# III. Model documentation and write-up

**1. Who are you (mini-bio) and what do you do professionally? If you are on a team, please complete this block for each member of the team.**

- **Aparna Ananthasubramaniam (team co-lead):** I am a joint PhD student in the Schools of Information and Social Work. As a computational social scientist, I use methods from data science (natural language processing, social networks, machine learning, complex systems, etc.) to study the effects of housing loss and socioeconomic shocks on mental health, wellbeing, and other outcomes during the life course. I also study how social policy, recessions, and other macro-level conditions affect these associations. A lot of my work is deeply interdisciplinary and community engaged.
- **Elyse J. Thulin (team co-lead):** Dr. Thulin is a Research Assistant Professor with the U-M Institute for Firearm Injury Prevention. Dr. Thulin uses mixed behavioral science and data science methods to understand factors that enhance the risk of firearm-related injury in adolescent and emerging adults, variations by intent, gender, and rurality, and ways that technology and online spaces can exacerbate or be leveraged to reduce the risk of harm.
- **Silas Falde:** I am a sophomore undergraduate at the University of Michigan School of Engineering studying Data Science. I hope to explore and apply the subject to many fields, including Public Health, while continuing undergraduate research.
- **Lily Johns:** Lily Johns is a Research Coordinator at the University of Michigan School of Public Health. Her research interests include suicide prevention, mental health promotion, and health communication.
- **Viktoryia Kalesnikava:** I do research on social determinants of physical and mental health. I approach my work from the lifecourse perspective, but often target late-life time frame. I feel fortunate to work with teams of talented people, and see how together we transform ideas into actionable insights.
- **Jonathan Kertawidjaja:** My name is Jonathan Kertawidjaja, and I am an undergraduate at the University of Michigan studying data science, with an interest in deep learning and statistics. I am currently doing research through the Undergraduate Research Opportunities Program.
- **Alejandro A. Rodríguez-Putnam:** I am service-oriented and passionate about public health interdisciplinary research, community work, and social justice matters. My research and professional interests include health administration, social epidemiology, emergency preparedness, global health, health policy, and the social determinants of health, among others
- **Emma Spring:** I'm a pre-medical undergraduate student at U-M, majoring in Biopsychology. I am a research assistant on the GREMAP/ATLAS team!

**2. What motivated you to compete in this challenge?**

Sucide is the second leading cause of death in adolescents; we know that social media is a major influence in contemporary lives, with national leaders such as the Surgeon General calling for a greater understanding of the ways in which social media exacerbates worse mental health outcomes. While NVDRS has an existing variable related to suicide disclosure on social media, we found that there were multiple other themes related to social media in the LE and CME narratives, which provide critical contextualizing information as to the role social media played relative to an adolescent decedent's death. Given the interdisciplinary nature of our team, we value the importance of expanding access to this information for individuals without relevant data science skills, and were excited to be contenders in this competition.

**3. High level summary of your approach: what did you do and why?**
We used mixed qualitative and computational methods in our project. First, we used human intelligence (via thematic content analysis) to develop a codebook based on information present in the CME and LE narratives on social media. Then we leveraged the benefits of NLP algorithms (e.g., large language models) to apply this codebook to thousands of cases. We were then able to use classical statistics to examine trends by experiences on social media to generate novel insights related to social media and adolescent suicide.

**4. Please provide the machine specs and time you used to run your model.**

- CPU (model): 2x 2.5 GHz Intel Haswell (Xeon E5-2680v3)
- GPU (model or N/A): NVIDIA RTX A6000 GPU
- Memory (GB): 48665MiB (including the LLM)
- OS: Linux, CUDA 12.4 environment
- Train duration: n/a (zero-shot)
- Inference duration: 85 minutes

**5. Anything we should watch out for or be aware of in using your model (e.g. code quirks, memory requirements, numerical stability issues, etc.)?**
You may get an error about failing to installpyproject, but this shouldn't affect performance.

**6. Did you use any tools, data, or pre-trained weights for data preparation or exploratory data analysis that aren't listed in your code submission?**
No

**7. How did you evaluate the performance of your approach, if at all?**
We evaluated our approach in several ways; first, in the creation of the codebook, we used qualitative thematic content analysis to iterative develop and test the codebook to ensure we were accurately capturing relevant experiences in social media related to adolescent suicide. For inter-rater reliability of the hand-coded cases, we used the Krippendorff's Alpha and pairwise agreement. Within the algorithmic models, we used precision, recall and the F1 score, which are akin to sensitivity (true positives) and specificity (true negatives) in the field of epidemiology.

**8. What are some other things you tried that didn't necessarily make it into the final workflow (quick overview)?**

In addition to the codes we presented, we identified a few other variables that could be useful to inform future training of individuals associated with evaluating the circumstances surrounding a decedent's death. For example, we had a code regarding if there was explicit mention that law enforcement reviewed a decedent's social media as part of the death investigation - in some cases, there was explicit mention of this behavior. In other cases, it appeared that a family member or friend had told law enforcement about something they saw on social media, but that law enforcement did not review the decedent's social media independently. Systematic review of social media as part of a death investigation of an adolescent would enable for more consistent reporting and enhance the accuracy of the prevalence of behaviors, etc.

**9. If you were to continue working on this problem for the next year, what methods or techniques might you try in order to build on your work so far? Are there other fields or features you felt would have been very helpful to have?**

For one of the variables we presented, we had lower inter-rater reliability (i.e., private sharing). This was due in part to the interpretability of information presented. With greater time, we would have been able to do more refinement of that code to enhance the inter-rater reliability, which has implications for precision and recall. We also would like to expand the types of LLM models we were using to include LLMs that are not publicly available (e.g., we have access to a secure version of ChatGPT through the University of Michigan, and would have been keen to compare performance between LLM models). Despite the possibility for additional analyses if we had another year, we were proud of the work we were able to achieve in the stated time.