

## SUSPINE (Suicidality Statistical Modelling for Prevention and Clinical Intervention Evaluation)

### Market Need

On an average day, more than 140 people die by suicide across the United States and Canada, making suicide among the top ten causes of death across all ages worldwide. Current clinical practice continues to rely on self-report with 50% of adults not disclosing their suicidal thoughts and remaining invisible for suicide prevention efforts. For those who do disclose their suicidal thoughts, the lack of objective tests for assessing suicide risk and limited mechanistic insight result in a trial-and-error approach when selecting interventions for everyone. Despite decades of research seeking to identify risk factors of suicidal thoughts and behaviors (STBs), their predictive ability has been limited.

### Technology Description

Our scientists have developed SUSPINE, a mobile application that integrates mathematical models with behavioural assessments of the active escape bias to classify causes of emerging suicide risk in real time. SUSPINE can provide a more objective and accurate way to assess suicide risk and can offer important insights into the associated brain mechanisms, paving the way for more individualized clinical interventions. SUSPINE combines computerized cognitive tasks with state-of-the-art computational models to probe specific stress- and control-related mechanisms that are implicated in suicidality. The tasks are optimized for capturing cognitive and neurobiological markers of suicidal ideation, while the models act as a metaphorical microscope allowing us to peer into the underlying mechanisms.

### Stage of Development

Our scientists have performed one in silico study and are currently conducting two empirical studies to validate the novel computational approach. In silico analysis enabled them to propose very specific hypotheses that span behavioral, cognitive, and neural analysis showing that the model can provide a general framework for understanding STBs and its relationship to major depression symptoms, many of which are known to increase suicide risk. The ongoing study examines the presence of computationally-defined subtypes of suicidality in a large sample by collecting behavioral data online – where participants complete an online, web-based version of the active escape task implemented in SUSPINE. Another ongoing study examines the predicted relationships between the model variables and whole-brain activity by collecting behavioral and functional magnetic resonance imaging (fMRI) data.

### Advantages

- Provisional patent filed on the method of predicting active-escape bias and identifying suicidal subtypes
- Novel mathematical model that can elucidate the neural mechanisms underlying STBs and facilitate early detection of suicide risk
- Enables personalized and collaborative goal setting and outcome monitoring between the patient and their treatment teams
- The behavioural data collected from the patients' performance on the task can be tracked over time assisting clinicians in following treatment efficacy in individual patients and making the technology easily accessible to both patients and clinicians.

### Notable Publication(s)

Karvelis and Diaconescu, 2022, Computational Psychiatry. <http://doi.org/10.5334/cpsy.80>