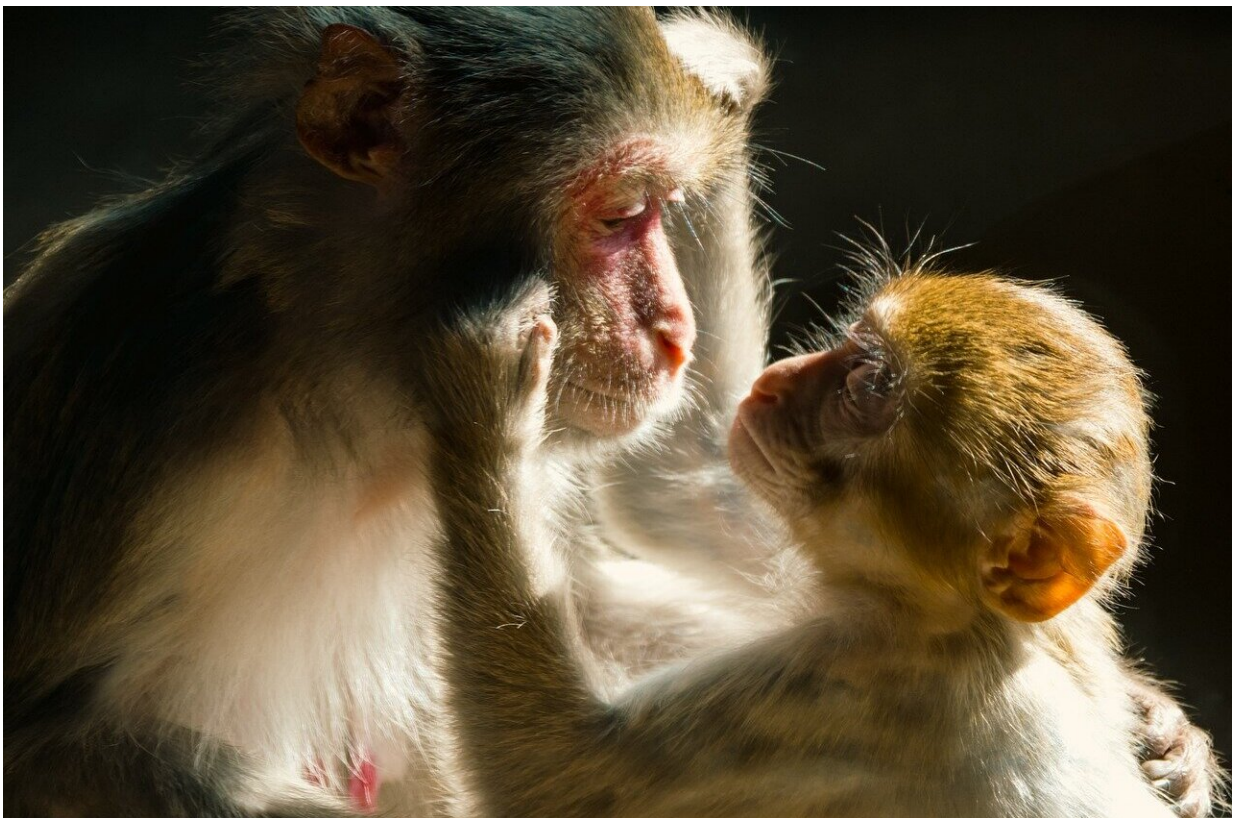


Extended maternal care is a central factor to animal and human longevity, modeling study suggests

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The relationship between mother and child may offer clues to the mystery of why humans live longer lives than expected for their

size—and shed new light on what it means to be human.

"It's one of the really mysterious things about humans, the fact that we live these super long lives as compared to so many other mammals," said Matthew Zippel, Klarman Postdoctoral Fellow in neurobiology and behavior in the College of Arts and Sciences. "What we're putting forward is that a part of the explanation for our long lifespan is this other foundational aspect of our lives, which is the relationship between the mother and her child."

The paper, "Maternal Care Leads to the Evolution of Long, Slow Lives," [was published](#) in the *Proceedings of the National Academy of Sciences* on June 14.

In their models, Zippel and co-authors found consistently that in species where [offspring](#) survival depends on the longer-term presence of the mother, the species tends to evolve longer lives and a slower life pace, which is characterized by how long an animal lives and how often it reproduces.

"As we see these links between maternal survival and offspring fitness grow stronger, we see the evolution of animals having longer lives and reproducing less often—the same pattern we see in humans," Zippel said. "And what's nice about this model is that it's general to mammals overall, because we know these links exist in other species outside of primates, like hyenas, whales and elephants."

Zippel and co-authors provide a universal mathematical model that demonstrates the relationship between the maternal survival and fitness of offspring on the one hand, and on the other, pace of life. Two additional empirical models incorporate the types of data about maternal survival and offspring fitness collected by field ecologists. Zippel said the hope is that these models can be further tested and utilized by field

ecologists to predict how [maternal care](#) and survival impacts the evolution of a species' lifespan.

"We hope we've made the model straightforward enough, that field ecologists can take their existing long-term demographic data that they've been collecting for decades and apply it to this model, and come up with this estimate of how much they expect mother's maternal care to have shaped the evolution of their study system," Zippel said.

The work builds off the Mother and Grandmother hypothesis, based on observations in 18th- and 19th-century [human populations](#), that offspring are more likely to survive if their mothers and grandmothers are in their lives. This theory has been used primarily as an explanation for menopause in humans, Zippel said—as ceasing reproduction decreases risk of death and allows older females to focus on grand-offspring care.

Zippel's models are both broader and more specific, incorporating more of the ways that a mother's presence or absence in her offspring's life impacts its fitness. The team makes predictions, based on results from Zippel's doctoral research on baboons and other primates, about how offspring fare if a mother dies after weaning but before the offspring's sexual maturation, which Zippel found leads to short-term and long-term, even intergenerational, negative effects on primate offspring and grand-offspring.

"We wanted to expand the Mother and Grandmother hypothesis to look at these specific ways that we know, in primates, that the mother's survival benefits her offspring," Zippel said. "And ask what are the broader and perhaps more subtle ways in which the benefits of maternal presence in one's life can lead to the evolution of longevity. We're also trying to explain this phenomenon across a much wider range of animals."

For Zipple, who spent six months during his doctoral research observing mother baboons with their infants in the field, the connection between motherhood and longevity reinforces his observations and underlines the importance and power of maternal care.

"When you watch mothers and infants in [nonhuman primates](#) interact, you can just see in the faces of the infants that there's nothing more important in the world than the presence of its mother," Zipple said. "So for me, the behavioral work, in combination with the demographic studies, really reinforced this common evolutionary thread that we share with our closest primate relatives—which is that there's a period of time where the whole world is our mother, and while that gets weaker over time, it never goes away. Part of the long-term aspiration of this line of research is linking that to longevity, linking these two mysterious and central aspects of what it is to be human."

Co-authors include H. Kern Reeve, professor of neurobiology and behavior (A&S), and Orca Jimmy Peniston, Kenai Peninsula College at the University of Alaska Anchorage.

More information: Matthew N. Zipple et al, Maternal care leads to the evolution of long, slow lives, *Proceedings of the National Academy of Sciences* (2024). [DOI: 10.1073/pnas.2403491121](https://doi.org/10.1073/pnas.2403491121)

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