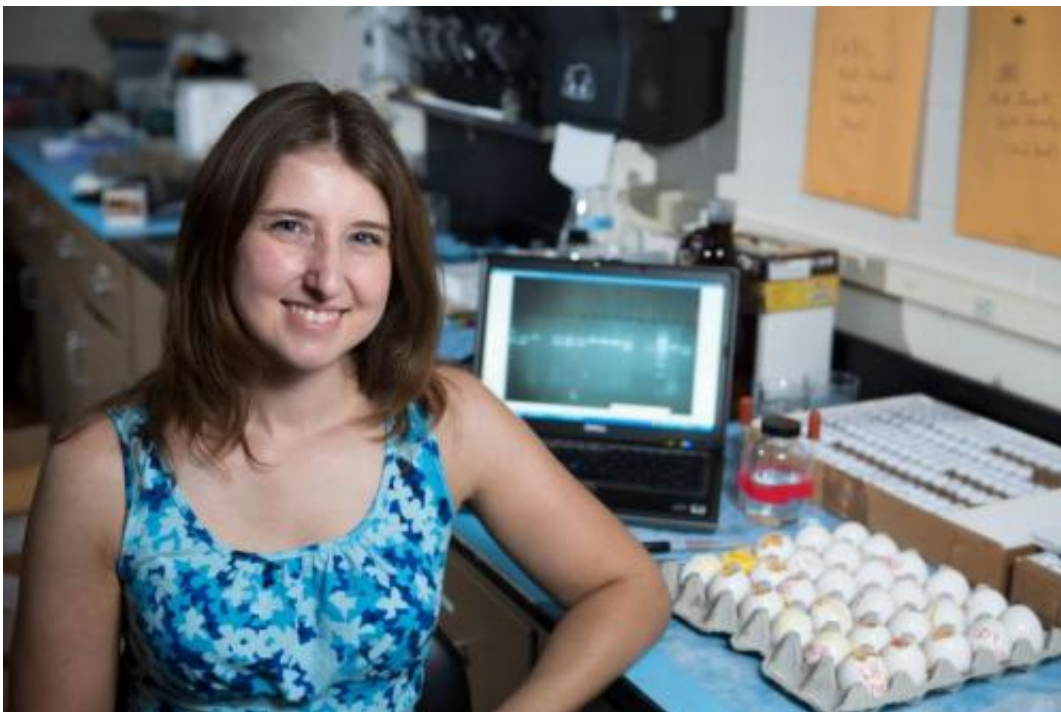


Study finds low weight gain in pregnant women reduces male fetal survival

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Kristen Navara, an associate professor of endocrinology at the University of Georgia, has spent her career researching how environmental factors affect people and animals. Credit: Peter Frey/University of Georgia

The amount of weight a woman gains during pregnancy can be vitally important—especially if she's carrying a boy—according to a study by researchers at the University of Georgia released today in *PLOS ONE*, an open access peer-reviewed journal published by the Public Library of Science.

Research by associate professor Kristen Navara in the College of Agricultural and Environmental Sciences found that [male fetuses](#) are more likely to die if their mothers don't gain enough weight during pregnancy.

"Fetuses are differentially susceptible to inadequate [weight gain](#) during pregnancy and that puts [males](#) more at risk at least at certain points of gestation," said Navara, a reproductive endocrinologist in the college's poultry science department.

"Currently, the recommendations for weight gain in pregnancy are the same whether the fetus is male or female, even though it is well known that they grow at different rates and have different metabolic rates. I think it is important to continue the research to determine whether women carrying boys should actually be eating more than women carrying girls in order to maximize the chances of the fetus's survival."

On average, 105 boys are born for every 100 girls worldwide, but that number can deviate based on a large number of social, economical and physiological variables. At times of extreme environmental stress, like war, the birth rate of girls exceeds that of boys.

Navara's work, in part, seeks to pinpoint the physiological reasons those shifts occur.

In her analysis of birth rate data, Navara found that for women who gained less than 20 pounds, the female-to-male [birth rate](#) ratio shifted to about 52-to-48 in favor of female babies. The shift is most likely due to the fact that male fetuses require more energy in the first weeks and months of gestation and have been shown to be more likely to succumb to adverse conditions in the womb, she said.

Female babies, as evidenced by a greater rate of successful births,

proved more resilient in the face of lower gestational weight gain than male babies. Navara believes that this correlation between weight gain and male fetal death could be stronger before six months of gestation, but data on male fetal deaths prior to six months of gestation was not available.

Navara's study is based on Centers for Disease Control and Prevention data on 46 million pregnancies over 23 years. She worked with the UGA Statistical Consulting Center to analyze the data.

"The correlation was a near perfect relationship where the proportion of males rose with the number of pounds women gained during gestation," Navara said. "To me, that tight of a relationship indicates that weight gain and the sex ratio at birth are, in fact, directly related and that the relationship isn't driven by another related variable."

While Navara works within the UGA poultry science department, she also studies reproductive systems across several different species.

"I believe there is a lot to be learned by cross-referencing what different species do, and picking out the effects and mechanisms that are conserved among all of them," she said.

In this particular study, her results could have implications on how childbearing women are instructed to care for themselves while pregnant.

"I think that the next step in the research is to actively follow pregnant women, document their diets and weight gains, and see whether intake of particular dietary components can influence whether male and female fetuses survive," Navara said. "This would also allow us to determine whether males are even more susceptible at earlier developmental stages than we were able to analyze in the current study. This would provide us

with more information that would tell us 'if you don't get enough of X, this puts male babies at risk of stillbirth at stage Y.'

More information: To read Navara's findings in their entirety, see [dx.plos.org/10.1371/journal.pone.0114304](https://doi.org/10.1371/journal.pone.0114304).

Provided by University of Georgia

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