identified in PDHA. The inclusion of CTS deployments to Kuwait is critical; without Kuwait, we missed over 24,000 deployments with any combat exposure in PDHA, over 28,000 with IZ/AF as country of deployment in PDHA, and over 51,000 deployments supporting OEF/OIF/OND in PDHA. In addition, using CTS allows researchers to capture deployments that do not have a corresponding PDHA.

Recommendations

1. Studies examining service members who are combat deployed need to specify the source and type of measure utilized.
2. When assessing literature on combat-related outcomes, recognize the measure used to define combat deployments as different measures can greatly impact results.
3. When conducting research on Army combat deployments in support of OEF/OIF/OND, we recommend using CTS to identify deployments to Iraq, Afghanistan, and Kuwait.