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1. Utilizing Daily Mood Diaries and Wearable Sensor Data to Predict Depression and Suicidal Ideation among Medical Interns

Adam Horwitz, PhD1, Ewa Czyz, PhD1, Nadia Al-Dajani, PhD1, Walter Dempsey, PhD2, Zhuo Zhao3, Inbal Nahum-Shani2, Srijan Sen, MD, PhD1

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Statement of Purpose: Intensive longitudinal methods for collecting self-report (e.g., daily diaries, ecological momentary assessment) and passive data from smartphones and smartwatches provide promising avenues for improved prediction of depression and suicidal ideation (SI), yet few studies have utilized these methods to predict mental health outcomes for non-clinical populations in real-world settings. **Methods/Approach:** In this study, we utilized a large sample of medical interns (N = 2,881) during the first quarter of residency to examine the incremental predictive validity of sensor data and daily diary assessments for depression and SI. Participants completed a baseline and follow-up assessment survey, were given Fitbit wearable devices, and provided daily mood ratings (scale: 1-10) via mobile application. Data from daily diaries and Fitbit devices were aggregated over a 60-day period during the first quarter of internship to form mean, variability, slope, and completion percentage features associated with sleep, steps, and mood. Three-step hierarchical logistic regressions examined presence of depression and SI at the end of the first quarter utilizing baseline predictors (e.g., depression, SI, neuroticism) in step 1, Fitbit sleep/step features in step 2, and daily mood features in step 3. **Results/Conclusions:** Passively collected Fitbit features related to sleep and steps had negligible predictive validity for depression (mean-level sleep was the lone independent predictor), and no incremental predictive validity for SI. However, mean-level and variability in mood scores derived from daily diaries were significant independent predictors of depression and SI, and significantly improved model accuracy, above and beyond Fitbit features and baseline predictors of depression and SI. **Innovation & Significance to the Field:** Mobile self-reporting of daily mood improves the prediction of depression and SI during a meaningful at-risk period under naturalistic conditions. Findings offer insights into the development of interventions that can adaptively respond to survey assessments or passively collected data detecting risk for adverse outcomes.

2. Equity Analysis of Burnout and Mental Health to Target Well-Being Programs

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Statement of Purpose: Medical students have high rates of depression with one in ten expressing suicidal ideation. Burnout is correlated with suicidal ideation, making it an important area for intervention. Although students of marginalized identities have higher rates of burnout overall, individual institutions lack mechanisms for identifying specific groups for targeted programming. To address this, we reanalyzed existing institutional-level mental health data to evaluate the needs of marginalized students. **Methods/Approach:** A survey was distributed to University of Michigan medical students and recent graduates in Summer 2020 via Qualtrics. Class year, gender, and race were collected and burnout, and concern for one’s emotional well-being and mental health were evaluated. A composite variable of race/ethnicities under-represented in medicine (URiM) was constructed, along with an interaction variable for women URiM. Multivariate logit regressions were conducted in R to construct odds ratios (OR) within each well-being domain (α=0.05). **Results/Conclusions:** The survey response rate was 56% (n=330). Half (49%) of students were burnt out, and most had concern for emotional well-being (86%) and their mental health (71%). Cis-gender women had higher odds of burnout (OR 2.8, 95%CI 1.6-5.1), concern for emotional well-being (OR 6.4, 95%CI 2.8-14.7), and concern for mental health (OR 4.1, 95%CI 2.2-7.5), even when controlling for race and class year. Concern for emotional well-being may be increased for cisgender-women URiM and transgender students. **Innovation & Significance to the Field:** It is feasible to use existing institutional data for equity analysis of student well-being, however demographic variable collection must be standardized and expanded to improve relevance of findings. Data suggest that cisgender-women should be a target of well-being programs. Further research should assess the needs of URiM women and transgender students at our institution, and whether URiM student’s experience of burnout differs from other students. The role of sexual orientation should also be assessed.
3. Increased Risk of Suicide from Manic Episodes Following COVID-19 Infection; A Multi-Institutional Analysis of 4,926 Patients
Khaled S Atieh, BS1, Brittany Miles, MSc1, Nicholas Martinez, MSc2, Thomas Fletcher, MD3
1University of Texas Medical Branch School of Medicine, 2Texas Tech University Health Sciences Center El Paso Paul L. Foster School of Medicine, 3University of Texas Medical Branch Department of Psychiatry

Statement of Purpose: Bipolar disorder I is known to increase risk of suicide ideation and attempts to a greater degree than other mood disorders. Modulating factors for the risk of suicide in Bipolar I patients have been studied, but the impact of SARS-CoV-2 on suicide risk is unknown. This study was designed to evaluate suicide risk of patients diagnosed with Bipolar I who had a recent SARS-CoV-2 infection and an episode of mania within 3 months of infection. Methods/Approach: We used TriNetX, a global health research network providing access to electronic medical records from approximately 85 million patients in 64 large healthcare organizations. The platform only contains de-identified data as per the de-identification standard defined in Section §164.514(a) of the HIPAA Privacy Rule. The presence of SARS-CoV-2 infection was determined by Laboratory codes 9088, 94500-6, and 94309-2, corresponding to the presence of SARS-CoV-2 RNA. Mania was determined by the ICD-10 code F30 corresponding to a manic episode. 2 Cohorts were created: One with COVID-19 infection followed by a manic episode in the subsequent 3 months, and the other with patients diagnosed with manic episodes without COVID-19 infection. The cohorts were balanced for age, race, gender, and ethnicity, resulting in 2,463 patients in each cohort (4,926 patients total). They were then compared for the outcome of suicide attempt via ICD-10 code T14.91. The suicide attempt time from for the cohort with COVID-19 infection was limited to 6 months post-infection. Results/Conclusions: We found patients who experience a manic episode within the first 3 months after COVID-19 infection are 2.1 times more likely to attempt suicide within 6 months of infection compared to those experiencing manic episodes that are not temporally connected to COVID-19 infection (p = 0.0475). Our study of 4,926 patients suggests that Bipolar I patients who experience a manic episode within 3 months of CoVID-19 infection have an increased risk of suicide attempts. Innovation & Significance to the Field: Patients with Bipolar I disorder should be monitored more closely for suicide.

4. Integrating Technology to Increase the Feasibility of Provider Training and Enhance Client Engagement in a Suicide Prevention Treatment for Adults with Psychosis in Community Mental Health
Lindsay A. Bornheimer, PhD1,2, Juliann Li Verdugo, MSW1, Joshua Holzworth, MSW2, Fonda N. Smith, MSW1, Hannah Sliwa1, Joseph A. Himle PhD1,2
1University of Michigan, School of Social Work, 2University of Michigan, Department of Psychiatry

Statement of Purpose: Suicide is a leading cause of preventable death among adults diagnosed with schizophrenia spectrum disorders (SSPDs). This abstract presents on technology-focused modifications of a cognitive-behavioral suicide prevention treatment for adults with psychosis in a community mental health (CMH) setting to increase feasibility of provider training and client engagement in treatment. Methods/Approach: Stakeholder data (n=25) were collected in the modification phase of a NIMH-funded pilot effectiveness clinical trial (R34) including clients with SSPDs and recent suicide ideation or attempt, peer advocates, and providers in CMH. All completed a survey and qualitative interview with research staff to discuss our plans for using technology in provider training and client engagement. Interviews were transcribed, coded in Dedoose using an open-coding technique to generate themes across questions, and analyzed using grounded theory methods. Results/Conclusions: Provider stakeholders agreed that virtual training would be feasible and recommended the following: cohort training with timeline, real-time question, and answer forum, use of hard copy materials, synchronous live role plays, and plan for future training boosters and supervision. Barriers identified by provider stakeholders include time constraints, competing demands and distraction, provider-buy in, agency/organization buy-in and support for training in workload, and availability for supervision. All stakeholders agreed that weekly supportive and content-boosting text messages, videos, and a treatment website could boost client engagement between treatment sessions. Barriers identified by all stakeholders include client technology availability and access, psychosis symptomatology, motivation, life stressors, and provider factors. Findings indicate the potential benefit of using technology to train providers and increase engagement with clients. Our future research will explore the feasibility and acceptability of these technology-focused modifications to our treatment. Innovation & Significance to the Field: Addressing technology barriers for clients and providers has the potential to increase provider access to training innovations and enhance client engagement in service delivery.
5. Increased Risk of Suicide from Delirium Associated with COVID Infection; A Multi-Institutional Analysis of 119,254 Patients
Nicholas Martinez, MS1, Brittany Miles, MS2, Khaled Atieh, BS2, Thomas Fletcher, MD2
1Texas Tech Health Science Center El Paso, PLFSOM, 2UTMB Galveston

Statement of Purpose: Cases and hospitalizations of COVID-19 continue to surge as the pandemic has yet to abate causing numerous mortalities and sequelae, some of which have yet to be discovered. Delirium is a common post-illness complication, especially in the hospital setting. The aim of this study is to investigate risk of suicidality in patients who develop delirium after recovery from COVID-19 infection. Methods/Approach: We used TriNetX, a global health research network providing access to electronic medical records from approximately 85 million patients in 64 large healthcare organizations. The platform only contains de-identified data as per the de-identification standard defined in Section §164.514(a) of the HIPAA Privacy Rule. The presence of SARS-CoV-2 infection was determined by Laboratory codes 9088, 94500-6, and 94309-2, corresponding to the presence of SARS-CoV-2 RNA. Delirium was determined by the ICD-10 codes F05 and R41.0 corresponding to delirium from known physiological condition and disorientation, unspecified, respectively. 2 Cohorts were created: One with COVID-19 infection prior to a diagnosis of delirium, and one with delirium that was excluded from having a diagnosis of COVID-19 infection. The cohorts were balanced for age, race, gender, and ethnicity, resulting in 59,627 patients in each cohort (119254 patients total). They were then compared for the outcome of suicide attempt via ICD-10 code T14.91. Results/Conclusions: We found patients who experience delirium after COVID-19 infection are 1.35 times more likely to attempt suicide compared to those experiencing delirium from other causes (p = 0.0399). The data collected from over 119,000 patients supports a positive association between suicidality and delirium in patients who recovered from COVID-19 infection. Innovation & Significance to the Field: The presence of delirium as a significant risk factor for suicidality after COVID-19 infection allows physicians to monitor for this potential sequela and treat accordingly to reduce mortality.

6. Social Distancing and Suicide in Pandemics: A Multivariate Analysis of the Spanish Flu
Steven J. Stack, PhD1, Ian R.H. Rockett PhD, MA, MPH2
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Statement of Purpose: Social distancing (sd) (e.g., school & business closings) has been emphasized in current socio-political efforts in controlling COVID-19. While such policies can increase suicide risk through lowering social integration, existing research has been largely limited to comparing suicide rates during the pandemic to those before the pandemic with no direct measure of days of sd. The association between variation in the actual days of sd across cities or other units and suicide rates has remained neglected or unadjusted for potential confounders. The present study fills this latter gap. Methods/Approach: Data on suicide rates are from the US Bureau of the Census and refer to suicides per 100,000 population in each of 42 large American cities during the Spanish Flu epidemic of 1918. Social distancing is measured from archival data comprising those from 86 local newspapers and weekly/monthly state and local health department reports. Specifically, sd is measured as the number of days of closures of schools, public gatherings, and mandatory quarantines in 2018. These ranged from 33 in Newark to 97 days in Kansas City Missouri. Following previous work, a control is incorporated for influenza death rates. In addition, new adjustments, using Census data, are made for variation in percent literacy, elderly, foreign born, white, & per capita expenditures on health. Results/Conclusions: Adjusting for the potential socio-demographic confounders, each ten day increase in the index of sd was associated with a 4.66% increase in the suicide rate. The model explains 46.8% of the variance in suicide rates. Innovation & Significance to the Field: This is the first study to document an association between days of sd and suicide rates that is independent of potential confounders. Although such sd has been associated with a decline in influenza deaths, it may also be associated with an increase in suicide deaths.
7. Suicide and Self-Injury Prevention with Low-Income Brazilian Adolescents in the COVID-19 Pandemic
Thayná Quinto S. Souza, MS
Catholic University of Santos; Faculdade Descomplica

Statement of Purpose: Suicide is the third cause of death among young people between the ages of 15 to 29 in Brazil, and the second cause among young people from 10 to 24 in the United States. According to the WHO, the Covid-19 virus pandemic has caused an increase in risk factors for suicide, including anguish, anxiety, and depression, added to issues of violence, alcohol and drug abuse, and the feeling of loss. Methods/Approach: Aiming to contribute to overcoming and prevention of suicide and self-injury during the pandemic, the Professional Master’s Program in Psychology at the Catholic University of Santos developed an Emergency Intervention Project with adolescents and their families in the region of Baixada Santista, Brazil. Developed from January to April 2021, the Project included 123 teenagers from 12 to 17 years old, with face-to-face and virtual sessions, artistic processes, and the use of Walter Trinca’s Drawing-and-Story method, in light of Humanistic Psychology and Social Psychology. Results/Conclusions: The results showed demands related to grief, self-destructive behaviors, and lack of social interaction. Even with the families’ financial and internet access limitations the project managed to offer psychological care to the participants, spaces for artistic expression, interaction, and elaboration on feelings. Innovation & Significance to the Field: This experience is significant given the numerous cases of self-injury and suicide, and the need to create preventive care and discuss practices carried out, challenges in COVID-19 pandemic and adaptation to virtual environments, and how they have been beneficial to the field of mental health.

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Statement of Purpose: Suicide is the second leading cause of death among adolescents in the US. Early detection of suicidal behavior is key to providing adolescents with the appropriate and timely support they need to prevent adverse outcomes. We tested the accuracy of an advanced machine learning (ML) model to prospectively identify adolescents at risk for suicide and the most important risk factors. Methods/Approach: We used cross-sectional data from Add Health’s 1995-1996 in-school and in-home surveys. The public-use data consisting of 4,779 adolescents provided a representative sample of adolescents aged 12-18 years in the US. Random forest (RF) algorithms were used to predict suicidal ideation among adolescents. Potential predictors included demographic characteristics, indicators of externalizing, family, and internalizing psychopathology, physical health, treatment, and social factors. Results/Conclusions: In 1996, the prevalence of suicidal ideation was 10.9%. Preliminary results show the RF model predicted suicidal ideation with an area under the curve (AUC) of 0.72. Major risk factors included parents’ education, communication and health status, and adolescent depression, substance use, and use of mental health services. The evidence from this study suggests that ML models using community surveys have the potential to detect adolescents at risk of suicide. Innovation & Significance to the Field: To our knowledge, this is one of the first studies to use advanced ML techniques to assess suicidal behaviors among a representative sample of the general population of adolescents in the US. Our prediction model also assesses the potential of using community surveys to prospectively identify youth at risk of suicidal behaviors. The combination of ML algorithms and synthesized datasets will provide new answers to important debates in the literature, with the potential to substantially enhance knowledge and prevention strategies for adolescent suicide.