

COMPLEX NETWORKS

Network healing after loss

Research now shows that human social networks surrounding a person who unexpectedly dies recover from the loss through strengthening of the relationships between friends and acquaintances of the deceased individual. The study demonstrates how individuals change their interaction patterns to support one another during a time of grief.

Robert Bond

We might think of human social networks as a type of superorganism that comprises groups of individuals and the ties between them. Using this analogy, it is important to think about how such an organism adapts to events that affect its constituent parts. As existing members are removed from the network, such as through the death of an individual, how does the network react? When such a loss occurs, not only is the individual gone, but also gone are all of the ties that the individual had to others in the network. Such a loss fundamentally affects the local structure of the network, but how the wider network reacts to such a structural change has remained an open question. It is possible that networks may be irreparably harmed in such cases, and the harm may even spread further to other relationships, where ties are broken and holes in the network form. On the other hand, the network may compensate for the loss by strengthening the remaining ties that surround the now-missing individual.

In this issue of *Nature Human Behaviour*, Hobbs and Burke¹ contribute substantially to our understanding of how human social networks react to the unexpected loss of an individual through death. The authors matched de-identified data from Facebook to public vital records from the State of California. By doing so, they were able to compare the structure and activity of social networks surrounding a person who had died unexpectedly to otherwise similar social networks that did not experience a death using counts of Facebook interactions between individuals, such as comments, posts and photo tags.

This study demonstrates that the mutual close friends of an individual who has died increase their interactions with one another soon after the death and that the increase in these interactions persists over years. Further, it shows that close friends of the person who has died make new connections and increase their interactions with other acquaintances of the deceased, who they may not have interacted with previously. Again, these



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interactions persist over years following the death of the central individual. By comparing these networks to a control group of networks that did not experience a loss, the authors are able to show that these networks are behaving in a unique way. The increase in interaction in bereaved networks suggests that people are changing their interaction patterns in ways that are likely to provide support to those who are experiencing grief.

Importantly, the authors show that the recovery of interaction after a loss is highly localized — it occurs primarily among the close friends and acquaintances of the individual who has died. Unlike other phenomena that are thought to spread to multiple degrees of separation through the network², it appears that the effects of the unexpected loss of an individual do not spread in the same way. This further emphasizes work that shows that social influence is most likely to occur among close friends who are likely to have a strong bond³.

Not all deaths exhibited similar patterns of recovery — networks examined in this study were less likely to recover after a suicide than after other types of death. Previous work has shown that after a friend's suicide, individuals are likely to increase suicidal ideation⁴. Future work may investigate how interventions could encourage social support after suicides.

The authors observe a large number of networks, which enables them to investigate differences in the degree of recovery depending on the age of the deceased and the ages of the close friends of the deceased. In both cases, younger networks experienced a stronger recovery than older networks. Importantly, however, the study shows that the recovery is not limited to the strengthening of relationships within an age group. Following a loss, the generation of parents and older relatives showed increased connections to a deceased young person's friend network. These results show how strategies for seeking social support may vary across the lifespan.

Prior research has investigated the effects of the death of one individual on others they were connected to. Perhaps most well known is the 'widowhood effect' in which the surviving spouse of someone who has died has an increased mortality risk⁵. However, understanding how the broader social network surrounding an individual who has died reacts to such a traumatic event has largely been unknown. Survey work in this area has found that interaction patterns change in such circumstances, finding that elderly widows increase their informal social interactions following the death of a spouse⁶. However, this work only investigated the interaction patterns of the individual most highly connected to the decedent — the spouse. The study by Hobbs and Burke demonstrates how a loss affects the social interactions of many other connected individuals.

Coupled with another recent study on online social integration and mortality risk⁷, this work reveals the important role that online social interactions have in characterizing who is at risk following a loss, as well as understanding how our social networks deal with loss when it occurs.

The study raises new questions about how social networks adapt and change over time. First, to what degree does the recovery observed in the networks studied here extend to other human networks? This study focused on the online networks

of Facebook users. Online behaviour may substantially differ from offline behaviour, particularly if the medium (social media, or specifically Facebook) structures interaction patterns. Further work should investigate whether such increased interactions occur in a broader set of social networks or whether supportive interactions in the online sphere have an impact on people's real life experiences of grief. Research has shown that online friendships that show high levels of interaction are likely to be close friends offline as well⁸. Whether or not increased social support online indicates that social relationships are also strengthening and changing offline is an important area for future research.

Second, how do social networks react to other types of phenomena, whether they are other types of traumatic events or serendipitous events? The focus of this study is on how networks react when an individual

is unexpectedly removed from the network. However, in many cases people experience trauma, but remain in place. Future studies should investigate whether social networks can be encouraged to show similar levels of support for harmed individuals rather than those who are deceased. Conversely, unexpected serendipitous events may occur for a given individual. Previous research has suggested that an individual's level of happiness largely recovers to a baseline level after both positive and negative life events⁹. Whether or not networks function in this way is an open question. This research provides a partial answer — social networks may recover from a loss to a baseline level of interaction. Were this to occur for serendipitous events as well as for traumatic events, we may be closer to a more universal understanding of how networks evolve as individuals experience unexpected and dramatic changes to life circumstances. □

Robert Bond is at the School of Communications, Ohio State University, Derby Hall, 3072, 154 North Oval Mall, Columbus, Ohio 43210-1339, USA.
e-mail: Bond.136@osu.edu

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Competing interests

Robert Bond worked with the same PhD advisor, James Fowler, as Will Hobbs at the University of California, San Diego.