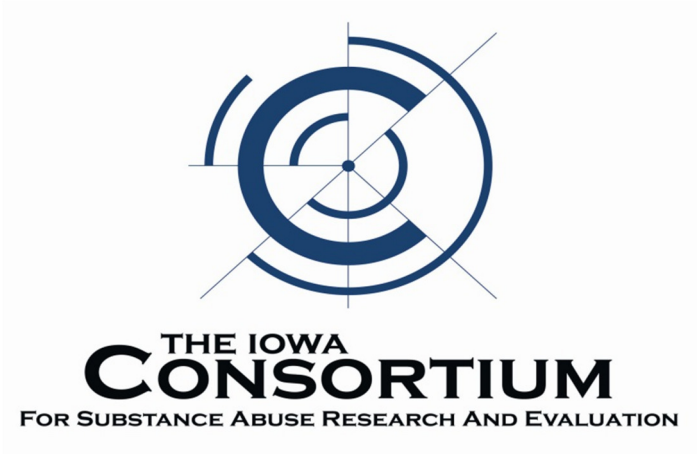
SBIRT IOWA

Iowa Army National Guard

THE IOWA CONSORTIUM FOR SUBSTANCE ABUSE RESEARCH AND EVALUATION

Iowa Army National Guard
Biannual Report
April 2016

With Funds Provided By:
Iowa Department of Public Health,
Division of Behavioral Health;
Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment, Grant Number TI023466



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Citation of references related to this report is appreciated. Suggested Citation:

Jones, D. & Arndt, S. (April 2016). Screening, Brief Intervention and Referral to Treatment (SBIRT). Iowa Army National Guard Biannual Report. (Iowa Department of Public Health contract #5886YM50). Iowa City, IA; Iowa Consortium for Substance Abuse Research and Evaluation.
http://iconsortium.subst-abuse.uiowa.edu/

EXECUTIVE SUMMARY

Screening Brief Intervention and Referral to Treatment (SBIRT) is a five-year (July 2012 – August 2017) grant awarded to the Iowa Department of Public Health and funded by the U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration (SAMHSA); Center for Substance Abuse Treatment. SBIRT IOWA uses a comprehensive, integrated, public health approach to incorporate universal screening into medical practice and within the Iowa Army National Guard (IAARNG) to identify, reduce, and prevent hazardous alcohol or drug use. The Iowa Consortium for Substance Abuse Research and Evaluation (Consortium) conducts the evaluation for the SBIRT IOWA project. This report includes information for over 7,000 Soldiers in the IAARNG that have undergone SBIRT IOWA screening from October 25, 2012 through February 29, 2016.

Iowa National Guard members age 18 or older are prescreened with two questions about alcohol use and illegal drug use. Individuals receive full screenings if they indicate any of the following occurring within the past year:

- Men up to age 65 report drinking five or more drinks in one day or over 14 drinks in one week.
- Women of any age and men over age 65 report drinking four or more drinks in one day or over seven drinks in one week.
- Any illegal drug use or prescription use for non-medical reasons by men or women of any age.

SBIRT IOWA uses two instruments to conduct full screenings. The 10-question Alcohol Use Disorders Identification Test (AUDIT) screens for risky drinking and alcohol disorders. The Drug Abuse Screening Test (DAST-10) screens for hazardous use of illegal drugs and prescription misuse. Soldiers are also screened for depression symptoms using the Patient Health Questionnaire (PHQ), which is a screening and diagnostic tool used by health care professionals for assessing mental health disorders. The PHQ-9 is the depressive disorders module of the PHQ, and is an optional screening tool for SBIRT providers. Substance use (AUDIT for alcohol or DAST-10 for drug use) and mental health (PHQ-9) screening scores were present in the majority of the screening records. This report addresses three questions:

1. Which Soldiers have higher screening scores (are there common characteristics at initial contact)?
2. How do the screening scores relate to PHQ-9 scores and depression symptoms?
3. Which Soldiers experience changes in substance use screening scores over time?

In addition to the screening instruments, SBIRT IOWA staff is required under the Government Performance and Results Act (GPRA) to gather demographic information. Data were extracted from the SBIRT screenings and GPRA files for 11,688 records representing 7,442 Soldiers. Both inactive and active GPRA records were included to maximize the number of Soldiers with at least two substance use screenings. Due to smaller sample sizes for higher risk categories, AUDIT and DAST-10 scores were categorized into two categories Low Risk – when AUDIT scores are less than or equal to 7 and DAST-10 scores equal to zero, and Unhealthy Use for any higher AUDIT or DAST-10 score.

The following results were found for the three questions:

"Which Soldiers have higher screening scores (are there common characteristics at initial contact)?"

- Three Soldier characteristics showed moderately strong and statistically significant relationships to Unhealthy Use: sex, age, and deployment to any combat zone. Being male, in the High Risk age group (between the ages of 20 and 25 years old) and having been deployed to any combat zone additively increased the chance of Unhealthy Use.
- Males in the High Risk age group who had been deployed had a high percentage of Unhealthy Use (14.5%), while females not in the High Risk age group who had not been deployed to any combat zone had a low percentage of Unhealthy Use (1.9%).

"How do the screening scores relate to PHQ-9 scores and depression symptoms?"

- PHQ-9 scores and depression severity levels were significantly related to Unhealthy Use in the select subgroup of Soldiers who received PHQ-9 screens in the SBIRT IOWA project. Increased depression severity dramatically elevated the chances of Unhealthy Use.
- Among the 2,208 Soldiers with a second PHQ-9 screening, Soldiers who were deployed to any combat zone were more likely to experience an increase in depressive symptoms from the first to second PHQ-9 screening.
- Unfortunately, there were differences between those who did receive the PHQ-9 and those who did not have recorded PHQ-9 screens. Thus, these results are based on a subset of Soldiers.

"Which Soldiers experience changes in substance use screening scores over time?"

- Use risk levels declined significantly between the initial and secondary SBIRT screens among the 3,350 Soldiers with two AUDIT and DAST-10 screenings. Male Soldiers and Soldiers in the High Risk age group (20 to 25 years of age) had higher chances of experiencing a decrease in risk level between the first and second SBIRT screening.
- Among the select group of Soldiers with PHQ-9 scores and two AUDIT and DAST-10 screenings, PHQ-9 scores significantly predicted both moving from a higher risk category to a lower one and moving from a lower risk category to a higher one, even after accounting for Soldier's gender and whether or not the Soldier was in the High Risk age category.

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BACKGROUND

In July 2012, the Iowa Department of Public Health (IDPH) received a five-year grant to provide Screening, Brief Intervention and Referral to Treatment (SBIRT) services by the Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Substance Abuse Treatment (CSAT). SBIRT IOWA uses a comprehensive, integrated, public health approach to incorporate universal screening into medical practice and within the Iowa Army National Guard (IAARNG) to identify, reduce, and prevent hazardous alcohol or drug use. Specially trained substance use disorder treatment staff administer prescreening and screening for alcohol and other substance use to Soldiers affiliated with the IAARNG. Staff also conduct brief interventions, brief treatment sessions, and make referrals for substance use disorder treatment. The Iowa Consortium for Substance Abuse Research and Evaluation (Consortium) conducts the evaluation for the SBIRT IOWA project. The data provided in this report cover the beginning of the project October 25, 2012 through February 29, 2016.

Screening/Assessment Tools and Scoring Key

SBIRT IOWA staff at the IAARNG administer the 10-question Alcohol Use Disorders Identification Test (AUDIT) when a Soldier pre-screens positive for risky alcohol use and the Drug Abuse Screening Test (DAST-10) when a Soldier pre-screens positive for drug use. The Patient Health Questionnaire (PHQ) is a screening and diagnostic tool used by health care professionals for assessing mental health disorders. The PHQ-9 is the depressive disorders module of the PHQ, and is an optional screening tool for SBIRT providers. Table 1 on the following page provides the scoring ranges, associated risk levels, and recommended services for the AUDIT, DAST-10, and PHQ-9.

Data Extraction

Data for these analyses were drawn slightly differently than for SBIRT annual reports in order to maximize the number of Soldiers with multiple screenings. Individuals that underwent SBIRT screening at the Camp Dodge location were identified as Soldiers in the Iowa Army National Guard. Once they were identified as Soldiers, their GPRA IDs were used to capture information from substance use and depression screenings at other Federally Qualified Health Centers participating in SBIRT IOWA. Information from both the SBIRT Activities files and GPRA interviews were used to obtain more complete demographic information. For this report, both inactive and active GPRA client records were utilized to assess changes in substance use and depression screenings across time and to maximize the number of Soldiers with DAST-10, AUDIT, and PHQ-9 scores.

Table 1. Screening Tool Scoring Key

Score	Risk Level	Recommended Service
AUDIT		
0 – 7	Low Risk or Negative	Encouragement and Education
8 – 15	Risky or Hazardous	Brief Intervention
16 – 19	High Risk or Harmful	Brief Treatment
20 – 40	High Risk	Referral to Treatment
DAST-10		
0	Low Risk	Encouragement and Education
1 – 2	Moderate Risk	Brief Intervention
3 – 5	Substantial Risk	Brief Treatment
6 – 10	Severe Risk	Referral to Treatment
PHQ-9[1]		
0 – 4	Minimal Depression	Patient may not need depression treatment.
5 – 9	Mild Depression	Physician uses clinical judgment about treatment, based on patient's duration of symptoms and functional impairment.
10 – 14	Moderate Depression	
15 – 19	Moderately Severe Depression	Warrants treatment for depression, using antidepressant, psychotherapy and/or a combination of treatment.
20 – 27	Severe Depression	

RESULTS

Which Soldiers Have Higher AUDIT and DAST-10 Screening Scores?

A total of 7,442 Soldiers underwent SBIRT IOWA screening (meaning at least a prescreening) from October 25, 2012 through February 29, 2016. Table 2 on the following page lists the number and percentages of Soldiers with and without alcohol and drug prescreens, AUDIT, and DAST-10 scores present.

All Soldiers were asked about their alcohol and drug use using a two question pre-screening tool. Only male Soldiers who reported drinking five or more drinks in a day and female Soldiers and Soldiers over 65 years who reported drinking four or more drinks in a day in the past year were administered the AUDIT. Similarly, only Soldiers who reported any drug use within the

[1] UMHS Depression Guideline, August 2011. PHQ-9 Questionnaire for Depression Scoring and Interpretation Guide. Retrieved from http://www.med.umich.edu/1info/FHP/practiceguides/depress/score.pdf

past year were given the DAST-10. If a Soldier screens positive on both the alcohol and drug screenings, then the AUDIT and DAST-10 are given.

Table 2. Number and Percent of Soldiers with Scores at First Visit

	Score Present	Score Not Present	Percent with Scores
Prescreen – Alcohol	7442	0	100.0%
Prescreen – Drugs	7442	0	100.0%
AUDIT	3800	3642	51.1%
DAST-10	93	7442	1.3%

Table 3 presents the number and percent of Soldiers at each level of risk, determined by prescreen, AUDIT, and DAST-10 scores at the initial evaluation. In order to best use all of the data, we classified all Soldiers as Low Risk, Moderate Risk, Substantial Risk, or High Risk based on the prescreening questions, AUDIT and DAST-10 scores. If Soldiers received a higher score than Low Risk on both the AUDIT and DAST-10, then their highest risk category was used. The highest two levels of risk were rare: only 73 Soldiers (less than 1%) reported use that fell into the "substantial risk" or "severe risk" categories. Therefore, subsequent analyses focus on differences between the 7,008 Soldiers with Low Risk versus the 434 of Soldiers reporting Unhealthy Use (Moderate, Substantial, and Severe categories combined) of alcohol or drugs.

Table 3. Risk Level at First Visit

	n = 7,442	Percent
Low Risk	**7008**	**94.2%**
Unhealthy Use	**434**	**5.8%**
Moderate Risk	*361*	*4.9%*
Substantial Risk	*42*	*0.6%*
Severe Risk	*31*	*0.4%*

Note: Moderate Risk, Substantial Risk and Severe Risk percentages do not total the Unhealthy Use percentage due to rounding.

Table 4 shows the percentage of Soldiers who report Unhealthy Use by calendar year from October 25, 2012 to February 29, 2016. Note that since 2012 and 2016 include data for only a few months, the number of Soldiers is smaller than for other years. Nonetheless, there has been a steady reduction in the percent of Soldiers reporting unhealthy use since the beginning of the project.[2] During the first full year of screening in 2013, 7.8% of Soldiers reported Unhealthy Use. However, this percentage decreased significantly to 5.3% in 2014 and 3.3% in 2015.

[2] Jonckheere-Terpstra test z = -8.103, p <0.0001

Table 4. Percent Unhealthy Use by Calendar Year

	Number	% Unhealthy Use
2012 (October – December)	223	11.7%
2013	3096	7.8%
2014	1659	5.3%
2015	2064	3.3%
2016 (January – February)	400	2.5%
All Years	7442	5.8%

Jonckheere-Terpstra test z = -8.103, p <0.0001

Demographic Associations

Tables 5 and 6 present screening scores for the instruments by demographic characteristics. The tables provide percentages; statistical significance test values appear below the tables. Table 5 shows risk level by sex.[3] Males were more than twice as likely as females to be in the Unhealthy Use group.

Table 5. Risk Level by Sex

	Low Risk (n = 7008)	Unhealthy Use (n = 434)
Sex		
Males	93.7%	6.4%
Females	97.3%	2.7%

$\chi^2 = 22.36$, df = 1, $p < 0.0001$

To minimize missing data, Table 6 uses information about Soldiers' race and ethnicity from both the SBIRT and GPRA records. These are not mutually exclusive and a Soldier can list more than one race or ethnic group. There were no significant differences in risk level (Low Risk versus Unhealthy Use) by race or ethnicity.

[3] $\chi^2 = 22.36$, df = 1, $p < 0.0001$

Table 6. Risk Level by Race or Ethnicity

	Low Risk (n = 7008)	Unhealthy Use (n = 434)
Race or Ethnicity		
White	92.1%	7.9%
Black/African American	96.0%	4.0%
Asian	91.9%	8.1%
Hawaiian or Pacific Islander	100.0%	0.0%
American Indian	90.9%	9.1%
Hispanic/Latino	92.4%	7.7%

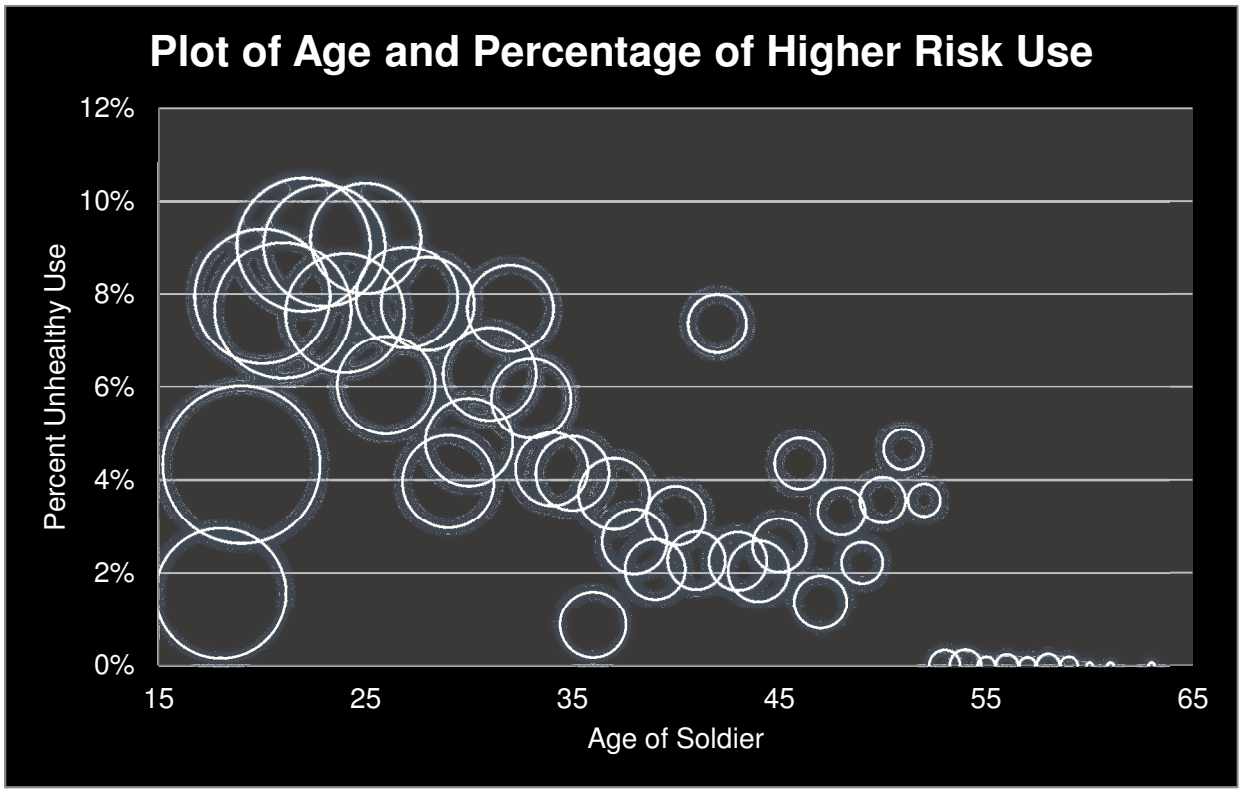
Ages of Soldiers in this sample range from 18 to 63 years with a median age of 25 years. Figure 1 shows the percentage of Soldiers reporting Unhealthy Use by age. The size (area) of the circles represents the number of Soldiers at each year of age when screened. There is a highly significant nonlinear relationship between age and Unhealthy Use.[4] The peak Unhealthy Use occurs from the age of 20 to 25. This is especially pertinent since over one-third (36.4%) of the Soldiers in this sample are between the ages of 20 and 25. This creates a situation whereby potentially risky drug and alcohol use is the most prevalent among the largest age group. For all of the following analyses, Soldiers between 20 to 25 years of age were classified in the High Risk age group.

Over 6% of Soldiers between the ages of 20 and 32, except for ages 29 and 30, reported Unhealthy Use. Between age 20 and 25, Unhealthy Use was 8% or higher. Unhealthy Use decreased steadily after age 33. On average, 6.7% of Soldiers age 33 and under report drug and alcohol use that places them in the Unhealthy Use category. However, the average percent of Unhealthy Use for Soldiers over the age of 33 is 3.3%.

There is one outlying high percentage at age 42, however the sample sizes are smaller and the estimates are unstable. There also may be an increasing trend beginning around age 44 to the early 50s. After age 52, Unhealthy Use was not reported.

[4] -Log Likelihood $\chi^2 = 54.58$, df = 3, $p<.0001$ comparing a linear logistic regression to one containing linear, quadratic, cubic and quantic terms

Figure 1. Soldier's Age and the Percentage of Higher Risk Use



Deployment

Deployment history was recorded for most (99.6%) Soldiers. Table 7 on the following page displays the numbers and percent of Soldiers in the Low Risk and Unhealthy Use categories, no deployment versus any deployment, multiple deployments, and location of deployment. Since Soldiers can be deployed to more than one location, the number of deployments by location exceeds the total number of Soldiers in the data.

Approximately nine in twenty (44.8%) Soldiers have been deployed, and 12.4% of these Soldiers reported being deployed to more than one location. A vast majority (94%) of Soldiers who have been deployed to a combat zone have been deployed to Iraq or Afghanistan. Due to this overwhelming majority, results will not distinguish between those deployed to Iraq or Afghanistan from those who deployed to any other combat zones. Instead, differences between Soldiers who have been deployment to any location and those who have never been deployed will be examined.

There is a statistically significant relationship between deployment and Unhealthy Use.[5] Nearly 7% of Soldiers who have been deployed to any combat zone reported Unhealthy Use compared to 5.0% of Soldiers who have never been deployed. However, there was no statistically significant relationship between specific deployment locations and Unhealthy Use.

[5] $\chi^2 = 12.10$, df = 1, $p < 0.01$

Deployments also vary considerably by age and sex, both of which are related to Unhealthy Use prevalence. Further analyses discussed in the next section attempt to assess how these other factors are independently associated with Unhealthy Use.

Table 7. Risk Level by Deployment

	Number	Low Risk (n = 7008)	Unhealthy Use (n = 434)
Never Deployed	4091	95.0%	5.0%
Deployed	3323	93.1%	6.9%
Location of Deployment			
Iraq/Afghanistan	3124	92.9%	7.1%
Persian Gulf	210	95.2%	4.8%
Vietnam/SE Asia	23	95.7%	4.4%
Korea	22	95.5%	4.6%
Not Listed	404	94.3%	5.7%
More Than One Location	411	93.9%	6.1%

Note: The World War II category was omitted since the birthdates of the ten Soldiers who reported serving in World War II indicated that they had not been born before 1945.

Multivariate Analyses Predicting Unhealthy Use

More sophisticated analyses (logistic regression) predicted a Soldier's likelihood of Unhealthy Use based on gender, race, age, and deployment. Results of multivariate logistic regression using age, sex, and deployment to predict Unhealthy Use were highly significant.[6] Being a male, in the High Risk age group and deployment to any combat zone all independently contributed to being in the Unhealthy Use group. The odds ratios (OR) appear in Table 8.

Being a male more than doubles (OR = 2.45) the odds of being in the Unhealthy Use group, as does being age 20 to 25 years old (OR = 2.51). Deployment to any combat location increases the chance by more than one and a half times (OR = 1.82). These effects appear to be additive.[7] This means the chance of being in the Unhealthy Use group increases for each risk factor present in the Soldier (e.g. male, aged 20-25, deployed to any combat zone). However, these characteristics do not combine to create a synergistic increase or decrease in Unhealthy Use. For example, the effect of being in the High Risk age group on Unhealthy Use is no different for women as it is for men. This is evident by the lack of any significant two-way interactions between demographic risk factors.

[6] Likelihood ratio $\chi^2 = 110.23$, df = 3, $p < 0.0001$
[7] All tests of 2-way interactions were not significant.

Table 8. Odds Ratios Predicting Unhealthy Use

	Odds Ratio	95% Confidence Interval
Male	2.45	1.64 - 3.64
High Risk Age Group (20 – 25 years old)	2.51	2.04 – 3.10
Deployed to Any Combat Zone	1.82	1.47 – 2.25

Finally, Table 9 shows the percentages of Soldiers reporting Unhealthy Use categorized by sex, age group, and whether or not they were deployed to any combat zone. Some of the individual rows represent smaller numbers of Soldiers. For example, only 63 female Soldiers in the High Risk age group deployed to a combat zone. The small subgroups will be reflected by broad 95% confidence intervals, e.g., the group of females in the High Risk age group who were deployed to a combat zone**. Shaded cells in Table 9 indicate non-high risk characteristics.**

Table 9. Risk Level by High Risk Characteristics

Sex	High Risk age Group	Deployment to any Combat Zone	Percent Unhealthy Use	95% Confidence Interval
Male	Yes	Yes	14.5%	11.6% - 17.4%
Male	Yes	No	7.5%	6.3% - 8.8%
Male	No	Yes	5.6%	4.7% - 6.6%
Male	No	No	3.4%	2.6% - 4.3%
Female	Yes	Yes	3.2%	-1.2% - 7.6%
Female	Yes	No	3.5%	1.6% - 5.4%
Female	No	Yes	2.1%	0.3% - 4.0%
Female	No	No	1.9%	0.5% - 3.2%

Answer to: *Which Soldiers have higher screening scores?*

Higher scores on the substance screening questions can be identified with some success. Male Soldiers between 20 and 25 years of age deployed to any combat location have dramatically higher levels of Unhealthy Use than other Soldiers. Sex (male), age (20 – 25 years), and deployment to a combat zone all additively contribute to this high rate. Thus males aged 20-25 who have been deployed to any combat zone represent the highest risk for unhealthy substance use while female Soldiers younger than 20 and older than 25 who have never been deployed represent the lowest risk of Unhealthy Use.

How do the Screening Scores Relate to PHQ-9 Scores and Depression Symptoms?

Nearly nine in ten (89%) of the 7,442 Soldiers who underwent alcohol and drug prescreening in the SBIRT-IOWA project between October 25, 2012 and February 29, 2016 were also screened for depressive symptoms with the PHQ-9. Furthermore, 2,208 Soldiers underwent PHQ-9 screening twice within this time frame. Table 10 displays the number of Soldiers with present and missing PHQ-9 scores by risk level, sex, age, and deployment status.

Table 10. Risk Level by High Risk Characteristics

	PHQ-9 Scores Missing	At Least One PHQ-9 Score Present	Two PHQ-9 Scores Present
All	819	6623	2208
Risk Level			
Low Risk	727	6281	2080
Unhealthy Use	92	342	128
Sex			
Female	111	940	263
Male	708	5683	1945
Age			
Not High Risk Age	466	4269	1400
High Risk Age	353	2354	808
Deployment			
Never Deployed	382	4091	1298
Deployed	431	3323	909

Note: Deployment totals do not add up to the totals in the "all" row due to missing deployment data for 28 Soldiers.

First PHQ-9 Scores and SBIRT Screening Scores

Missing Initial PHQ-9 Scores and Soldier Demographics

Nearly one-quarter (24.5%) of soldiers did not have a PHQ-9 assessment at their first SBIRT screening. In order to minimize the amount of missing data, first PHQ-9 screenings that occurred during subsequent SBIRT screenings were included. As a result, the percent of Soldiers with missing PHQ-9 screening scores was reduced to 11%. Unfortunately, the presence or absence of data remained significantly related to Unhealthy Use.[8]

Soldiers with a missing PHQ-9 score were more likely to have a screening score that indicated Unhealthy Use. Nearly one in ten (9.0%) Soldiers with a missing PHQ-9 score entered into the SBIRT data reported Unhealthy Use; however, one in twenty (5.2%) Soldiers who did have a PHQ-9 score reported Unhealthy Use.

Whether or not a Soldier's PHQ-9 score was present also depended on his or her age, deployment, and race. Significantly more Soldiers in the High Risk age group were missing a PHQ-9 (13.0%) compared to other ages (9.8%).[9] Similarly, more Soldiers who were deployed to any combat zone had missing PHQ-9 entries (13.0%) compared to those not deployed (9.3%).[10] Finally, significantly more white Soldiers were missing PHQ-9 scores (15.5%) than non-white Soldiers (5.5%).[11] Since those with a score were less likely to report Unhealthy Use, and less likely to be between the ages of 20 and 25, deployed to a combat zone, and non-white, the PHQ-9 scores represent a biased sample. Therefore, the following analyses do not reflect all Soldiers screened in SBIRT.
The evaluators held discussions with the SBIRT IOWA Steering Committee and IAARNG staff to explore possible sources of this bias. There was no selective bias inherent in the IAARNG

[8] $\chi^2 = 48.89$, df = 1, $p < 0.0001$
[9] $\chi^2 = 17.99$, df = 1, $p < 0.0001$
[10] $\chi^2 = 24.78$, df = 1, $p < 0.001$
[11] $\chi^2 = 17.84$, df = 1, $p < 0.001$

SBIRT screening process and speculations that the PHQ-9 screening may have been inadvertently omitted at some annual Periodic Health Assessment events proved to be unfounded. In recent years, the PHQ-9 is recorded in SBIRT more consistently. In 2013, 22.2% of intakes were missing the PHQ-9, while in 2014 and 2015 the percentages of missing PHQ-9 data were 3.0% and 0.97%, respectively. Between January 1, 2016 and February 29, 2016, only 1.5% of intakes were missing PHQ-9 screening scores.

Present PHQ-9 Scores and Soldier Demographics

PHQ-9 scores were coded with the following levels of severity: None (0 – 4), Mild (5 – 9), Moderate (10 – 14), Moderately Severe (15 – 19), and Severe (20 – 27). Both PHQ-9 scores and the depression severity coding were used in analyses. Ninety-five percent (95.4%) of Soldiers had no or minimal depression.

Neither PHQ-9 scores nor the severity level was associated with the Soldier's sex.[12] Similarly, being in the High Risk age group was not associated with PHQ-9 scores or severity.[13] Deployment to any combat zone yielded mixed results. While the PHQ-9 *scores* were not significantly related to ever being deployed to any combat zone, PHQ-9 *severity* was significantly associated with deployment to any combat zone.[14] Whereas 22 of the 2,892 deployed soldiers with PHQ-9 scores (0.8%) were Moderately Severe or Severe, only 17 of those 3,709 not deployed (0.5%) reported that degree of depression.

Predicting SBIRT Screening Scores with PHQ-9 Scores and Severity Level and Soldier Demographics

Within this special subset of Soldiers with PHQ-9 scores, PHQ-9 severity level was a good indicator of Unhealthy Use.[15] Table 11 shows the relationship of PHQ-9 depression severity and being in the Unhealthy Use group. Note the lower sample size in Table 11 compared to all other analyses due to several Soldiers with missing PHQ-9 scores.

Among Soldiers with valid PHQ-9 scores, the percentage of Soldiers who report Unhealthy Use increases as depressive symptoms increase. Less than one in twenty (4.6%) Soldiers who reported no depressive symptoms also reported drug or alcohol use that is considered Unhealthy Use. However, of the 229 Soldiers who indicated mild depressive symptoms, over one in ten (10.5%) also reported potentially risky use of drugs and alcohol.

[12] Mann-Whitney $z = 0.28$, $p = 0.778$; Jonckheere-Terpstra test $z = 1.73$, $p = 0.083$
[13] Mann-Whitney $z = 0.22$, $p = 0.822$, Jonckheere-Terpstra test $z = 2.61$, $p = 0.794$
[14] Mann-Whitney $z = 1.21$, $p = 0.225$, Jonckheere-Terpstra test $z = 2.843$, $p < 0.01$
[15] Jonckheere-Terpstra test, $z = 8.65$, $p < 0.0001$

Table 11. Risk Level by First PHQ-9 Screening Severity

	Number	Low Risk (n = 6281)	Unhealthy Use (n = 342)
None	6266	95.4%	4.6%
Mild	229	89.5%	10.5%
Moderate	89	80.9%	19.1%
Moderately Severe	28	75.0%	25.0%
Severe	11	54.6%	45.5%

Jonckheere-Terpstra test, z = 8.95, p < 0.0001

Follow-up analyses using logistic regression and including the Soldier's sex, age group, deployment status, and PHQ-9 score and severity continued to support the PHQ-9 as a predictor of Unhealthy Use among those select Soldiers who had PHQ-9 scores. However, since the Soldier's age and deployment status significantly influenced whether or not the Soldier had a valid PHQ-9 score, interpretation of these results are not discussed in detail.

Second PHQ-9 Scores and Screening Scores

Missing Second PHQ-9 Scores and Soldier Demographics

Nearly one-third (29.7%) of Soldiers had at least two PHQ-9 screenings between October 25, 2012 and February 29, 2016. However, similar to the first PHQ-9 score, there were biases present. Whether or not a Soldier had a second PHQ-9 screening score was significantly associated with Unhealthy Use, gender, and deployment status.

Soldiers who reported Unhealthy Use during the second screening as evidenced by their *second* full screen from the AUDIT or DAST-10 scores were less likely to have a second PHQ-9 screening (50.0%) than Soldiers reporting Low Risk use (66.7%).[16] However, whether or not the Soldier had a second PHQ-9 screening was not related to the Soldier's *first* AUDIT or DAST-10 scores. Female Soldiers were less likely to have a second PHQ-9 screening (25.0%) than male Soldiers (30.4%).[17] Soldiers who had been deployed to any combat zone had fewer PHQ-9 screenings (27.4%) than Soldiers who had never been deployed to any combat zone (31.7%).[18]

Change in PHQ-9 Screening Scores and Severity from First to Second Screening and Soldier Demographics

Table 12 shows Soldiers' second PHQ-9 screening risk level percentages at each PHQ-9 severity level based on their initial PHQ-9 screen. Note that the sample size for this table is smaller and represents the 2,208 Soldiers with more than one PHQ-9 screening. Soldiers' PHQ-9 severity level at the first screening are along the rows of the table and Soldiers' PHQ-9 severity level at the second screening are within the columns of the table. There is a strong relationship between Soldier's first and second PHQ-9 screening scores.[19]

[16] $\chi^2 = 50.29$, df = 1, $p < 0.0001$
[17] $\chi^2 = 12.66$, df = 1, $p < 0.0001$
[18] $\chi^2 = 12.66$ df = 1, $p < 0.0001$
[19] Bowker test for symmetry $\chi^2 = 38.66$, df = 9, $p < 0.0001$

This table shows that a large majority of Soldiers did not display any depressive symptoms at the first or second screening: 93.5% of the 2,126 Soldiers who did not have any depressive symptoms on their first PHQ-9 screening did not have any depressive symptoms on their second PHQ-9 screening. The remaining 6.5% of Soldiers who did not have any depressive symptoms at the first screening reported depressive symptoms at the second screening.

When these data are collapsed to assess what percentage of Soldiers experience no change, an increase, or a decrease in depressive symptoms from the first to second screening, nine out of ten Soldiers with a second PHQ-9 screening had the same level of severity at both screenings. Nearly 3% reported a higher PHQ-9 severity level on the first screening than on the second screening suggesting a decrease in depressive symptoms. Finally, 6.8% of Soldiers moved from a lower level of severity on their first screening to a higher level on the second screening, suggesting an increase in depressive symptoms. Among Soldiers who experienced a decrease in depressive symptoms, 68.3% experienced mild symptoms on the first screening and no symptoms on the second screening. Of those who experienced an increase in depressive symptoms, 66% went from having no symptoms to having mild symptoms.

There was a significant relationship between soldier's deployment and PHQ-9 change.[20] Soldiers who were deployed were more likely to experience an increase in depressive symptoms from the first to second screening (8.3%) compared to Soldiers who were never deployed (5.8%) and were less likely to experience a decrease in depressive symptoms.

Table 12. Percentage of Soldiers at Each Initial PHQ-9 Severity Level and Their PHQ-9 Severity Levels on the Second Screen

First Screen Risk Level	Number	Second Screen Risk Level				
		None	Mild	Moderate	Moderately Severe	Severe
None	2126	93.5%	4.7%	1.2%	0.4%	0.3%
Mild	58	74.1%	10.3%	6.9%	5.2%	3.5%
Moderate	19	63.2%	15.8%	10.5%	5.3%	5.3%
Moderately Severe	3	100.0%	0.0%	0.0%	0.0%	0.0%
Severe	2	100.0%	0.0%	0.0%	0.0%	0.0%

Bowker test for symmetry $\chi^2 = 38.66$, df = 9, $p < 0.0001$

Answer to: *How do the screening scores relate to PHQ-9 scores and depression symptoms?*

PHQ-9 scores and depression symptoms appear to have a strong influence for increasing the chances of Unhealthy Use in this subgroup of Soldiers with PHQ-9 scores. The effect of depressive symptom severity is large and apparent, even in the Mild risk group. Unfortunately, these results are based on a selective sub group. Soldiers without PHQ-9 scores had higher levels of Unhealthy Use than those analyzed.

[20] χ^2=10.09, df=2, $p < .01$

This bias persisted among Soldiers with a second PHQ-9 screening. However, among this subset of Soldiers with two PHQ-9 scores, there is a significant increase in depressive symptoms between screenings. Furthermore, within this sample, Soldiers who were deployed to any combat zone were more likely to experience an increase in depressive symptoms.

Which Soldiers Experience Changes in Substance Use Screening Scores Over Time?

Of the 7,442 Soldiers who underwent SBIRT IOWA prescreening between October 25, 2012 and February 29, 2016, 3,350 (45%) have been screened twice. The median number of days between the two screenings is 490 days (approximately 16 months).

Table 13 shows the second screen's risk level percentages of Soldiers at each risk level on their initial SBIRT screen. For example, for Soldiers who initially screened as Low Risk, 96.2% again screened in the Low Risk level on their second screen. Of these initially Low Risk Soldiers, 3.0% moved into the Moderate Risk level. More importantly, of those who initially screened in the Moderate Risk level, 83.0% moved down into the Low Risk level. Regardless of what the Soldiers' first screening indicated, 90.7% of Soldiers did not have a change in risk level from the first to second screening, while 5.4% of Soldiers moved to a lower risk level and 4.0% moved into a higher risk level. There is a highly significant reduction in risk levels over the two screenings.[21]

Table 13. Percentage of Soldiers at Each Initial Risk Level and Their Risk Levels on the Second Screen

First Screen Risk Level	Number	Second Screen Risk Level			
		Low Risk	Moderate Risk	Substantial Risk	Severe Risk
Low Risk	3012	96.2%	3.0%	0.7%	0.1%
Moderate Risk	156	83.0%	10.6%	4.8%	1.6%
Substantial Risk	10	52.6%	15.8%	15.8%	15.8%
Severe Risk	10	76.9%	7.7%	0.0%	15.4%

Bowker test for symmetry $\chi^2 = 29.41$, df = 6, $p < 0.001$

Using the definition of Unhealthy Use, the percentages in Table 13 show a similar pattern. While 3.8% of Soldiers who initially screened in the Low Risk group increased their use to Unhealthy Use, 80.0% of those who initially were in the Unhealthy Use group reduced their use to Low Risk. This indicated a significant reduction in Unhealthy Use.[22] The disparity in results may be due to the drastic reduction in risk mainly for those in the Substantial and Severe Risk groups.

[21] Bowker test for symmetry $\chi^2 = 29.41$, df = 6, $p < 0.001$
[22] McNemar's test $\chi^2 = 11.44$, df = 1, $p > 0.001$ (exact p = 0.0009)

Table 14. Initial and Second Screen Unhealthy Use

First Screen	Second Screen	
	Low Risk	Unhealthy Use
Low Risk	96.2%	3.8%
Unhealthy Use	80.0%	20.0%

McNemar's test $\chi^2 = 11.44$, df = 1, $p > 0.001$ (exact p = 0.0009)

When separating change in risk level by no change, a decrease in risk level, and an increase in risk level from the first to second screening, a few significant demographic patterns emerge. Male soldiers and soldiers who are age 20 to 25 were more likely to experience a change in risk level between the first and second screening compared to female Soldiers and Soldiers not in the "High Risk age" category. There were no significant differences among Soldiers who have or have not been deployed to a combat zone.

A higher percentage of females had the same level of severity at both screenings (94.5%) than males (90.1%). More males experienced both a decrease in risky alcohol and drug use (5.8%) than females (2.7%), and an increase in risky alcohol use and drug use (4.1%) than females (2.9%) from the first to second screening.[23]

Similar findings were also present for the High Risk age group. A significantly larger percentage of Soldiers between the ages of 20 and 25 experienced either an increase or decrease in Unhealthy Use from the first to second screening compared to Soldiers outside of this age group.[24] Ninety-two percent of Soldiers younger than 20 and older than 25 had the same risk level on both screenings compared to 88.0% of Soldiers in the High Risk age group.

More advanced statistical procedures (multinomial logistic regression) suggest that male Soldiers and Soldiers in the High Risk age group had higher chances of experiencing a movement from a higher level of risk to a lower level of risk between screenings relative to experiencing no change in risk level compared to female Soldiers outside of the High Risk age group.[25] However, gender and age were not associated with a significant change in the odds of experiencing a movement from a lower risk level to a higher risk level between screenings.

In addition, an increase in PHQ-9 scores was also associated with an increase in the odds of a Soldier experiencing a change in risk level between the first and second screening, even after accounting for the Soldier's gender and whether or not the Soldier was in the High Risk age category.[26] However, among Soldiers with second PHQ-9 scores, an increase in the second PHQ-9 score was associated with an increase in the odds of moving from a lower risk level to a higher risk level, but was not significantly associated with the odds of moving from a high risk screening to a lower risk screening.[27]

[23] $\chi^2 = 9.60$, df = 1, $p < 0.01$
[24] $\chi^2 = 17.36$, df = 1, $p < 0.0001$
[25] Multinomial Regression, Log Likelihood $\chi^2 = 29.81$, df=4, $p < .0001$
[26] Multinomial Regression, Log Likelihood $\chi^2 = 57.49$, df=6, $p < .0001$
[27] Multinomial Regression, Log Likelihood $\chi^2 = 46.02$, df=6, $p < .0001$

Answer to: *Which Soldiers Experience Changes in Substance Use Screening Scores Over Time?*

Among the 3,350 Soldiers with two screening scores, 90.7% experienced no change in risk level between the first and second screening. Most Soldiers either maintained their Low Risk status or reduced their risk level by the time of the second SBIRT screening. Those in the Moderate Risk initially showed the most marked change, with 83.0% becoming Low Risk at the second screening.

However, among the remaining 9.3% who did experience a change in risk level between the first and second screening, there was an indication that male Soldiers and Soldiers between the ages of 20 and 25 were more likely to experience a decrease in risk level between the first and second screening. Furthermore, among the 3,270 Soldiers who had PHQ-9 screenings and two SBIRT screenings, an increase in PHQ-9 scores significantly increased the odds of experiencing a change between the first and second SBIRT screening scores.

CONCLUSION

Of the 7,422 Soldiers who underwent SBIRT IOWA screening since the beginning of the project, 3,350 were screened at least twice. This report addressed three questions:

1. Which Soldiers have higher screening scores (are there common characteristics at initial contact)?
2. How do the screening scores relate to PHQ-9 scores and depression symptoms?
3. Which soldiers experience changes in substance use screening scores over time?

There was some success predicting higher screening scores based on sex, age, and deployment to Iraq/Afghanistan. Being male, between the ages of 20 and 25 years old, and having been deployed to Iraq/Afghanistan additively increased the chances of Unhealthy Use. Males in the High Risk age group who had been deployed had a high percentage of Unhealthy Use, 14.5%. In contrast, females not in the High Risk age group who had not been deployed to any combat zone had a low percentage of Unhealthy Use, 1.9%. Race or ethnicity showed no evidence of affecting these results. Thus, specialized programs further aimed to reinforce SBIRT efforts and reduce unhealthy drinking might target those in the riskiest groups. Interestingly, the percent of Soldiers who reported Unhealthy Use significantly decreases for each subsequent calendar year of SBIRT screening between October 25, 2012 and February 29, 2016.

PHQ-9 scores and depression severity levels were strongly related to Unhealthy Use, at least in the subgroup of Soldiers who received PHQ-9 screens in the SBIRT project. Unfortunately, there were differences between those who did receive and those who did not receive a PHQ-9 screen in terms of age, deployment status, and Unhealthy Use. Thus, these results came from a selective subset of Soldiers. Additionally, female Soldiers and Soldiers who have been deployed to a combat zone were less likely to have a second PHQ-9 screening score. Among this select group of Soldiers with two screening scores, Soldiers who had been deployed to any combat zone were more likely to experience an increase in depressive symptoms.

Changes in AUDIT and DAST-10 scores and Unhealthy Use were evident in these data. Use risk levels declined significantly between the initial and secondary SBIRT screens. The decline was particularly noticeable in Moderate Risk use category, where over 80% of Soldiers remitted

to Low Risk. Further analyses indicate that male Soldiers and Soldiers in the High Risk age group (between the ages of 20 and 25) had higher odds of experiencing a decrease in risk level between the first and second SBIRT screening. However, these characteristics were not associated with an increase in the odds of experiencing a change from a lower level of risk to a higher level of risk between screenings. Among the select group of soldiers with PHQ-9 scores and two alcohol and drug screenings, an increase in PHQ-9 score significantly predicted both an increase and decrease in screening scores, even after accounting for Soldier's gender and whether or not the Soldier was in the High Risk age category.