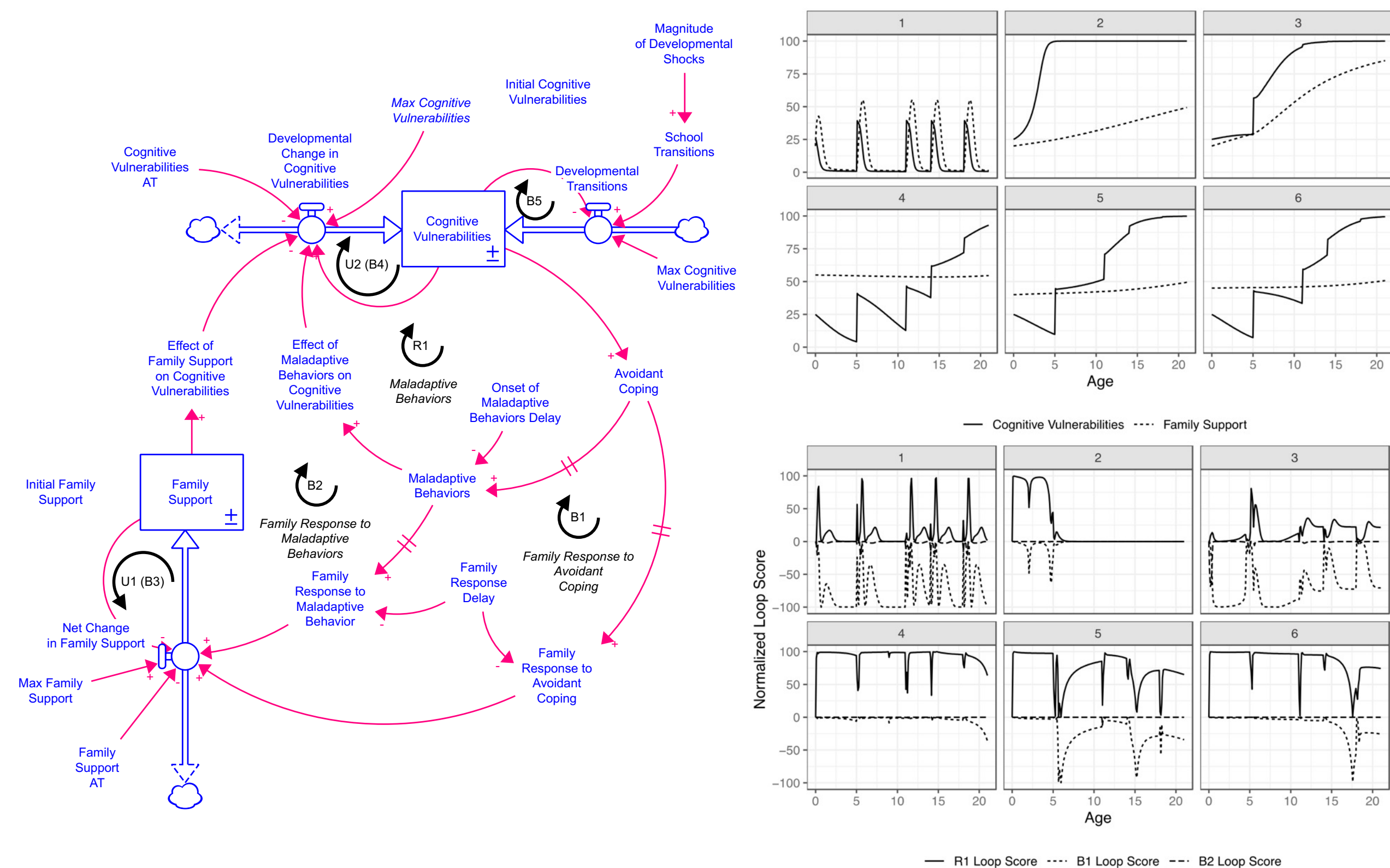


## ABSTRACT

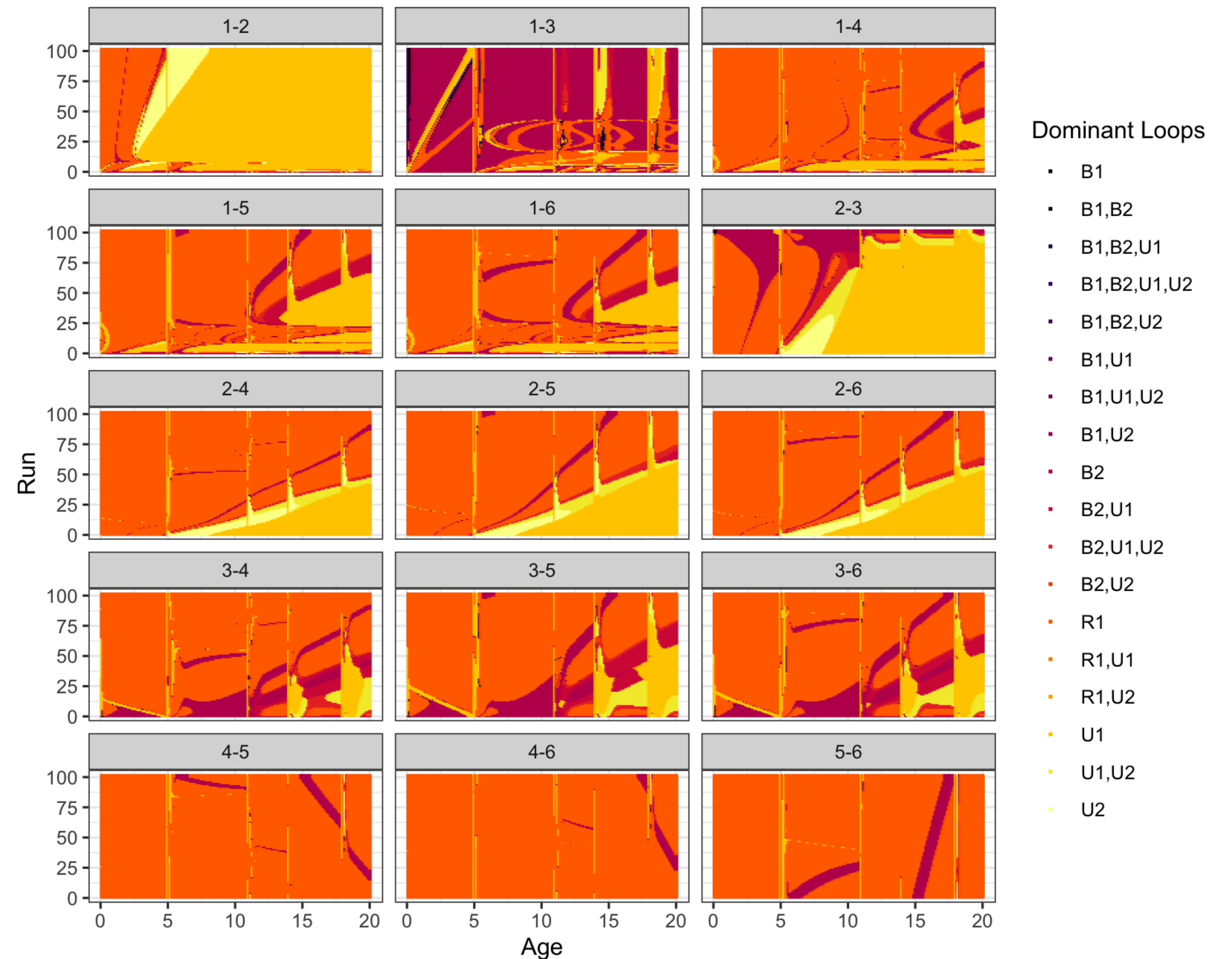
This paper presents a method to analyze system dynamics models that focuses on characterizing loop dominance patterns with an application to understanding the developmental trajectories of cognitive vulnerabilities and family support related to the risk of adolescent suicide. Drawing on prior work on loop dominance, the method uses Loops That Matter as implemented in Stella Simulator to describe and characterize loop dominance patterns. The paper illustrates the approach using “Limits to Growth” and then applies the method to a small system dynamics model from developmental psychology based on secondary qualitative analysis of interviews using grounded theory. Results highlight the significant and unique insights of formal analysis of system dynamics models for advancing scientific knowledge and the potential of system dynamics for developing novel interventions to pressing public health problems.

## THE MODEL



**Figure 1.** Individual level model of dynamics of cognitive vulnerabilities and family response in response to developmental shocks of school transitions (left) simulations of six hypothetical individuals (top right) and loop scores for three main loops (bottom right) from Hovmand et al (2022).

## RESULTS



**Figure 2.** Each plot shows the pattern of loop dominance over time for an individual trajectory in a 100-step sequence from person or case  $i$  to  $j$ . For example, in the plot 4-5, the horizontal line with  $y=50$  represents a person who is “halfway” between person 4 and person 5 in their initial conditions and parameters at birth where the color corresponds to the dominant loop(s) at for the individual at that point in time. Overall patterns highlight large regions where loop dominance is smooth along with regions that reflect more chaotic patterns of dynamical systems such as the bifurcation of loop dominance patterns shifting from 1-4, 1-5 and 1-6 in five-to-twelve-year-old period. To explore the figure, go to <https://tinyurl.com/5n7ewd2w> or use the QR code (right).



## ACKNOWLEDGEMENTS

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