|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Supplementary** **Table 1. Univariable and multivariable prediction models of the associations between 12-month exposure to stressful life events (SLEs) and 12-month suicide attempts (SA) among respondents having high predicted 12-month suicide attempt (SA) riska** | | | | | | | | | | | | | | | | | |
|  |  | | | | | | | | | | | | | | | | |
|  | **SLE Prevalence** | |  | **Univariable**  **Models** | |  | **Multivariable**  **Model 1** | |  | **Multivariable**  **Model 2** | |  | **Multivariable**  **Model 3** | |  | **Multivariable**  **Model 4** | |
| **Stressful Life Events (SLEs)** | **%** | **(SE)** |  | **ARDb** | **(95% CI)** |  | **ARDb** | **(95% CI)** |  | **ARDb** | **(95% CI)** |  | **ARDb** | **(95% CI)** |  | **ARDb** | **(95% CI)** |
| Physical Health |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Serious illness/injury | 9.2 | (2.0) |  | 2.2 | (-4.2-8.7) |  | 0.7 | (-2.8-4.2) |  | 0.0 | (-2.6-2.7) |  | 1.4 | (-2.4-5.2) |  | 1.0 | (-2.5-4.5) |
| Interpersonal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Separation/divorce/other breakup | 20.6 | (2.6) |  | 13.1c,d | (3.7-22.6) |  | 9.4c,d | (2.9-16.0) |  | 3.3 | (-0.1-7.2) |  | 10.2c,d | (3.2-17.2) |  | 8.3c,d | (2.3-14.4) |
| Betrayal by loved one | 36.5 | (3.8) |  | 3.5 | (-1.7-8.8) |  | -1.8 | (-4.2-0.7) |  | -3.0c,d | (-5.1---0.8) |  | -1.9 | (-4.2-0.3) |  | -2.5c,d | (-4.8-0.2) |
| Economic |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Job loss | 18.0 | (3.0) |  | 7.5c,d | (0.3-14.8) |  | 3.0 | (-1.0-8.5) |  | 1.0 | (-1.5-3.6) |  | - | - |  | - | - |
| Major financial crisis | 30.1 | (4.0) |  | 8.0c,d | (1.5-14.6) |  | 3.6 | (-0.4-9.1) |  | 0.1 | (-2.1-2.4) |  | - | - |  | - | - |
| Any economic evente | 38.3 | (4.2) |  | 7.5c,d | (2.1-12.8) |  |  |  |  |  |  |  | 4.7c,d | (1.5-7.8) |  | 3.2c,d | (0.2-6.2) |
| Victimization |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Burglary | 6.6 | (2.0) |  | 14.1 | (-7.5-35.7) |  | - | - |  | - | - |  | - | - |  | - | - |
| Armed robbery | 0.4 | (0.2) |  | 17.1 | (-14.7-48.8) |  | - | - |  | - | - |  | - | - |  | - | - |
| Burglary or armed robbery | 6.9 | (1.6) |  | 14.2 | (-6.6-35.0) |  | 6.1 | (-2.5-14.6) |  | 4.7 | (-1.0-10.4) |  | - | - |  | - | - |
| Physical or sexual assault | 2.7 | (1.1) |  | 13.9 | (-7.0-34.7) |  | 4.4 | (-2.0-10.8) |  | 2.2 | (-2.3-6.8) |  | - | - |  | - | - |
| Any victimizationse | 9.1 | (2.2) |  | 13.5 | (-3.0-30.0) |  |  |  |  |  |  |  | 7.7c,d | (1.3-14.1) |  | 7.2c,d | (1.3-13.1) |
| Legal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Trouble with police | 5.5 | (2.0) |  | 7.8 | (-5.6-21.1) |  | - | - |  | - | - |  | - | - |  | - | - |
| Trouble with the law | 4.9 | (1.5) |  | 1.1 | (-7.5-9.7) |  | - | - |  | - | - |  | - | - |  | - | - |
| Any legal eventse | 9.0 | (2.2) |  | 4.5 | (-4.1-13.1) |  | -0.7 | (-3.9-2.6) |  | -1.0 | (-3.1-1.2) |  | -0.4 | (-3.6-2.7) |  | -0.4 | (-3.3-2.4) |
| Social Support Network |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Death of a loved one | 22.7 | (3.1) |  | -0.5 | (-4.5-3.5) |  | -2.0c,d | (-3.9---0.1) |  | -2.3c,d | (-3.8---0.8) |  | - | - |  | - | - |
| Serious illness/injury of loved one | 16.1 | (2.9) |  | 0.6 | (-4.1-5.3) |  | -0.6 | (-3.4-2.2) |  | -1.5 | (-3.1-0.2) |  | - | - |  | - | - |
| Life crisis of loved one | 10.5 | (1.9) |  | 4.2 | (-3.111.4) |  | 0.4 | (-3.1-3.9) |  | 0.8 | (-1.9-3.4) |  | - | - |  | - | - |
| Any social support network eventse | 34.4 | (3.9) |  | 0.2 | (-3.9-4.4) |  |  |  |  |  |  |  | -1.3 | (-3.3-0.7) |  | -2.1c,d | (-3.9---0.2) |
| Total |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Any SLEf | 72.6 | (3.5) |  | 3.2 | (-0.5-6.9) |  |  |  |  |  |  |  |  |  |  |  |  |
| Exactly 1 SLE | 22.6 | (3.3) |  | -3.2c,d | (-6.1---0.4) |  |  |  |  | - | - |  |  |  |  | - | - |
| Exactly 2, 2+ SLEs | 21.9 | (3.0) |  | -0.9 | (-4.1-2.4) |  |  |  |  | 2.1 | (-2.4-6.5) |  |  |  |  | 2.8 | (-0.6-6.2) |
| 3+ SLEs | 28.2 | (3.2) |  | 9.4c | (1.3-17.4) |  |  |  |  | 16.4d | (-1.1-31.8) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Abbreviations: CI, confidence interval; SA, suicide attempt; SE, standard error; SLE, stressful life event

aEstimates reflect weighted data to make the n=3,175 respondents considered here representative of the n=8,997 in the full eligible LS1-LS2 pooled sample. The smaller sample is due to our use of a case-control sampling scheme to develop the model. See the Technical Supplement for a discussion of this design. High-risk was defined as the 15% of respondents with highest predicted SA risk based on a previously developed machine learning model using information available during active duty.

bARD represents the difference in estimated prevalence of SA between respondents exposed and those not exposed to the SLE. ARD estimated were made based on transformations from modified Poisson regression equations

cSignificant ARD at the 0.05 level, two-sided test.

dSignificantly different from the ARD in the lower-risk subsample at the 0.05 level, two-sided test.

eAny of the individual SLEs within this conceptual domain.

fAny individual SLEs across all conceptual domains.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Supplementary** **Table 2. Univariable and multivariable prediction models of the associations between 12-month exposure to stressful life events (SLEs) and 12-month suicide attempts (SA) among respondents having lower predicted 12-month suicide attempt (SA) riska** | | | | | | | | | | | | | | | | | |
|  |  | | | | | | | | | | | | | | | | |
|  | **SLE Prevalence** | |  | **Univariable**  **Models** | |  | **Multivariable**  **Model 1** | |  | **Multivariable**  **Model 2** | |  | **Multivariable**  **Model 3** | |  | **Multivariable**  **Model 4** | |
| **Stressful life events (SLEs)** | **%** | **(SE)** |  | **ARDb** | **(95% CI)** |  | **ARDb** | **(95% CI)** |  | **ARDb** | **(95% CI)** |  | **ARDb** | **(95% CI)** |  | **ARDb** | **(95% CI)** |
| Physical Health |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Serious illness/injury | 6.9 | (0.9) |  | 0.7 | (-0.8-2.2) |  | 0.0 | (-0.0-0.1) |  | 0.1 | (-0.0-0.2) |  | 0.0 | (-0.1-0.1) |  | 0.0 | (-0.1-0.2) |
| Interpersonal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Separation/divorce/other breakup | 13.1 | (1.3) |  | 0.3c | (-0.5-1.1) |  | 0.0c | (-0.0-0.0) |  | 0.0 | (-0.0-0.0) |  | 0.0c | (-0.1-0.0) |  | 0.0c | (-0.1-0.0) |
| Betrayal by loved one | 14.0 | (1.3) |  | 0.6 | (-0.2-1.5) |  | 0.1 | (-0.1-0.2) |  | 0.2c | (-0.1-0.5) |  | 0.1 | (-0.1-0.3) |  | 0.2c | (-0.1-0.6) |
| Economic |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Job loss | 9.1 | (1.1) |  | 0.1c | (-0.4-0.7) |  | 0.0 | (-0.4-0.2) |  | 0.0 | (-0.0-0.0) |  | - | - |  | - | - |
| Major financial crisis | 18.7 | (1.5) |  | 0.6c | (-0.1-1.2) |  | 0.1 | (-0.0-0.3) |  | 0.3d | (0.1-0.5) |  | - | - |  | - | - |
| Any economic evente | 23.7 | (1.7) |  | 0.5c | (-0.0-0.9) |  |  |  |  |  |  |  | 0.1c | (-0.0-0.2) |  | 0.2c,d | (0.0-0.3) |
| Victimization |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Burglary | 3.9 | (0.8) |  | 1.3 | (-1.3-3.9) |  | - | - |  | - | - |  | - | - |  | - | - |
| Armed robbery | 0.7 | (0.3) |  | - | - |  | - | - |  | - | - |  | - | - |  | - | - |
| Burglary or armed robbery | 4.1 | (0.8) |  | 1.2 | (-1.2-3.6) |  | 0.1 | (-0.0-0.2) |  | 0.1 | (-0.1-0.3) |  | - | - |  | - | - |
| Physical or sexual assault | 0.9 | (0.3) |  | 1.3 | (-1.7-4.4) |  | 0.0 | (-0.1-0.1) |  | 0.0 | (-0.1-0.1) |  | - | - |  | - | - |
| Any victimizationse | 4.8 | (0.8) |  | 1.3 | (-0.9-34.9) |  |  |  |  |  |  |  | 0.2c | (-0.1-0.4) |  | 0.2c | (-0.1-0.1) |
| Legal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Trouble with police | 2.8 | (0.6) |  | 0.7 | (-0.5-1.9) |  | - | - |  | - | - |  | - | - |  | - | - |
| Trouble with the law | 1.2 | (0.4) |  | - | - |  | - | - |  | - | - |  | - | - |  | - | - |
| Any legal eventse | 3.7 | (0.8) |  | 0.5 | (-4.1-13.1) |  | 0.0 | (-0.1-0.1) |  | 0.0 | (-0.1-0.2) |  | 0.0 | (-0.1-0.1) |  | 0.0 | (-0.1-0.1) |
| Social Support Network |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Death of a loved one | 18.7 | (1.4) |  | 0.2 | (-0.3-0.8) |  | 0.0c | (-0.0-0.0) |  | 0.0c | (-0.0-0.0) |  | - | - |  | - | - |
| Serious illness/injury of loved one | 11.5 | (1.3) |  | 0.4 | (-0.5-1.3) |  | 0.0 | (-0.0-0.1) |  | 0.0 | (-0.0-0.1) |  | - | - |  | - | - |
| Life crisis of loved one | 8.3 | (1.0) |  | 0.6 | (-0.7-1.9) |  | 0.0 | (-0.0-0.1) |  | 0.0 | (-0.0-0.1) |  | - | - |  | - | - |
| Any social support network eventse | 28.0 | (1.8) |  | 0.1 | (-0.3-0.5) |  |  |  |  |  |  |  | 0.0 | (-0.1-0.1) |  | 0.0c | (-0.1-0.1) |
| Total |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Any SLEf | 52.1 | (1.7) |  | 0.3d | (0.0-0.5) |  |  |  |  |  |  |  |  |  |  |  |  |
| Exactly 1 SLE | 23.5 | (1.6) |  | 0.3c | (-0.1-0.7) |  |  |  |  | - | - |  |  |  |  | - | - |
| Exactly 2, 2+ SLEs | 13.7 | (1.2) |  | 0.5 | (-0.3-1.3) |  |  |  |  | 0.0 | (-0.1-0.0) |  |  |  |  | 0.0 | (-0.1-0.0) |
| 3+ SLEs | 14.9 | (1.4) |  | 2.3 | (-1.2-5.7) |  |  |  |  | 0.0c | (-0.1-0.0) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Abbreviations: CI, confidence interval; SA, suicide attempt; SE, standard error; SLE, stressful life event

aEstimates reflect weighted data to make the n=3,175 respondents considered here representative of the n=8,997 in the full eligible LS1-LS2 pooled sample. The smaller sample is due to our use of a case-control sampling scheme to develop the model. See the Technical Supplement for a discussion of this design. High-risk was defined as the 15% of respondents with highest predicted SA risk based on a previously developed machine learning model using information available during active duty.

bARD represents the difference in estimated prevalence of SA between respondents exposed and those not exposed to the SLE. ARD estimated were made based on transformations from modified Poisson regression equations

cSignificant ARD at the 0.05 level, two-sided test.

dSignificantly different from the ARD in the high-risk subsample at the 0.05 level, two-sided test

eAny of the individual SLEs within this conceptual domain.

fAny individual SLEs across all conceptual domains.

Not selected for Phases 3-4 n=16,909

Selected for Phases 3-4 n=26,516

Main study not complete, no indication of correct contact info, no questions answered

n=14,455

Main study not complete, indication of correct contact info, no questions answered

n=4,470

Main study not complete, but interview started, 1+ questions answered n=1,112

Final Non-Interviews in Phases 3-4

Refusals: n=248

Other Non-Iws: n=47

Interviews complete in Phases 3-4 (Harvard definition) n=6,184

Eligible for STARRS-LS1 n=72,387a

Not selected for Phase 1 contact n=20,424

Non-Sample Duplicate removed n=1

Selected for Phase 1 contact n=51,962b

Phases 1-2 Not Complete n=43,425

Final Non-Interviews in Phases 1-2

Refusals: n=6

Other Non-Iws: n=58

Non-Sample Deceased (from Phases 1-4)

n=149

Interviews complete in Phases 1-2 (Harvard definition) n=8,324c

Eligible for Phases 3-4 n=43,425c

Abbreviations: STARRS-LS1, Study to Assess Risk & Resilience in Servicemembers-Longitudinal Study Wave 1; Iws, interviews.

aAs noted in the text, LS1 was carried out in a probability sample of participants from the earlier Army STARRS survey. The design of the Army STARRS surveys is described elsewhere (Kessler et al., 2013a). The n=72,387 baseline respondents were weighted to post-stratify for a wide range of socio-demographic and Army career variables recorded in administrative systems for all the over 500,000 soldiers on active duty as a point in time during the years of Army STARRS Recruitment. Non-response bias and weighting adjustments to correct for this bias in the baseline Army STARRS surveys are described elsewhere (Kessler et al., 2013b).

bSee the text for a brief overview of stratification used for the Army STARRS-LS Wave 1 sample selection.

cAs in the original Army STARRS surveys (Kessler et al., 2013b), recruitment in the LS surveys was carried out in phases in which an attempt was made to survey all predesignated respondents in the first 2 phases and then subsampling was used to administer more intensive recruitment efforts only to a probability subsample of phases 1-2 non-respondents. Appropriate weights were used to adjust for this under-sampling of hard-to-recruit respondents at the end of data collection.

**Supplementary Figure 1. Recruitment diagram for the STARRS-LS1 survey**

E **Supplementary Figure 1. Recruitment diagram for the STARRS-LS1 survey**

Abbreviations: STARRS-LS2, Study to Assess Risk & Resilience in Servicemembers-Longitudinal Study Wave 2; Iws, interviews.

aSee the footnotes in Supplementary Figure 1 for an overview of the phases used in all Army STARRS and STARRS-LS surveys and the text for a brief overview of stratification used for LS1/LS2 sample selection. These procedures are discussed in detail in earlier Army STARRS reports (Kessler et al., 2013a).

bAll STARRS-LS Wave 1 respondents were eligible for LS2.

**e Supplementary Figure 2. Recruitment diagram for the STARRS-LS2 surveya**

Main study not complete, no indication of correct contact info, no questions answered

n=1,107

Main study not complete, indication of correct contact info, no questions answered n=983

Main study not complete, interview started, 1+ questions answered

n=180

Final Non-Interviews in Phases 3-4 Refusals: n=55

(10 withdrawals)

Other Non-Iws: n=4

Interviews complete in Phases 3-4

(Harvard definition)

n=5,365

Eligible for Phases 3-4 n=7,694

Phases 1-2

Not Complete

n=7,694

Final Non-Interviews in Phases 1-2

Refusals: n=8

(6 withdrawals)

Other Non-Iws: n=5

Non-Sample

Deceased (from Phases 1-4) n=10

Eligible for STARRS-LS2 n=14,522b

Non-Sample

Wave 1 Wrong Respondent n=14

Phase 1

n=14,508

Interviews complete in Phases 1-2 (Harvard definition)

n=6,791

**Technical Supplement**

**The case-control sample design**

As described in the paper where the prediction model was originally reported (Stanley et al., 2022), the prediction model used to develop the risk index was estimated in a case-control sample developed within a 70% randomly selected training sample. The case-control sample included all LS respondents reporting a suicide attempt (SA) in the prior 12 months in the training sample (n=84) and 5 times as many randomly selected controls from the training sample (n=420). Cases were then given a weight of 5 so that the weighted number of cases equaled the number of controls. This was done to address the issue of extreme imbalance in the sample.

For the analyses presented in the current report, the controls from this case-control training sample were unweighted to adjust for their under-sampling and combined with the training sample cases and the full 30% holdout sample (n=35 with SAs and n=2636 others) to generate a total sample of n=3,175. The upweighting of the controls from the training case-control sample resulted in the n=3,175 observations considered here representing the full stacked LS1/2 sample of n=8,997.

**Exclusion of respondents who reported a SA in LS1 from the LS2 sample**

Although SA history was included in the risk index, we excluded respondents with SAs in the 12-months before LS1 from the LS2 sample. This might seem to be a discrepancy, but that is not the case because the information used in the risk index was limited purposefully to things that we knew about soldiers *prior to* separation/deactivation. A history of suicidal behaviors was included among these predictors. The outcome, in comparison, was 12-month SA among respondents who separated/deactivated at least 12 months before the LS survey. As a result, information about a SA in the 12 months before LS1 in the analysis sample would not come into the prediction equation for a 2nd SA made by that same person in the 12 months before LS2. The risk model consequently is not biased by this exclusion.

But why did we exclude respondents who were in the LS1 analysis sample who reported 12-month SAs in that sample? We did so based on the logic of discrete-time survival analysis (Masyn, 2014), where a stacked dataset of the sort we used here in combining eligible responses from LS1 and LS2 are independent so long as no single respondent experiences the outcome of interest in more than one time interval. This is guaranteed in discrete-time survival analysis by censoring cases after the occurrence of the outcome, which is what we did here. It is possible to allow for repeat occurrences by building in methods that allow for clustering and testing for the possibility that the predictors of repeat occurrences are different from those of initial occurrences, but the number of repeat occurrences in the subset of respondents who completed both LS surveys and were eligible for this analysis in both waves was too small (n=62) to justify these extensions.

**Analysis methods**

As noted in the body of the paper, the analysis was carried used demographic rate standardization (Chevan & Sutherland, 2009) to evaluate the role of SLEs in accounting for the association between the high-risk indicator and subsequent SAs. In this approach, a separate prediction model is estimated for the joint associations of a series of intervening variables (in our case, SLEs) in predicting an outcome (in this case, SAs) within subsamples defined by a dichotomous focal predictor (in this case, the SA risk index). Observed SA prevalence among high-risk respondents (Ph) can then be defined as

Ph = p0h + V1hE1h + V2hE2h + … + VihEih, (1)

where Vih is the slope of SA on SLE (i.e., vulnerability to the effects of the SLE with respect to SAs) among high-risk respondents, Eih is the prevalence of SLE exposure among high-risk respondents, and p0h is the predicted prevalence of SA under the model among respondents exposed to none of the SLEs. A similar expression can be made for the predictors of SA prevalence among lower-risk respondents (Po); that is,

Po = p0o + V1oE1o + V2oE2o  + … + VioEio. (2)

The importance of differences in exposure and vulnerability to the SLEs in accounting for the observed difference in SA prevalence between high-risk and lower-risk respondents (i.e., Ph - Po) can then be decomposed by subtracting the elements in Eq. (2) from those in Eq. (1) and rearranging to obtain

Ph-Po = Si=1*n*(Eih-Eio)Vio + Si=1*n*(Vih-Vio)Eio + Si=1*n*(Vih-Vio)(Eih-Eio) + (p0h -p0o), (3)

summed over the *n* SLEs under consideration.

The first expression in Eq. (3), the *exposure* component, describes the extent to which the observed higher SA prevalence among high-risk respondents could be accounted for by their higher exposure to SLEs even if vulnerability was the same as among lower-risk respondents. The second expression, the *vulnerability* component, describes the extent to which the observed higher SA prevalence among high-risk respondents could be accounted for by the higher vulnerability to the effects of SLEs on SA even if exposure was the same as among lower-risk respondents. The third expression, the *interaction* component, describes the extent to which the observed higher SA prevalence could be accounted for by the joint occurrence of higher exposure and higher vulnerability to SLEs among high-risk respondents. The final *residual* component describes the elevation in SA prevalence among high-risk compared to lower-risk respondents in the absence of exposure to any of the SLEs.

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