Student's research on COVID-19 transmission leads to discovery of a major model gap

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Scientists have long studied the spread of diseases, but the emergence of COVID-19 and its profound impact on society have underscored the

critical need to understand where and how diseases spread.

As George Mason University doctoral student Jericho McLeod reviewed literature on disease transmission as part of his work toward a Ph.D. in computational science and informatics, he and George Mason professor Eduardo López noticed a gap in the models and now seek to correct it.

In trying to understand why disease transmissions were worse in some areas over others, McLeod and López dove into COVID-19 data looking specifically at extended family ties—meaning family members beyond the nuclear family of parents and children, such as cousins, aunts, uncles, or grandparents.

"According to research on social networks in the United States, individuals during crises like COVID-19, contract their social circles yet become more active with them," said McLeod. "During lockdown, you saw your friends less, but may have still delivered groceries to your grandmother regularly."

Studies by McLeod, López, and George Mason Ph.D. student Unchitta Kan previously confirmed that people migrated closer to family more frequently after the pandemic began and that availability of extended family plays a primary factor in influencing face-to-face interaction, laying the groundwork for this research. Now, McLeod and López wanted to know if these extended family ties played a role in the spread of COVID-19.

With the help of Kan and doctoral students Bryan Adams, Valentin Vergara Hidd, and Mailun (Alan) Zhang, they aimed to confirm that these networks mattered enough to warrant future research and updates to disease modeling.

The team gathered obituaries in the Unites States between 2020 to 2022

to examine familial relationships with Centers for Disease Control and Prevention (CDC) data on deaths by geography, age, and gender.

They found that during COVID-19, there were more instances of multiple family members dying within short periods (e.g., 60 days) compared to 2018 and 2019, where such cases were less common. This rise in deaths aligns with CDC data on excess deaths but is more noticeable between different waves of the pandemic. So, should these relationships be considered in models demonstrating the spread of disease? McLeod says yes.

In July, McLeod presented his research at the International Pandemic Sciences Conference at Oxford University and was awarded best poster presentation in the epidemiology, data and analytics category.

"I am very proud of our work, and it has been collaborative in every way," said López, who is an associate professor of computational data sciences.

"Jericho has a strong ability to work through the data engineering portion of a problem, but also has the intuition necessary to make this research happen. We were optimistic that we would see the effects that we did, and now we have this great opportunity to study something that people have just completely overlooked."

McLeod earned a degree in accounting from the University of South Alabama before attending George Mason to earn an MBA. In one of his business courses at the Costello College of Business taught by Pallab Sanyal, professor of information systems and operations management, McLeod was introduced to data analytics and machine learning—and found it fascinating.

He went on to complete a graduate certificate in data analytics at George

Mason before deciding to pursue a Ph.D.

"Attending the [Oxford] conference was so energizing," McLeod said. "It brought together a collection of top minds, and Dr. López knew the right people to introduce me to, which led to additional conversations, ideation, and thoughts on future directions for this research."

Provided by George Mason University

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