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| **Supplementary Table 1. ICD-9-CM and ICD-10-CM Mental and Behavioral Health Codes** | |
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| **Disorder** | **Codes** |
| Major depression | ICD-9-CM codes: 296.2X, 296.3X, 300.4, 311 |
|  | ICD-10-CM codes: F32.XX (excluding F32.81 and F32.89), F33.XX |
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| Suicide attempt | ICD-9-CM codes: E950.X, E951.X, E952.X, E953.X, E954, E955.X, E956, E957.X |
|  | ICD-10-CM codes: T14.91, T36.XX2, T37.XX2, T38.XX2, T39.XX2, T40.XX2, T41.XX2, T42.XX2, T43.XX2, T44.XX2, T45.XX, T46.XX2, T47.XX2, T48.XX2, T49.XX2, T50.XX2, T51.XX2, T52.XX2, T53.XX2, T54.XX2, T55.XX2, T56.XX2, T57.XX2, T58.XX2, T59.XX2, T60.XX2, T61.XX2, T62.XX2, T63.XX2, T64.XX2, T65.XX2, T71.1X2, T71.2X2 |
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| Bipolar disorder | ICD-9-CM codes: 296.0X, 296.1X, 296.4X, 296.5X, 296.6X, 296.7, 296.80, 296.81, 296.89, 301.13 |
|  | ICD-10-CM codes: F30.X, F31.X, F34.0 |
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| Nonaffective psychosis | ICD-9-CM codes: 293.81, 293.82, 293.89, 295.XX, 297.X, 298.X, 301.22 |
|  | ICD-10-CM codes: F06.0, F06.1, F20.XX, F21, F22, F23, F24, F25.X, F28, F29, F53 |
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| Dementia | ICD-9-CM codes: 290.XX, 294.1X, 294.8 |
|  | ICD-10-CM codes: F01.XX, F01.XX, F03.XX |
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| Intellectual disabilities | ICD-9-CM codes: 317, 318, 319 |
|  | ICD-10-CM codes: F70, F71, F72, F73, F78, F79 |
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| Autism | ICD-9-CM code: 299.XX |
|  | ICD-10-CM code: F84.0 |
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| Tourette’s disorder | ICD-9-CM code: 307.23 |
|  | ICD-10-CM code: F95.2 |
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| Stereotyped movement disorders | ICD-9-CM code: 307.3 |
|  | ICD-10-CM code: F98.4 |
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| Borderline intellectual functioning | ICD-10-CM code: R41.83 |
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Abbreviations. ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification.

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| **Supplementary Table 2. Baseline self-report predictorsa included in machine learning models** |
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| **Risk factor domain** |
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| **1. Symptom frequency scales** |
| 1. 2-week depression symptom frequency (Aish, Wasserman & Renberg, 2001; Akiskal et al., 2005; American Psychiatric Association, 2013; Kessler & Ustün, 2004; Llerena et al., 2013; Rizvi et al., 2015; Rush, Gullion, Basco, Jarrett & Trivedi, 1996; Rush et al., 2003; Saffer, Lanting, Koehle, Klonsky & Iverson, 2015; Treynor, Gonzalez & Nolen-Hoeksema, 2003; Zimmerman et al., 2013): Anhedonia/loss of pleasure (sum of 5 reverse coded items), Cognitive difficulties (sum of 7 items), Positive mental health (sum of 17 items), Rumination (sum of 8 items), Dissociation (sum of 4 items), Mixed episodes (sum of 6 items), Other depression-related symptoms (sum of 16 items), Decrease in appetite (response to single item), Increase in appetite (response to single item), Decrease in weight (response to single item), Increase in weight (response to single item), Decrease/increase in appetite/weight (maximum of responses to 4 items), Sleep onset insomnia (response to single item), Mid-nocturnal insomnia (response to single item), Early morning insomnia (response to single item), Hypersomnia (response to single item), Worst sleep problem (maximum of responses to 4 items), Sleep problems severity scale (sum of 4 items), Count of severe sleep problemsb |
| 1. Suicidality (Nock, Holmberg, Photos & Michel, 2007; Posner et al., 2009; Posner et al., 2011): 2-week suicidal ideation (Any, Number of days), Duration of suicidal ideation (response to single item), Controllability of suicidal ideation (response to single item), Onset of suicidal ideation (1 year ago, 5 years ago, more than 5 years ago), 2-week frequency of tempting fate (response to single item), Lifetime suicide attempt (Number of attempts, Ever injured, Most serious injuries were moderate/severe), 2-week suicidality scalec |
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| **2. Severity** |
| 1. 2-week depression symptom severity (Aish, Wasserman & Renberg, 2001; American Psychiatric Association, 2013; Inventory of Depressive Symptomatology (IDS) and Quick Inventory of Depressive Symptomatology (QIDS), 2020; Kessler & Ustün, 2004; Llerena et al., 2013; Rizvi et al., 2015; Rush et al., 1996; Rush et al., 2003; Saffer et al., 2015; Zimmerman et al., 2013): Depression symptom frequency (sum of 43 standardized items), Hamilton Rating Scale for Depression severity levels (mild, moderate, severe, very severe), Quick Inventory of Depressive Symptomatology Self-Report Scale Score (sum of 16 items) |
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| **3. Subtypes** |
| 1. Endogenous depression (Kessler & Ustün, 2004; Sotsky et al., 1991; Ursano et al., 2014): Causes of lifetime depressive episodes (all/almost all caused by stressful experiences, most caused by stressful experiences, half caused by stressful experiences and half happened out of the blue, most/all happened out of the blue), Very first depressive episode was caused by stressful experiences (as opposed to happening out of the blue), Cause of current depressive episode (happened out of the blue, caused by recent stressful experiences only, caused by long-term stressful events only, caused by both recent and long-term stresses), Count of types of stresses that caused current depressive episode (sum of 4 items), Change in stresses since current depressive episode began (better or gone, somewhat better, staying the same, getting worse with no end in sight) |
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| **4. Clinical staging** |
| 1. Depression persistence (Akiskal et al., 2005; Kessler & Ustün, 2004; Sotsky et al., 1991; Ursano et al., 2014): Number of months of longest depressive episode, Number of years with severe depressive episodes, Percent of life with depression, Depression persistence-severityd, Free of depression for at least 6 months between first and current episode |
| 1. History of depression (Kessler & Ustün, 2004; Sotsky et al., 1991; Ursano et al., 2014): Age of first depressive episode, Number of years since onset of first depressive episode, Number of months of first depressive episode, First depressive episode in life is current episode, Number of months in current depressive episode before seeking treatment |
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| **5. Psychiatric comorbidity** |
| 1. Presenting problems (Akiskal et al., 2005; American Psychiatric Association, 2013; Anderson et al., 2018; Blevins, Weathers, Davis, Witte & Domino, 2015; Gibbons et al., 2016; Kessler & Ustün, 2004; Rush et al., 1996; Spielberger et al., 1983; Weissman et al., 2000; Zimmerman et al., 2013; Zuromski et al., 2019): Generalized anxiety (Only presenting problem, Primary problem, Primary/secondary problem, Primary/secondary/unreported by met criteria, 4-category response)e, Panic/phobias (Only presenting problem, Primary problem, Primary/secondary problem, Primary/secondary/unreported by met criteria, 4-category response)f, PTSD (Only |

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| **Supplementary Table 2 (continued). Baseline self-report predictorsa included in machine learning models** |
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| **Risk factor domain** |
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| presenting problem, Primary problem, Primary/secondary problem, Primary/secondary/unreported by met criteria, 4-category response)g, OCD (Only presenting problem, Primary problem, Primary/secondary problem, Primary/secondary/unreported by met criteria, 4-category response)h, Alcohol/substance use problems (Only presenting problem, Primary problem, Primary/secondary problem, Primary/secondary/unreported by met criteria, 4-category response)i, Anger control problems (Only presenting problem, Primary problem, Primary/secondary problem, Primary/secondary/unreported by met criteria, 4-category response)j, Any other serious emotional problem (Only presenting problem, Primary problem, Primary/secondary problem, Primary/secondary/unreported by met criteria, 4-category response)k, Depression (Only presenting problem, Primary/secondary problem, Exactly 1 other comorbid problem, Exactly 2 other comorbid problems, 2 or more other comorbid problems, 3 or more other comorbid problems), Count of primary problems, Count of secondary problems, Count of all primary/secondary problems, Count of comorbidities classified as not a problem, Count of other presenting problems |
| 1. Comorbid presenting problems (Akiskal et al., 2005; American Psychiatric Association, 2013; Anderson et al., 2018; Blevins, Weathers, Davis, Witte & Domino, 2015; Gibbons et al., 2016; Kessler & Ustün, 2004; Rush et al., 1996; Spielberger et al., 1983; Weissman et al., 2000; Zimmerman et al., 2013; Zuromski et al., 2019): Weighted psychiatric comorbiditiesl, Anxietym and any externalizingn presenting problem, Anxietym and PTSD as presenting problems, Any externalizingn and PTSD as presenting problems, At least 1 anxietym and 1 externalizingn and PTSD as presenting problems, Count of anxiety presenting problemsm, Count of externalizingn presenting problems, Above the median of the sum of standardized panic/phobias, PTSD, and anxietym comorbid presenting problem variables |
| 1. 2-week PTSD (Blevins, Weathers, Davis, Witte & Domino, 2015; Zuromski et al., 2019): 6-Item Short-Form PCL-5 PTSD Screening Scale (sum of 6 items)o, Number of months in life with PTSD-related symptoms |
| 1. 30-day alcohol/substance use (Gibbons et al., 2016; Hamilton et al., 2011): Quantity-frequency of alcohol use (average number of drinks per day x frequency per week), Average number of nicotine products used per day, Frequency of drugs used per week (sum of 6 items), Marijuana used every or nearly every day, No drugs used, Heavy drinkerp, Heavy smokerq, Heavy drug userr, Count of alcohol/substance use related problems experienced at least once a week (sum of 7 items), Count of alcohol/substance use related problems experienced at least once a month (sum of 7 items) |
| 1. 12-month disorders (Ursano et al., 2014): 12-month prevalence and number of months in past 12 with Generalized anxiety, Panic, Social anxiety, Specific phobia, Agoraphobia, PTSD, Obsessions/compulsions, Mania/bipolar disorder, Non-suicidal self-injurious behavior, Alcohol/substance use problems, Anger control problems, Any other serious emotional problem |
| 1. Lifetime disorders (Ursano et al., 2014; Weissman et al., 2000): Lifetime history and number of years in life with Generalized anxiety, Panic, Social anxiety, Specific phobia, Agoraphobia, PTSD, Obsessions, Compulsions, Obsessions/compulsions, Mania/bipolar disorder, Non-suicidal self-injurious behavior, Alcohol/substance use problems, Anger control problems, Any other serious emotional problem, Lifetime history of Externalizing problemsn (any, 2 or more), Count of lifetime externalizing problemsn, Count of lifetime anxiety problemss, Count of all lifetime disorders |
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| **6. Functioning and quality of life** |
| 1. 2-week depression-related role impairment (Leon, Olfson, Portera, Farber & Sheehan, 1997): Full days out of role (any, number of days, percent of days), Partial days out of role (any, number of days, percent of days), Full and partial days out of role due (any, total number of days, total percent of days), Severe/very severe work impairment (response of 7-10 on 0-10 scale), Severe/very severe family life/home impairment (response of 7-10 on 0-10 scale), Severe/very severe social life impairment (response of 7-10 on 0-10 scale), Severe/very severe impairment in any area of life (response of 7-10 on 0-10 scale) |
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| **7. Early environmental exposures** |
| 1. Adverse childhood events (Dube et al., 2001; Weissman et al., 2000): Close loved one died, Close loved one attempted/died by suicide, Lived in a foster home, Sent to a juvenile detention center, Sent to a juvenile detention center or lived in a foster home, Parents/caregivers separated or divorced, Parent/caregiver was in prison for 6+ months, Parent/caregiver had a mental illness, Parent/caregiver had alcohol/substance use problems |
| 1. Childhood trauma (Bernstein et al., 2003; Parker, Tupling & Brown, 1979): How often experienced Emotional/verbal abuse (sum of 2 items), Physical abuse (sum of 2 items), Sexual abuse (sum of 2 items), |

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| **Supplementary Table 2 (continued). Baseline self-report predictorsa included in machine learning models** |
|  |
| **Risk factor domain** |
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| Emotional neglect (sum of 3 items), Physical neglect (sum of 3 items), How often had strict rules (response to single item), How often felt loved and cared for (sum of 3 items) |
| 1. Parent/caregiver emotional problems (Weissman et al., 2000): Experienced depression (at least sometimes, at least often, very often), Depression and suicidality (depression at least often and suicidality at least rarely, depression very often and suicidality at least sometimes), Panic/generalized anxiety (at least sometimes, at least often), Mania/bipolar disorder (at least sometimes), Anger control problems (at least sometimes, at least often), Alcohol/substance use problems (at least sometimes, at least often, very often), Count of all emotional problems experiencedt (sum of 8 items experienced at least often, sum of 8 items experienced very often), How often experienced a serious mental illnessu (sum of 4 items), How often experienced psychological distressv (sum of 3 items) |
| 1. Other adverse childhood experiences (Stein et al., 2018): How often family was on welfare or homeless during childhood (maximum of responses to 2 items) |
|  |
| **8. Recent environmental stressors** |
| 1. 30-day chronic stress severity (Campbell-Sills et al., 2018b): Finances/career (maximum of responses to 2 items on 0-10 scale, severe/very severe stress=max response of 7-10, very severe stress=max response of 10), Personal health (response to single item on 0-10 scale, severe/very severe stress=response of 7-10, very severe stress=response of 10), Love life (response to single item on 0-10 scale, severe/very severe stress=response of 7-10, very severe stress=response of 10), Loved ones (maximum of responses to 2 items on 0-10 scale, severe/very severe stress=max response of 7-10, very severe stress=max response of 10), Relationships with family/others (maximum of responses to 2 items on 0-10 scale, severe/very severe stress=max response of 7-10, very severe stress=max response of 10), Life overall (response to single item on 0-10 scale, severe/very severe stress=response of 7-10, very severe stress =response of 10), Count of mild/no chronic stressors (sum of 5 items with responses of 0-3 on 0-10 scale), Count of severe/very severe chronic stressors (sum of 5 items with responses of 7-10 on 0-10 scale), Count of very severe chronic stressors (sum of 5 items with responses of 10 on 0-10 scale), How often per month currently experience physical bullying (response to single item), relational bullying (response to single item), verbal bullying (response to single item), any type of bullying (sum of 3 items) |
| 1. 12-month stressful life events (Ursano et al., 2014): Experienced life-threatening illness/injury, Mugged/victim of armed robbery, Break-in/burglary, Mugged or break-in, Physically assaulted, Sexually assaulted or raped, Major financial crisis, Lost a job, Major financial crisis or lost a job, Serious trouble with police/arrested, Serious legal trouble/lawsuit, Serious trouble with police or legal trouble, Betrayal by someone close to you, Separation/divorce/serious romantic break-up, Break-up/falling out with close friend/relative, Betrayal or break-up, Close friend/relative died, Close friend/relative had a life-threatening illness/injury, Close friend/relative experienced some other serious life crisis, Other stressful life event, Close friend/relative died or ill or other crisis, Experienced any kind of stressful life event, Experienced 2 or more stressful life events, Count of financial/legal stressful events, Count of all stressful life events |
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| **9. Personality scales** |
| 1. Personality traits (Akiskal et al., 2005; Anderson, Sellbom & Salekin, 2018; Cyders, Littlefield, Coffey & Karyadi, 2014; Gosling, Rentfrow & Swann, 2003; Zimmermann, Rossier, Meyer de Stadelhofen & Gaillard, 2005): Agreeableness scale (sum of 3 items), Alexithymia scale (sum of 4 items), Antagonism/antisocial personality traits (sum of 4 items), Detachment scale (sum of 4 items), Emotionality scale (sum of 2 items), Externally oriented thinking scale (sum of 3 items), Extraversion/openness scale (sum of 4 items), Impulsive/sensation-seeking scale (sum of 6 items), Negative urgency scale (sum of 5 items), Psychoticism personality traits (sum of 5 items) |
| 1. Temperament (Akiskal et al., 2005; Anderson et al., 2018; Costa & McCrae, 1992; Gosling et al., 2003; Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983): Anxious (sum of 5 items), Cyclothymic (sum of 5 items), Depressive (response to single item), Hyperthymic (sum of 3 items), Irritable (sum of 2 items) |
| 1. Attachment style (Bartholomew & Horowitz, 1991): Dismissing-avoidant (response to single item), Fearful-avoidant (response to single item), Preoccupied/anxious-resistant (response to single item), Secure (response to single item) |

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| **Supplementary Table 2 (continued). Baseline self-report predictorsa included in machine learning models** |
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| **Risk factor domain** |
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| **10. Neurocognition** |
| 1. Attentional control (Judah, Grant, Mills & Lechner, 2014): Distractibility scale (sum of 3 items), Low flexibility scale (sum of 3 items) |
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| **11. Dysfunctional cognitive schemas** |
| 1. Interpersonal needs (Van Orden, Cukrowicz, Witte & Joiner, 2012): Perceived burdensomeness (sum of 3 items), Perceived access to social support/thwarted belongingness (response to single item) |
| 1. Cognitive distortions (Akiskal et al., 2005; Roberts, 2015): Cognitive distortions scale (sum of 6 items) |
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| **12. Protective/resilience factors** |
| 1. Social support (Kessler & Ustün, 2004; Schuster, Kessler & Aseltine, 1990): Religiosity scale (sum of 3 items), Frequency of interaction with friends/relatives (response to single item), Frequency of participation in social groups (response to single item), Seeking help with personal problems (reach out to a lot of different people, only to family/friends/closest confidants, no one), How much could rely on people for support with personal problems (response to single item), Access to social support (could rely a lot on people for support with personal problems, could rely some or more on people for support with personal problems), Number of people could rely on for support with personal problems, Number of confidants, Negative social networks (response to how often people make too many demands = response to how often people argue with you) |
| 1. Emotional regulation (Garnefski & Kraaij, 2007; Gross & John, 2003; Medrano & Trogolo, 2016; Schlotz, Yim, Zoccola, Jansen & Schulz, 2011): Cognitive reappraisal scale (sum of 6 items), Difficulties in regulation of emotional response scale (sum of 4 items), Difficulties in processing emotions scale (sum of 4 items), Putting things into perspective/stress management skills scale (sum of 3 items), Refocus on planning scale (sum of 3 items), Self-blame scale (sum of 3 items), Perceived stress reactivity scale (sum of 7 items), Reactivity/regulation scale (Sum of Perceived stress reactivity scale, Difficulties in regulation of emotional response scale, Difficulties in processing emotions scale) |
| 1. Resilience (Campbell-Sills et al., 2018a; Campbell-Sills & Stein, 2007): Perceived psychological resilience scale (sum of 12 items) |
|  |
| **13. Comorbid physical disorders** |
| 1. Medications (Kessler & Ustün, 2004): Number of medications taken per day for ongoing physical problems |
| 1. Health care visits (Kessler & Ustün, 2004): Number of health care visits for physical problems in the past 12 months |
| 1. Health indicators: BMI (underweight, normal weight, normal weight or more, overweight, overweight or more, obese, obese or more, morbidly obese), Rating of overall physical health (excellent, very good, good, fair, poor, 5-category response, very good or better, good or better, fair or better) |
| 1. Continuity of care (Safran et al., 1998): Provider of routine physical health care (has a regular PCP, has a regular place, no regular PCP or regular place), Number of years going to the regular PCP/place for routine physical health care |
| 1. TBIs (Ursano et al., 2014): Lifetime prevalence, Number of lifetime TBIs (1, 2 or more, total), Age of first TBI, 12-month prevalence |
| 1. Somatic symptoms (Axelsson, Andersson, Ljótsson, Wallhed Finn & Hedman, 2016; Toussaint et al., 2016): Severity of Distressing/bothersome symptoms in past 30 days (frequency of symptoms per week x length per day x severity of symptoms), Duration of symptoms (none, 1-3 months, 4-6 months, 7-12 months, 1-2 years, more than 2 years, 6-category response, 1+ months, 4+ months, 7+ months, 1+ years), Perception of symptom severity (sum of 8 items), Anxiety about symptoms (sum of 4 itemsw), Somatic symptom disorder scale (sum of 15 items) |
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| **14. Family history of psychopathology** |
| 1. Family history of depression (Weissman et al., 2000): Number of parents/relatives with a history of depression |
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| **15. Socio-demographics** |
| 1. Age: Age at baseline survey (19-34, 35-49, 50-59, 60+, 35 or more, 50 or more, 60 or more) |
| 1. Children: Any biological or stepchildren, Number of children (0, 1, 2, 3+), Age of oldest child (under 6, under 13, under 18), Age of youngest child (under 6, under 13, under 18), Currently pregnant/partner currently pregnant |

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| **Supplementary Table 2 (continued). Baseline self-report predictorsa included in machine learning models** |
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| **Risk factor domain** |
|  |
| 1. Education: High school or less, Some college, College graduate, Graduate school or more, 4-category response, Some college or less, College graduate or less |
| 1. Employment status: Employed, Retired, Student, Disabled, Unemployed, Other |
| 1. Nativity: Born in the US |
| 1. Occupational category: Executive/administrator/senior manager, Professional, Technical support, Sales, Clerical/administrative support, Service, Crafts worker/precision production, Operator/laborer, Other |
| 1. Race/ethnicity: Non-Hispanic white, Non-Hispanic black, Hispanic, Other |
| 1. Marital/relationship status: Relationship status (married/cohabitating, engaged, steadily dating, dating but not in a steady relationship, not currently dating, 5-category response), Number of years married/steadily dating, Quality of marriage/relationship (response to single item on 0-10 scale) |
| 1. Sex: Male/Female |
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| **16. Treatment characteristics** |
| 1. Treatment preferences (Kessler & Ustün, 2004; Milosevic, Levy, Alcolado & Radomsky, 2015; Steidtmann et al., 2012): Likelihood to participate in a RCT of new antidepressant (response to single item), Willingness to try psychotherapy (response to single item on 0-10 scale, unwilling=response of 0-2, moderately willing=response of 3-7, completely willing=response of 8-10, 3-category response), Willingness to try ADM (response to single item on 0-10 scale, unwilling=response of 0-2, moderately willing=response of 3-7, completely willing=response of 8-10, 3-category response), Willingness to try other kinds of treatment (response to single item on 0-10 scale), ADM preference (preferred specific type of antidepressant, preferred specific class) |
| 1. Treatment expectations (Curry et al., 2006; McHorney, Victor Spain, Alexander & Simmons, 2009; Unni, 2008; Unni, Olson & Farris, 2014; Vik, Maxwell & Hogan, 2004; Wisniewski, Rush, Balasubramani, Trivedi & Nierenberg, 2006): Expectation for psychotherapy to successfully treat depression (response to single item on 0-10 scale, failure=response of 0-2, moderate success=response of 3-7, complete success=response of 8-10, 3-category response), Expectation for ADM to successfully treat depression (response to single item on 0-10 scale, failure=response of 0-2, moderate success=response of 3-7, complete success=response of 8-10, 3-category response), Expectation for combination of psychotherapy and ADM to successfully treat depression (response to single item on 0-10 scale, failure=response of 0-2, moderate success=response of 3-7, complete success=response of 8-10, 3-category response), Expectation for ECT to successfully treat depression (response to single item on 0-10 scale, failure=response of 0-2, moderate success=response of 3-7, complete success=response of 8-10, 3-category response), Expectation for ketamine therapy to successfully treat depression (response to single item on 0-10 scale, failure=response of 0-2, moderate success=response of 3-7, complete success=response of 8-10, 3-category response), Expectation for ADM side effects (No side effects, Mild but temporary, Mild and long-term, Moderate but temporary, Moderate and long-term, Severe but temporary, Severe and long-term, Any, Any mild, Any moderate, Any severe, Any temporary, Any long-term), Concerns about ADM (sum of 4 items), Expectation for success of current treatment (response to single item), Belief in current treatment being the best (response to single item) |
| 1. Health literacy (Chew et al., 2008; Haun, Valerio, McCormack, Sørensen & Paasche-Orlow, 2014): Number of hours spent discussing depression treatment options before initial visit, Number of hours spent researching depression treatment options before initial visit, Total number of hours spent discussing/researching depression treatment options before initial visit, Inadequate health literacy (sum of 3 items) |
| 1. Treatment provider (Baumann, Baumann, Le Bihan & Chau, 2008; Bieber, Müller, Nicolai, Hartmann & Eich, 2010; Safran et al., 1998): Type of provider currently treating depression (PCP/NP, psychiatrist, psychologist, PCP/NP and psychiatrist, PCP/NP and psychologist, psychiatrist and psychologist), Previously received mental health treatment from same provider currently treating depression, Quality of relationship with provider (sum of 8 items) |
| 1. Current assigned treatment (Kessler & Ustün, 2004): Individual/group counseling/psychotherapy, Medication |
| 1. Treatment history (Kessler & Ustün, 2004; Sotsky et al., 1991; Ursano et al., 2014): Received any treatment in the past, Age of first receiving treatment, Percent of years in treatment, Number of times hospitalized overnight for depression, Current episode is first episode/first time receiving treatment, Current treatment is the same as previous self-reported treatment, Types of treatment received in the past (Individual counseling/psychotherapy, Group counseling/psychotherapy, ADM, Internet guided self-help therapy/self-help support group/ECT/ketamine/other, Combinations of different types), Count of different types of treatment ever received (sum of 8 items), Helpfulness of past treatment (was helpful, was not helpful), Effectiveness of past |

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| **Supplementary Table 2 (continued). Baseline self-report predictorsa included in machine learning models** |
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| **Risk factor domain** |
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| psychotherapy treatment (at least very effective, completely effective, maximum of responses to 2 items), Effectiveness of past ADM treatment (never received, not effective, not very, somewhat effective, at least somewhat effective, very effective, at least very effective, completely effective, response to single item) |
| 1. Treatment compliance (Morisky, Ang, Krousel-Wood & Ward, 2008): Medication non-compliance scale (sum of 5 items) |
|  |

Abbreviations: PTSD, post-traumatic stress disorder; OCD, obsessive-compulsive disorder; BMI, body mass index; PCP, primary care provider; TBI, traumatic brain injury; RCT, randomized controlled trial; ADM, antidepressant medication; ECT, electroconvulsive therapy; NP, nurse practitioner.

aWe included dichotomous variables, nested dichotomous variables, categorical and ordinal variables, continuous variables, standardized and stabilized continuous variables as potential predictors in the feature selection for additive algorithms.

bSeveresleep problems included taking 30 minutes or more to fall asleep, waking up throughout the night a few times or more, waking up too early more than half the time or more, and sleeping longer than 9 hours a day or more.

cStandardized sum of 4 or more days with suicide ideation in the past 2 weeks; suicidal thoughts in past 2 weeks were somewhat difficult, very difficult, or impossible to control; and tempted fate rarely, sometimes, often, or very often in the past 2 weeks.

dThis variable was created by summing the standardized percent of life with depression variable, standardized number of months of longest depressive episode variable, and standardized depressive temperament item "People tell me I am often unable to see the lighter side of things". Higher scores indicate higher depressive persistence/severity/temperament.

eGeneralized anxiety as either a primary or secondary presenting problem as indicated by the patient or if the patient reported anxiety 7 or more months of the past 12 and reported symptoms of DSM-5 Generalized Anxiety Disorder Criteria A and C.

fPanic/phobias as either a primary or secondary presenting problem as indicated by the patient or if the patient reported panic/phobias 7 or more months of the past 12.

gPTSD as either a primary or secondary presenting problem as indicated by the patient or a score in the clinical range of a PCL-5 screening scale calibrated to the full PCL-5.

hOCD as either a primary or secondary presenting problem as indicated by the patient or if the patient reported having obsessions or compulsions every month for the past 12 months.

iAlcohol/substance use problems as either a primary or secondary presenting problem as indicated by the patient or if the patient met threshold scoring rules on the Patient-Reported Outcomes Measurement Information System (PROMIS) 30-day Alcohol/Substance Use Short Form-7a.

jAnger control problems as either a primary or secondary presenting problem as indicated by the patient or if the patient reported anger attacks 7 or more months of the past 12 and reported that one or more of three statements described them either a lot or exactly (“Sometimes I get so furious that I could hurt someone”; “I snap at people when I get angry”; “Sometimes I get so mad that I trash everything”).

kAny other serious emotional problem as either a primary or secondary presenting problem as indicated by the patient or if the patient reported any other serious emotional problem 7 or more months of the past 12.

lCount of possible self-reported comorbidities classified as primary, secondary, unreported by met criteria, or not a presenting problem.

mAnxiety included panic/phobias, OCD, and generalized anxiety.

nExternalizing problems included anger control problems, alcohol/substance use problems, and any other serious emotional problem.

oDefined as a score of 38+ on the PTSD Checklist for DSM-5 based on responses to the 6-item short-form version of the PCL-5 calibrated to the full PCD-5.

p30-day heavy drinking was defined as alcohol quantity\*frequency >= 15.

q30-day heavy smoking was defined as using 26 or more nicotine products per day.

r30-day heavy drug use was defined as self-reported use of prescription opioids (either without a doctor’s prescription or more than prescribed to get high, buzzed, or numbed out) or heroin/street fentanyl at least once a month or using prescription stimulants, tranquilizers, muscle relaxers, or sedatives (either without a doctor’s prescription or more than prescribed to get high, buzzed, or numbed out) at least 1 day a week or using marijuana every or nearly every day or using any other illegal nonprescription drug at least 1 day a week in the past 30 days.

sAnxiety problems included generalized anxiety, panic, social anxiety, specific phobia, agoraphobia, PTSD, obsessions, and compulsions.

tEmotional problems included depression, panic, generalized anxiety, mania/bipolar disorder, anger control problems, alcohol/substance use problems, suicidality, and any other serious emotional problem.

uSerious mental illnesses included mania/bipolar disorder, anger control problems, alcohol/substance use problems, and any other serious emotional problem.

vPsychological distress included depression, panic, and generalized anxiety.

wSum of 30-day frequency of anxiety/worry/distress about symptoms, severity of anxiety/worry/distress, time spent thinking/focusing on symptoms, severity of interference in life due to symptoms or anxiety/worry/distress about symptoms.

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| **Supplementary Table 3. Administrative predictorsa included in machine learning models** |
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| **Risk factor domain** |
|  |
| **1. Psychiatric comorbidity** |
| 1. Health care visits: Number of visits with any ICD code for Suicidal Ideationb, 2 or more visits with ICD code for diagnosis of any substance use problems in past 12 months and at least 1 was face-to-face |
| 1. Diagnoses (Lew et al., 2009): ICD code for diagnosis of PTSD in past 12 months, Lifetime history of previously diagnosed mental disorders (Any adjustment disorders, anxiety disorders, depressive disorders, PTSD, substance use disorders, other reactions to stress, other mental disorders, total number), Mental disorders in EHR at initial visit (Any adjustment disorders, anxiety disorders, depression disorders, PTSD, substance use disorders, other reactions to stress, other mental disorders, total number), Primary mental disorder in EHR at initial visit (Any adjustment disorders, anxiety disorders, depressive disorders, PTSD, substance use disorders, other reactions to stress, other mental disorders), Primary diagnosis at initial visit (depression, a mental disorder other than depression and not a physical disorder, a physical disorder and not depression), Any visit with ICD code for diagnosis of Polytrauma Clinical Triad - Depressionb, Any visit with ICD code for diagnosis of Polytrauma Clinical Triad – PTSDb |
|  |
| **2. Recent environmental stressors** |
| 1. Accidents: Number of visits with any ICD code for Accidents (past 6 months, past 12 months, past 2 years, past 5 years) |
|  |
| **3. Comorbid physical disorders** |
| 1. Medications: Prescribed any Antimigraine Medicationsb, Prescribed any Non-Opioid Analgesic Medicationsb, Prescribed any Opioid Analgesic Medicationsb, Prescribed any Pain Medicationsb, Prescribed any Medications |
| 1. Health care visits (Chronic Pain Research Alliance, 2015; Lew et al., 2009; Mayhew et al., 2019): Number of visits with CPT code for any Sleep apnea related proceduresb, Number of visits with CPT code for any Pain related proceduresb, Number of visits with ICD code for diagnosis of any of the 10 Chronic Overlapping Pain Conditionsb, Number of visits with ICD code for diagnosis of any of the 13 Pain Condition Crosswalk Clustersb, Any visit with ICD code for diagnosis of Polytrauma Clinical Triad - Chronic Painb, Any visit with ICD code for diagnosis of Polytrauma Clinical Triad - TBIb, Any visit with ICD code for diagnosis of Polytrauma Clinical Triad - Chronic Pain and TBI in the past 3 months |
| 1. Health indicators (Charlson, Pompei, Ales & MacKenzie, 1987): Charlson Comorbidity Index Score (0, 1, 2 or more, 3-category response), Worst pain on 0-10 NRS pain scaleb |
|  |
| **4. Socio-demographics** |
| 1. Marital status: Currently married, divorced, separated, widowed, never married, previously married, 3-category response (currently married, previously married, never married) |
| 1. Housing stability: Ever homelessb, Number of visits with any ICD code for Problems with housing, material resources, and social isolationb |
| 1. Neighborhood characteristics: Census region (Northeast, Midwest, South, West) |
|  |
| **5. Treatment characteristics** |
| 1. Current treatment characteristics: Received a referral to specialist during initial visit, Received psychotherapy at a primary care facility, Received psychotherapy at a specialty mental health facility, Number of psychotherapy visits in the 84 days after the initial visit |
| 1. Treatment provider: Treatment provider at initial visit was a primary care provider (as opposed to a mental health specialist) |
| 1. Facility characteristics: Driving time in minutes to the nearest VHA primary care facility, Ratio of medical/social positions lost/onboards at the facility where the patient visited in the year prior to the initial visit, Setting of initial visit (community based outpatient clinic, specialty mental health, primary care), Facility of initial visit had at least one full-time integrated mental health specialist on staff, Facility of initial visit did not have a full-time integrated mental health specialist on staff |
| 1. Treatment history: Number of visits with any ICD code for Noncompliance with treatment in the past 5 years |
|  |

Abbreviations: ICD, International Classification of Diseases; PTSD, post-traumatic stress disorder; EHR, electronic health record; CPT, Current Procedural Terminology; TBI, traumatic brain injury; NRS, numeric rating scale; VHA, Veterans Health Administration.

aWe included dichotomous variables, nested dichotomous variables, categorical and ordinal variables, continuous variables, standardized and stabilized continuous variables as potential predictors in the feature selection for additive algorithms.

bIn the past month, past 2 months, past 3 months, past 6 months, past 12 months, past 2 years, and past 5 years before initial visit.

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| **Supplementary Table 4. Geospatial predictorsa included in machine learning models** |
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| **Risk factor domain** |
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| **1. Socio-demographics** |
| 1. GDP (Bureau of Economic Analysis, 2021): Per capita county GDP in thousands of chain-linked 2012 dollarsb, Per capita nominal county GDP in real-time dollars, Difference in per capita county GDP (chain-linked 2012 dollars) from previous year |
| 1. Poverty (United States Census Bureau, 2020): Percent of population below 150% of the poverty line at the Census Block Group |
| 1. Income (United States Department of Commerce & Bureau of Economic Analysis, 2018): Per capita personal income (by residence) in thousands of dollars in the county |
| 1. Homelessness (United States Department of Housing and Urban Development, 2014): Annual rate of homelessness per 1,000 Census Track population on a single given night in January |
| 1. Quality of health (University of Wisconsin Population Health Institute & Robert Wood Johnson Foundation, 2021): Composite health outcomes measure based on length of life and quality of life in the countyc, Overall health outcome summary score in the county (higher = worse)c, Years of potential life lost before age 75 (age-adjusted) per 100,000 in the county population |
| 1. Healthcare coverage (Centers for Medicare and Medicaid Services (CMS), 2018): Medicaid eligible rate per capita in the county |
| 1. Mortality rates (National Center for Health Statistics (NCHS), 2019): Infant mortality rate (<1 year old) from all causes per 100,000 infants in the county, Mortality rate due to alcohol, drugs, external causes, HIV/AIDS, homicide, liver disease per 100,000 in the county population, Suicide rate (by any method) per 100,000 in the county population |
| 1. Urbanicity (United States Department of Agriculture: Economic Research Service, 2020): Major metro area, urban area, rural area |
|  |

Abbreviation: GDP, Gross domestic product; HIV/AIDS, human immunodeficiency virus, acquired immunodeficiency syndrome.

aWe included dichotomous variables, nested dichotomous variables, categorical and ordinal variables, continuous variables, standardized and stabilized continuous variables as potential predictors in the feature selection for additive algorithms.

bInflation-adjusted measure of area’s gross product, based on national prices for the goods and serviced produced within the area. The real estimates of GDP are measured in chained (2012) dollars.

cThe county-level composite health outcomes measure is a sum of the following standardized variables: Years of potential life lost before age 75 (age-adjusted) per 100,000 people, Percent of adults reporting fair or poor health (age-adjusted), Average number of days in a month with poor physical health (age-adjusted), Average number of days in a month with poor mental health (age-adjusted), Percent of very low weight live births (<2,500 grams); the overall health outcomes summary score is a sum of the variables (non-standardized forms) used in the Composite health outcomes measure, with higher scores = worse county-level health outcomes.

| **Supplementary Table 5. Algorithms used in the Super Learner ensemble machine learning analysisa** | |
| --- | --- |
|  |  |
| **Algorithm** | **Description** |
| I. Super Learner | Super Learner is an ensemble machine learning approach that uses cross-validation (CV) to select a weighted combination of predicted outcome scores across a collection of candidate algorithms (learners) to yield an optimal combination according to a pre-specified criterion that performs at least as well as the best component algorithm. R package: *SuperLearner* (Polley, LeDell, Kennedy, Lendle & van der Laan, 2018; van der Laan, Polley & Hubbard, 2007) |
|  |  |
| II. Learners in the Super Learner library | |
|  |  |
| A. Logistic regression | Maximum likelihood estimation with logistic link function. R package: s*tats* (Nelder & Wedderburn, 1972) |
|  |  |
| B. Elastic Net | Elastic net is a regularization method that minimizes the problem of overlap among predictors by explicitly penalizing over-fitting with a composite penalty λ{MPP x Plasso + (1- MPP) X Pridge}, where MPP is a mixing parameter penalty with values between 0 and 1 that controls relative weighting between the lasso penalty (Plasso) and the ridge penalty (Pridge). The parameter λ controls the total amount of penalization. The ridge penalty handles multicollinearity by shrinking all coefficients smoothly towards 0 but retains all variables in the model. The lasso penalty allows simultaneous coefficient shrinkage and variable selection, tending to select at most one predictor in each strongly correlated set, but at the expense of giving unstable estimates in the presence of high multicollinearity. The elastic net approach of combining the ridge and lasso penalties has the advantage of yielding more stable and accurate estimates than either ridge or lasso alone while maintaining model parsimony. R package: *glmnet* (Friedman, Hastie & Tibshirani, 2010)  Hyperparametersa: =(0.0, 0.2, 0.4, 0.6, 0.8, 1.0). |
|  |  |
| C. Splines |  |
| C1. Adaptive splines | Adaptive spline regression flexibly captures both linear and piecewise non-linear associations as well as interactions among these associations by connecting linear segments (splines) of varying slopes and smooths to create piece-wise curves (basis functions). Final fit is built using a stepwise procedure that selects the optimal combination of basis functions. R package:*earth* (Milborrow, 2016)  Hyperparametersa: degree = (1, 3, 5), penalty = (2, 4, 6). |
|  |  |
| C2. Adaptive  polynomial splines | Adaptive polynomial splines are like adaptive splines but differ in the order in which basis functions (e.g., linear versus nonlinear) are added to build the final model. R package: *polspline* (Kooperberg, 2015) |
|  |  |
| D. Decision trees – bagging | Random Forest. Independent variables are partitioned (based on contiguous values) and stacked to build decision trees that are combined (ensemble) to create an aggregate “forest”. Random forest builds numerous trees in bootstrapped samples and generates an aggregate prediction by averaging across trees, thereby reducing over-fitting. R package: *ranger* (Wright & Ziegler, 2017)  Hyperparametersa:max.depth = (2, 3, 4, 5), min.node.size = (16, 64, 256, 400), num.trees = (3000), mtry = (, ) |
|  |  |

| **Supplementary Table 5 (continued). Algorithms used in the Super Learner ensemble machine learning analysisa** | |
| --- | --- |
|  | |
| **Algorithm** | **Description** |
| E. Support vector machines | Support vector machines treat independent variables as dimensions in high dimensional space and attempt to identify the best hyperplane (linear, polynomial, radial, or sigmoid kernel) to separate the sample into classes (e.g., cases and non-cases) with maximum distance between classes. R package: *WeightSVM* (Xu, 2020)  Hyperparametersa: kernel = (radial), cost = (0.1, 1, 10, 50), gamma (0.0001, 0.001, 0.01, 0.1, 1) |
| F. Decision trees – boosting |  |
| F1. Gradient  Boosting Machine | GBMs build a sequential ensemble of shallow successive decision trees that iteratively learn the residuals from prior trees. This is a flexible method, where the number of trees, interaction depth, and shrinkage are leveraged to build flexible models. R package: *CatBoost* (Prokhorenkova, Gusev, Vorobev, Dorogush & Gulin, 2019)  Hyperparametersa,b: Iterations = (500, 1000, 2000), learning rate = (0.05, 0.03, 0.01), depth = (2, 3, 4, 5), min data in leaf = (4, 16, 64, 256), max\_leaves = (2, 4, 8, 16, 32) |
|  |  |
| F2. Extreme  Gradient Boosting | A fast and efficient implementation of gradient boosting. R package: *XGBoost* (Chen & Guestrin, 2016)  Hyperparametersa,b: ntrees = (5000), max\_depth = (2, 3, 4, 5), shrinkage = (0.10, 0.05, 0.01)  gamma = (0, 4, 16, 64), minobspernode = (3, 9, 27, 81), colsample\_bytree = (1.0, 0.8, 0.6), subsample = (1, 0.9, 0.8), colsample\_bynode = (1, 0.9, 0.8) |
|  |  |
| G. Discrete Bayesian  Additive Regression  Trees Sampler | Bayesian trees are based on an underlying probability model (priors) for the structure and likelihood for data in terminal nodes. The aggregate tree is generated by averaging across tree posteriors (reducing overfit). R package: *dbarts* (Dorie et al., 2021)  Hyperparametersa: ntree=100 |
|  |  |
| H. Mean | Arithmetic mean |
|  |  |
| I. Stratified outcome  prevalence | Stratified outcome prevalence |
|  |  |

aHyperparameters: Default values were used unless otherwise noted. Algorithms included for all combinations of hyperparameters.

bRandom selection of 100 hyperparameter combinations included in analysis for gradient boosting algorithms. Learners were selected into the SuperLearner in two stages. In the first stage, cross-validated predicted probabilities and AUCs for each learner were estimated by fitting the learners in the training sample using 10-fold cross-validation. Resubstitution predicted probabilities and AUCs were also estimated by fitting the learners in the full training sample and estimating predicted probabilities in the same sample. Learners with a high cross-validated AUC, that were not overfit/underfit by resubstitution AUC, and that had a small drop-off in performance between resubstitution and cross-validation were selected for the next stage. This selection was done by algorithm and at least one learner from each algorithm was carried forward. In the second stage, learners selected from the first stage were entered into a SuperLearner, which was then fit to the training sample using 10-fold cross-validation. Learners that were assigned weights in at least 2 folds when solving for the non-negative least squares were selected for the final SuperLearner model.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Supplementary Table 6. Distribution of socio-demographic characteristics, baseline depression severity, and treatment response among the full baseline sample, analytic sample, and patients lost to follow-up** | | | | | | | | | | | | | | |
|  | **Weighted for baseline non-response** | | | | | | | |  | **Also weighted for loss to follow-up** | |  |  |  |
|  | **Baseline sample (n=809)** | |  | **Analytic sample (n=660)** | |  | **Patients lost to follow-up (n=149)** | |  | **Analytic sample (n=660)** | |  | **Difference between analytic sample and patients lost to follow-up** | |
|  | **%** | **(SE)** |  | **%** | **(SE)** |  | **%** | **(SE)** |  | **%** | **(SE)** |  | **2** | **Df** |
| Age |  |  |  |  |  |  |  |  |  |  |  |  | 11.65a | 3 |
| 19-34 | 24.2 | (1.6) |  | 22.5 | (1.8) |  | 31.6 | (4.0) |  | 23.3 | (1.9) |  |  |  |
| 35-49 | 30.7 | (1.8) |  | 31.0 | (2.0) |  | 29.4 | (3.9) |  | 30.7 | (2.1) |  |  |  |
| 50-59 | 19.3 | (1.5) |  | 21.6 | (1.7) |  | 9.9 | (2.6) |  | 20.8 | (1.7) |  |  |  |
| 60+ | 25.7 | (1.6) |  | 24.9 | (1.8) |  | 29.1 | (3.9) |  | 25.2 | (1.8) |  |  |  |
| Sex |  |  |  |  |  |  |  |  |  |  |  |  | 0.90 | 1 |
| Female | 26.3 | (1.7) |  | 27.1 | (1.9) |  | 23.0 | (3.7) |  | 26.1 | (1.9) |  |  |  |
| Male | 73.7 | (1.7) |  | 72.9 | (1.9) |  | 77.0 | (3.7) |  | 73.9 | (1.9) |  |  |  |
| Race/ethnicity |  |  |  |  |  |  |  |  |  |  |  |  | 1.62 | 3 |
| White | 62.3 | (1.9) |  | 62.8 | (2.1) |  | 60.1 | (4.3) |  | 67.9 | (2.1) |  |  |  |
| Black | 18.2 | (1.5) |  | 17.3 | (1.7) |  | 22.0 | (3.8) |  | 13.6 | (1.5) |  |  |  |
| Hispanic | 12.4 | (1.3) |  | 12.5 | (1.4) |  | 11.8 | (2.9) |  | 11.7 | (1.5) |  |  |  |
| Other | 7.2 | (1.0) |  | 7.4 | (1.1) |  | 6.0 | (2.1) |  | 6.9 | (1.1) |  |  |  |
| Marital status |  |  |  |  |  |  |  |  |  |  |  |  | 2.14 | 4 |
| Currently married | 55.6 | (1.9) |  | 54.4 | (2.1) |  | 60.5 | (4.3) |  | 54.9 | (2.2) |  |  |  |
| Divorced | 20.9 | (1.5) |  | 21.4 | (1.7) |  | 18.6 | (3.5) |  | 21.3 | (1.7) |  |  |  |
| Separated | 5.9 | (0.9) |  | 5.8 | (1.0) |  | 6.4 | (2.1) |  | 5.9 | (1.1) |  |  |  |
| Widowed | 2.3 | (0.5) |  | 2.5 | (0.6) |  | 1.5 | (1.1) |  | 2.7 | (0.7) |  |  |  |
| Never married | 15.4 | (1.4) |  | 15.9 | (1.6) |  | 13.0 | (2.9) |  | 15.2 | (1.6) |  |  |  |
| Census region |  |  |  |  |  |  |  |  |  |  |  |  | 5.86 | 3 |
| Northeast | 8.4 | (1.1) |  | 7.3 | (1.1) |  | 13.0 | (3.1) |  | 8.0 | (1.2) |  |  |  |
| Midwest | 17.8 | (1.4) |  | 17.4 | (1.6) |  | 19.1 | (3.3) |  | 19.6 | (1.8) |  |  |  |
| South | 53.8 | (1.9) |  | 54.1 | (2.1) |  | 52.6 | (4.3) |  | 51.5 | (2.2) |  |  |  |
| West | 20.0 | (1.5) |  | 21.2 | (1.7) |  | 15.3 | (3.0) |  | 20.9 | (1.8) |  |  |  |
| Urbanicity |  |  |  |  |  |  |  |  |  |  |  |  | 2.55 | 2 |
| Major metro | 84.6 | (1.3) |  | 83.5 | (1.5) |  | 88.9 | (2.6) |  | 79.5 | (1.8) |  |  |  |
| Urban | 14.2 | (1.3) |  | 15.2 | (1.5) |  | 10.0 | (2.5) |  | 18.8 | (1.7) |  |  |  |
| Rural | 1.2 | (0.4) |  | 1.2 | (0.4) |  | 1.1 | (.8) |  | 1.7 | (0.6) |  |  |  |
| % of population below 1.5x of poverty line | | | | |  |  |  |  |  |  |  |  | 2.75 | 3 |
| Least low income | 18.7 | (1.5) |  | 19.7 | (1.7) |  | 14.5 | (3.0) |  | 21.5 | (1.9) |  |  |  |
| 2nd quartile | 26.2 | (1.6) |  | 25.3 | (1.8) |  | 29.8 | (3.9) |  | 28.2 | (2.0) |  |  |  |
| 3rd quartile | 29.0 | (1.7) |  | 28.6 | (1.9) |  | 31.0 | (4.0) |  | 27.0 | (1.9) |  |  |  |
| Most low income | 26.1 | (1.6) |  | 26.4 | (1.8) |  | 24.7 | (3.7) |  | 23.2 | (1.7) |  |  |  |
| Type of ADM |  |  |  |  |  |  |  |  |  |  |  |  | 2.25 | 6 |
| TeCA (Mirtazapine) | 5.8 | (0.9) |  | 5.9 | (1.0) |  | 5.1 | (1.9) |  | 4.7 | (0.8) |  |  |  |
| NDRI (Bupropion) | 15.7 | (1.3) |  | 15.3 | (1.5) |  | 17.2 | (3.2) |  | 15.7 | (1.5) |  |  |  |
| SARI (Trazodone) | 15.0 | (1.4) |  | 15.1 | (1.5) |  | 14.2 | (3.0) |  | 15.8 | (1.7) |  |  |  |
| SNRIs | 16.8 | (1.4) |  | 16.2 | (1.5) |  | 19.1 | (3.4) |  | 15.6 | (1.6) |  |  |  |
| Duloxetine | 11.1 | (1.2) |  | 10.2 | (1.2) |  | 15.2 | (3.1) |  | 9.2 | (1.2) |  |  |  |
| Venlafaxine | 5.6 | (0.8) |  | 6.1 | (1.0) |  | 3.8 | (1.6) |  | 6.4 | (1.1) |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Supplementary Table 6 (continued). Distribution of socio-demographic characteristics, baseline depression severity, and treatment response among the full baseline sample, analytic sample, and patients lost to follow-up** | | | | | | | | | | | | | | |
|  | **Weighted for baseline non-response** | | | | | | | |  | **Also weighted for loss to follow-up** | |  |  |  |
|  | **Baseline sample**  **(n=809)** | |  | **Analytic sample(n=660)** | |  | **Patients lost to follow-up (n=149)** | |  | **Analytic sample (n=660)** | |  | **Difference between analytic sample and patients lost to follow-up** | |
|  | **%** | **(SE)** |  | **%** | **(SE)** |  | **%** | **(SE)** |  | **%** | **(SE)** |  | **2** | **df** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SSRI | 57.0 | (1.9) |  | 56.9 | (2.1) |  | 57.7 | (4.3) |  | 59.7 | (2.1) |  |  |  |
| Citalopram | 5.4 | (0.8) |  | 5.6 | (0.9) |  | 4.5 | (1.8) |  | 6.7 | (1.2) |  |  |  |
| Escitalopram | 14.4 | (1.3) |  | 13.7 | (1.4) |  | 17.7 | (3.3) |  | 14.2 | (1.6) |  |  |  |
| Fluoxetine | 8.5 | (1.0) |  | 8.5 | (1.2) |  | 8.4 | (2.3) |  | 8.2 | (1.1) |  |  |  |
| Fluvoxamine | 0.2 | (0.1) |  | 0.2 | (0.2) |  | 0.0 | -- |  | 0.1 | (0.1) |  |  |  |
| Paroxetine | 2.8 | (0.6) |  | 2.8 | (0.7) |  | 2.9 | (1.5) |  | 3.1 | (0.7) |  |  |  |
| Sertraline | 25.8 | (1.6) |  | 26.1 | (1.8) |  | 24.2 | (3.7) |  | 27.4 | (2.0) |  |  |  |
| SMS | 0.3 | (0.2) |  | 0.4 | (0.3) |  | 0.0 | -- |  | 0.6 | (0.5) |  |  |  |
| Vilazodone | 0.1 | (0.1) |  | 0.2 | (0.2) |  | 0.0 | -- |  | 0.5 | (0.5) |  |  |  |
| Vortioxetine | 0.1 | (0.1) |  | 0.2 | (0.2) |  | 0.0 | -- |  | 0.1 | (0.1) |  |  |  |
| TCA | 2.9 | (0.6) |  | 3.1 | (0.7) |  | 2.0 | (1.2) |  | 3.0 | (0.6) |  |  |  |
| Amitriptyline | 1.1 | (0.4) |  | 1.3 | (0.4) |  | 0.6 | (0.6) |  | 1.4 | (0.4) |  |  |  |
| Doxepin | 0.7 | (0.3) |  | 0.6 | (0.3) |  | 0.7 | (0.7) |  | 0.5 | (0.3) |  |  |  |
| Nortriptyline | 1.1 | (0.4) |  | 1.2 | (0.5) |  | 0.7 | (0.7) |  | 1.1 | (0.4) |  |  |  |
| Baseline Depression Severityb | |  |  |  |  |  |  |  |  |  |  |  | 6.26 | 3 |
| Mild | 30.1 | (1.7) |  | 31.2 | (1.9) |  | 25.5 | (3.7) |  | 33.4 | (2.1) |  |  |  |
| Moderate | 35.6 | (1.8) |  | 34.3 | (2.0) |  | 41.1 | (4.3) |  | 33.7 | (2.1) |  |  |  |
| Severe | 21.4 | (1.6) |  | 20.6 | (1.7) |  | 24.9 | (3.8) |  | 20.0 | (1.8) |  |  |  |
| Very Severe | 12.9 | (1.3) |  | 13.9 | (1.5) |  | 8.6 | (2.2) |  | 12.9 | (1.4) |  |  |  |
| Treatment response | -- | |  | 36.5 | (2.0) |  | -- | |  | 35.7 | (2.1) |  |  |  |
| (n) | (809) | |  | (660) | |  | (149) | |  | (660) | |  |  |  |

Abbreviations: SE, standard error; df, degrees of freedom; ADM, antidepressant medication; TeCA, tetracyclic antidepressants; NDRI, norepinephrine-dopamine reuptake inhibitors; SARI, serotonin antagonist reuptake inhibitors; SNRIs, serotonin-norepinephrine reuptake inhibitors; SSRI, selective serotonin reuptake inhibitor; SMS, serotonin modulator and stimulator; TCA, tricyclic antidepressants.

aSignificant at the .05 level, two-sided test.

bBased on a transformation of baseline QIDS-SR scores to Hamilton Rating Scale of Depression categories using published transformation rules (Table 3 in Rush et al., 2003).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Supplementary Table 7. Relative risk of fairness in Super Learner top tertile full sample using robust standard errors (n=660)** | | | | | | | | | | | | | | | | | | | | | | | |
|  | **Age** | | | | |  | **Sex** | | | | |  | **Race/ethnicity** | | | | |  | **Education** | | | | |
|  | **Main effects** | |  | **Interaction** | |  | **Main effects** | |  | **Interaction** | |  | **Main effects** | |  | **Interaction** | |  | **Main effects** | |  | **Interaction** | |
|  | **RR** | **(95% CI)** |  | **RR** | **(95% CI)** |  | **RR** | **(95% CI)** |  | **RR** | **(95% CI)** |  | **RR** | **(95% CI)** |  | **RR** | **(95% CI)** |  | **RR** | **(95% CI)** |  | **RR** | **(95% CI)** |
| SL top tertile | 3.3a | (2.6-4.3) |  | 3.2a | (2.3-4.4) |  | 3.3a | (2.6-4.2) |  | 4.1a | (2.4-6.9) |  | 3.3a | (2.6-4.2) |  | 3.2a | (2.0-5.1) |  | 3.3a | (2.6-4.2) |  | 3.0a | (2.1-4.1) |
| 51 years old or older | 0.9 | (0.7-1.1) |  | 0.8 | (0.5-1.3) |  | -- | -- |  | -- | -- |  | -- | -- |  | -- | -- |  | -- | -- |  | -- | -- |
| Male | -- | -- |  | -- | -- |  | 1.1 | (0.8-1.3) |  | 1.3 | (0.8-2.3) |  | -- | -- |  | -- | -- |  | -- | -- |  | -- | -- |
| Non-Hispanic White | -- | -- |  | -- | -- |  | -- | -- |  | -- | -- |  | 1.0 | (0.8-1.3) |  | 1.0 | (0.6-1.6) |  | -- | -- |  | -- | -- |
| College grad or more | -- | -- |  | -- | -- |  | -- | -- |  | -- | -- |  | -- | -- |  | -- | -- |  | 0.9 | (0.7-1.1) |  | 0.8 | (0.5-1.2) |
| Interaction | -- | -- |  | 1.0 | (0.7-1.9) |  | -- | -- |  | 0.8 | (0.4-1.4) |  | -- | -- |  | 1.0 | (0.6-1.8) |  | -- | -- |  | 1.2 | (0.7-1.9) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Abbreviations: RR, relative risk; CI, confidence interval.

aSignificant at the .05 level, two-sided test.

|  |  |  |
| --- | --- | --- |
| **Supplementary Table 8. Description of predictors selected by the Super Learner model** | | |
| **Predictor** |  | **Descriptiona** |
|  |  |  |
| Depression sx freq |  | Sum of 43 standardized items |
| Severe 30-day financial stress (D) |  | -- |
| Positive mental health sx freq (S) |  | Stabilized sum of 17 standardized items |
| Psychiatric comorbidities above median (D) |  | -- |
| County drug overdose mortality rate |  | Annual rate per 100,000 population |
| Referred to specialist at initial visit (D) |  | -- |
| Emotional regulation (S) |  | Stabilized sum of 6 standardized items |
| Quality of relationship with provider (S) |  | Stabilized sum of 8 standardized items |
| Freq social group participation (S) |  | Stabilized response to single item |
| Stress management skills (S) |  | Stabilized sum of 3 standardized items |
| Expect mild/temporary ADM side effects (D) |  | -- |
| Past psychotherapy helpfulness (S) |  | Stabilized maximum of responses to 2 items |
| Past tx helpful (D) |  | -- |
| Anhedonia sx freq (RS) |  | Reversed stabilized sum of 5 standardized items |
| Psychiatric comorbidities (S) |  | Stabilized count of possible comorbidities classified as not being presenting problems |
| Willingness to try psychotherapy (S) |  | Stabilized response to single item |
| Expect no ADM side effects (D) |  | -- |
| Perceived psychological resilience (S) |  | Stabilized sum of 12 standardized items |
| Live in Midwest (D) |  | -- |
| Intake carried out by psychologist (D) |  | -- |
| Occupation: Crafts worker (D) |  | -- |
| Intermediate psychiatric comorbidities (D) |  | -- |
| Past ADM helpfulness (S) |  | Stabilized response to single item |
| Perceived access to social support (S) |  | Stabilized response to single item |
| Job loss/financial crisis in past 12 months (D) |  | -- |
| Willingness to try psychotherapy (S) |  | Truncated 3-category stabilized response to single item |
| Stressor caused MDE, but now improved (D) |  | -- |
| Severe 30-day stress (D) |  | -- |
| Px has regular primary care provider (D) |  | -- |
| High access to social support (D) |  | -- |
| Belief in current tx being best (S) |  | Stabilized response to single item |
| Expect psychotherapy to be moderately successful (D) |  | -- |
| Expect mild ADM side effects (D) |  | -- |
| Weighted psychiatric comorbidities (S) |  | Stabilized count of possible self-reported comorbidities classified as primary (2 points), secondary (1 point), or not a presenting problem. Multiple presenting problems of each type could be reported |
| History of medication noncompliance (S) |  | Stabilized response to single item |
| Live in South (D) |  | -- |
| Past psychotherapy completely effective (D) |  | -- |
| Major financial crisis in past 12 months (D) |  | -- |
| MDE is primary diagnosis (D) |  | -- |
| Expectation for success of current tx (S) |  | Stabilized response to single item. |
| Family history of MDE |  | Count |
| ADM provided in regular PCP office (D) |  | -- |
| Lifetime panic (D) |  | -- |
| 12-month PTSD (D) |  | -- |
| Completely willing to try psychotherapy (D) |  | -- |
| Years since first MDE |  | Count |
| Current tx psychotherapy (D) |  | -- |
| Employed (D) |  | -- |
| Regular PCP is prescribing ADM (D) |  | -- |
| Excellent-good self-rated physical health (D) |  | -- |
| BMI: Obese (D) |  | -- |
| ADM prescribed in specialty setting (D) |  | -- |
| Mild MDE based on HRSD (D) |  | -- |
|  |  |  |

Abbreviations: sx, symptoms; freq, frequency; (D), dummy variable; (S), stabilized variable; ADM, antidepressant medication; tx, treatment; (RS), reverse stabilized; MDE, major depressive episode; px, patient; PCP, primary care provider; PTSD, post-traumatic stress disorder; BMI, body mass index; HRSD, Hamilton Rating Scale of Depression.

aDescriptions are provided only for predictors that are not dichotomies.

**Supplementary Figure 1. Flow diagram of patients recruited into the study among those seen for incident depression as reported in the Veterans Health Administration electronic medical records from 12/2018 - 6/2020**

Incomplete 3-month Survey (n=149)

* *Did not start n=142*
* *Did not finish n= 7*

Unique Patients  
n=55,106

No Contact (n=38,106)

* *Maximum number of call attempts reached n=27,603*
* *Non-working contact n=6,828*
* *Moved, no forwarding n=3,675*

Contact Made  
n=17,000

Consented  
n=6,298

Refusals (n=10,702)

* *Refused n=10,659*
* *Rescinded n=43*

Consented and Complete  
n=4,164

Full Sample  
n=2,609

Incomplete Baseline (n=2,162)

* *Did not start n=1,688*
* *Did not finish n=446*

Not Eligible (n=1,554)

* *Suicidal n=84*
* *Depression not a presenting problem n=471*
* *Mania a presenting problem n=728*
* *Reported no depression severity n=272*

Received ADM

n=809

Not Eligible for Present Analysis (n=1,800)

* *Received Psychotherapy only n=989*
* *Received ADM and psychotherapy n=811*

Analytic Sample  
n=660

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