Understanding how emotions ripple after terrorist acts

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The 2013 Boston Marathon bombing motivated mass expressions of fear, solidarity, and sympathy toward Bostonians on social media networks around the world. In a recently released study, researchers at the University of Pittsburgh and Cornell University analyzed emotional reactions on Twitter in the hours and weeks following the attack.

The study is the first large-scale analysis of fear and social-support reactions from geographically distant communities following a terrorist attack. The findings show the extent to which communities outside of Boston expressed their emotions by using hashtags such as #PrayForBoston and how those reactions correlated with geographic proximity, social-network connections, and direct ties to Boston.

The full results of the study, which have been published online in the journal *EPJ Data Science*, may provide insight to governmental agencies exploring how to best handle public fear following a disruptive event.

"When a community in one geographic location is attacked, it is important for government officials to be able to predict where public fears will be heightened most as a result of that attack. The findings of our study will potentially assist officials in predicting the exact manner and extent in which citizens in their own regions will react to tragic occurrences in another region of the country," said Yu-Ru Lin, the study's principal researcher and an assistant professor in Pitt's School of Information Sciences. "By swiftly recognizing the heightened presence of fear as a result of occurrences elsewhere, officials within a city can

respond appropriately with various measures to calm the public and reassure them that all measures are being taken to ensure public safety and well-being."

The study is unique in that previous studies of emotional responses to terror attacks have only focused on those in directly affected areas. For the Pitt-led study, researchers analyzed more than 180 million geocoded tweets from individuals in 95 cities around the world. Researchers focused their analysis on the 60 most-populated metropolitan areas in the United States as well as the 35 highest-populated cities outside of the United States.

To study expressions of fear, Lin's team utilized content-analysis programs to search for a predetermined set of keywords—including "fearful," "fatal," and "terror,"—within tweets directly related to the bombing. The study also utilized Twitter hashtags to identify tweets reflecting expressions of solidarity and sympathy. Researchers found that citizens in some cities were more likely to express specific emotions based on geography and shared experiences.

The hashtag #PrayForBoston—a variant of the #PrayFor{X} hashtags that have been used in recent years following various tragic events—was used to identify expressions of sympathy. Citizens in the city of London were modest in their expressions of fear and solidarity but were more forthcoming in their use of the #PrayForBoston hashtag. Lin and her team theorized that the greater show of sympathy from Londoners was due to the citizens of London having endured their own terrorist attacks in the recent past and therefore relating to the sense of tragedy that Boston's citizens were enduring.

The hashtag #BostonStrong—a variant of the #{X}strong hashtags made popular by Lance Armstrong's Livestrong motto and the U.S. Army's "Army Strong" media campaign—was used to measure expressions of

solidarity. Expressions of solidarity were used most by citizens in U.S. cities that possess close geographic proximity and have similar cultural identities as Boston. For instance, citizens in Chicago and Washington, D.C., were more likely to express emotions of solidarity due to their relative closeness in distance and personal ties with Boston.

"Our findings suggest that the immediate emotional reactions on social media are indicators of deeper feelings of connection to suffering in other communities that linger," said Drew Margolin, Lin's collaborator and an assistant professor of communication in the College of Agriculture and Life Sciences at Cornell University. "In the future, this may have implications for anticipating how communities will respond to shocking events beyond terrorist attacks, such as school shootings, natural disasters like Hurricane Sandy, or incidents like those that occurred in Ferguson, Missouri."

According to the study's overall findings, the extent to which communities outside of the Boston metropolitan area expressed emotional reactions to the attack directly correlated with individuals' geographic proximities, social network connections to Boston residents, and relationships to the city of Boston. Furthermore, reactions of fear were the most likely of sentiments to be expressed by individuals with direct ties to Boston or to Bostonians. The extent to which individuals had ties to the Boston area was the best predictor of fear and solidarity expression as well as a strong predictor of an expression of sympathy.

More information: The paper "The ripple of fear, sympathy and solidarity during the Boston bombings" is available online in *EPJ Data Science*: www.epjdatascience.com/content … 13688-014-0031-z.pdf

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