



Core Faculty Member [Stephen Smagula, PhD](#), is an Assistant Professor of Psychiatry and Epidemiology at the University of Pittsburgh. His research examines the neurobiology, psychosocial factors, and rest-activity rhythms that contribute to late-life depression, and he is currently developing a program for patients and healthcare providers to monitor sleep-wake patterns on the Apple Watch.



The [Center's](#) Julia Holber had the opportunity to ask Dr. Smagula about his interest in aging epidemiology, psychiatry, and what projects he hopes to pursue next.

Julia: Can you tell me a bit about your background and training?

Stephen: Sure! I studied neuroscience in undergrad, and I was really interested in the brain and how people thought. It wasn't until I was studying psychological anthropology and developmental neuroscience that I realized I could study mental health and see how the social world impacts brain development. At first, I couldn't find the right PhD program because it was highly interdisciplinary work, so I got involved with epidemiology. I came to Pitt and started working with my mentor, [Dr. Jane Cauley](#). Here I fell in love with the field of aging epidemiology and understanding what determines mental health outcomes in aging.

Julia: Can you define aging epidemiology and the work done in the field?

Stephen: Epidemiology refers to the study of the distribution and determinants of disease in populations, and a lot of it in recent history became counting who has what. But the epidemiology I was taught goes much further - using causal reasoning tools and longitudinal analyses to look at why people get sick. Older adults are extremely variable in their health and the purpose of my work is to answer the question: what could have been done to change that trajectory?

Julia: Were there any specific experiences that influenced your decision to examine sleep-wake patterns and depression?

Stephen: During my dissertation, I examined why older men were experiencing increases in depression in a large cohort study. We were initially looking at their sleep, but just looking at the quantity of their sleep wasn't telling us much about who was more likely to become depressed. Then, there was some literature coming out looking at the rhythm of activity, the rest-activity rhythm as we call it, which you can measure with an actigraph. This data was showing that people who became depressed had different activity *rhythms*. I became really interested in understanding these patterns and how they affect people's health trajectories.

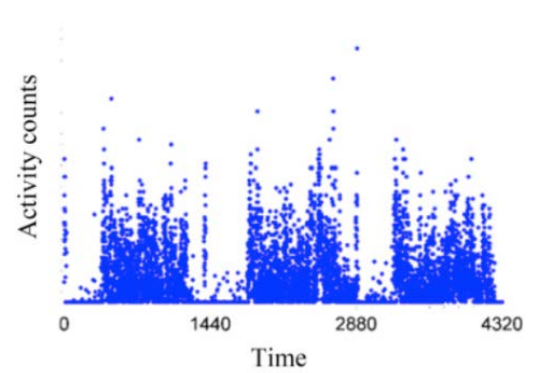


Julia: When you talk about activity rhythms, what should we be picturing?

Stephen: People don't often think about it, but it's really simple- activity follows a circadian rhythm. You have a period of inactivity, you usually transition pretty quickly, then you have a period of activity, and that repeats. So actigraphy shows those repetitive cycles of activity which have a lot of characteristics. How stable is the rhythm across days? How consistent is it within days? How strong is it? What's the shape? What's the timing? People are collecting these measures with research actigraphs and wearables like the Fitbit and the Apple Watch.

Julia: Can you give us an idea of what a normal 24-hour activity rhythm would look like?

Stephen: That's a big question in the field right now. There are many ways to measure activity rhythms, and they differ with variables like age or if you're employed. But, the essence of a healthy rhythm is you're getting going in the morning at a pretty decent speed- you're not lingering between states of activity and inactivity. Once you become active, you're active for a persistent period of time. You're not only active for 7, 8, 9 hours- you have a wide period of relatively consistent activity. Keep in mind the rhythm we are measuring is any form of activity- it doesn't matter what type or how vigorous. A good, healthy rhythm shows someone who's really engaged with the activities of human life.



Julia: Recently, your work has also focused on late-life depression among dementia caregivers.

Stephen: Yes, I have an ongoing study for depression risk in dementia caregivers, for obvious reasons. Everyone knows someone who's affected by taking on the caregiving role. It can disrupt your activity during their day as well as your sleep in the night. I want to figure out what's different between caregivers who develop depression and those who don't. That study is ongoing, but I will say in general, caregivers with depression tend to have activity rhythms that are narrower. They might get going at the same time as most people, but they tend to settle down earlier. Other times depression symptoms are associated with having inconsistent patterns. Their rhythms aren't tied to a social routine, which reflects and perpetuates a disconnection between their inner world and the social world that gives our lives value.



Julia: What other projects are you currently working on that you're excited about?

Stephen: I'm currently working on building a system for the Apple Watch to monitor these rhythms. We already know certain patterns are associated with depression risks and poor health outcomes, and we need to provide a way for people to measure these things in real-time. Healthcare providers will be able to understand their patients' activity patterns and begin to implement interventions for individual patients. You have to monitor a rhythm before you can start stabilizing and modifying it.

Julia: What comes next? What questions would you like to investigate moving forward?

Stephen: My next question is: why? Why are activity rhythms linked to depression risks? What does this mean? Is it due to something different in depressed patients' brains? Is the activity rhythm affecting the brain? Is it mostly psychosocial? Likely all of these things are interrelated, but sorting out how rest-activity behaviors, neurobiology, and the psychosocial context of depression unfolds over time is important to help target novel interventions. Without a doubt, the activity rhythms are useful for tracking risk, but sorting out the mechanisms is the next important step.

Want to read more about Dr. Smagula's work? Read his [latest publication](#) on the association of irregular rest-activity rhythms with manic-hypomanic and depressive symptoms.

