

Male maturity shaped by nutrition during first six months of life

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It seems the old nature versus nurture debate can't be won. But a new Northwestern University study of men in the Philippines makes a strong case for nurture's role in male to female differences -- suggesting that rapid weight gain in the first six months of life predicts earlier puberty for boys.

Males who experienced rapid growth as babies -- an indication that they were not nutritionally stressed -- also were taller, had more muscle and were stronger, and had higher testosterone levels as young adults. They had sex for the first time at a younger age and were more likely to report having had sex in the past month, resulting in more lifetime sex partners.

The researchers think that testosterone may hold the key to understanding these long-term effects.

"Most people are unaware that male infants in the first six months of life produce testosterone at approximately the same level as an adult male," said Christopher W. Kuzawa, associate professor of anthropology in the Weinberg College of Arts and Sciences and author of the study. "We looked at weight gain during this particular window of early life development, because testosterone is very high at this age and helps shape the differences between males and females."

The study provides more evidence that genes alone do not shape our fate.

"The environment has a very strong hand in how we turn out," Kuzawa said. "And this study extends that idea to the realm of [sex differences](#) and male biology."

The study found men, on average, tend to be taller and more muscular than females, and the magnitude of that difference appears to be the result of nutrition within the first six months of an infant male's life, according to the study.

"There is a perennial question about how important heredity is versus the environment as shapers of who we turn out to be," said Kuzawa. "In the last 20 years, a lot has been learned about a process called developmental plasticity -- how the body responds early in life to things like nutrition and stress. Early experiences can have a permanent effect on how the body develops, and this effect can linger into adulthood. There is a lot of evidence that this can influence risk of diseases like heart attack, diabetes and hypertension -- really important diseases."

Kuzawa and his collaborators applied the same framework in this study and found evidence that male characteristics -- such as height, muscle mass and testosterone levels as opposed to disease characteristics -- also relate back to early life developmental plasticity.

"Another way to look at it is that the differences between the sexes are not hard wired, but are responsive to the environment, and in particular to nutrition," Kuzawa said.

Testosterone has long been known to increase muscle mass and puts a person on a higher growth trajectory to be taller. The Northwestern study suggests that the age of [puberty](#) also is influenced by events in the first six months of life.

The study, which was funded by the National Science Foundation and

the Wenner Gren Foundation, was conducted among a group of 770 Filipino males aged 20 to 22 who have been followed their entire lives. Since 1983 a team of researchers in the United States and the Philippines (including Kuzawa for about the last 10 years) has been working to understand how early life nutrition influences adult health, such as risk for cardiovascular disease and diabetes.

"Rapid Weight Gain After Birth Predicts Life History and Reproductive Strategy in Filipino Males" was published Sept. 13 in the *Proceedings of the National Academy of Sciences*. The study's co-authors are Thomas W. McDade, associate professor of anthropology, Northwestern University, Linda S. Adair, University of North Carolina at Chapel Hill, and Nanette Lee, University of San Carlos of the Office of Population Studies in Cebu City, Philippines.

Provided by Northwestern University

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