CURE: A Mathematical Model of Suicide Risk among US Veterans

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Suicide has proven itself to be a major public health issue, especially among our service members, with an average of 20 veteran suicides per day. The majority of existing work in suicidology provides qualitative research, often in the form of correlational relationships among factors involved in suicidal ideation; however, such studies lack the mathematical sophistication to be useful as a predictive measure, so that at-risk individuals might receive the help they need before it is too late. In an effort to create more of a predictive tool, we developed an ordinary differential equations model based on a 2013 study conducted by Leemput et al., where they implemented the theory of critical slowing to flag individuals who were near a dangerous tipping point in their emotional landscape. We identified seven major factors involved in suicidal behavior and, through our modeling effort, analyzed the complex interactions among each of these factors. Here we will share some initial results of this effort, including a discussion of the results of our global sensitivity analysis, and discuss ways in which this research may be used to further improve the care we provide to our veterans.

Keywords: suicide risk, critical slowing, sensitivity analysis, US veterans, undergraduate research