Early study links mothers' education level to telomere length in newborns

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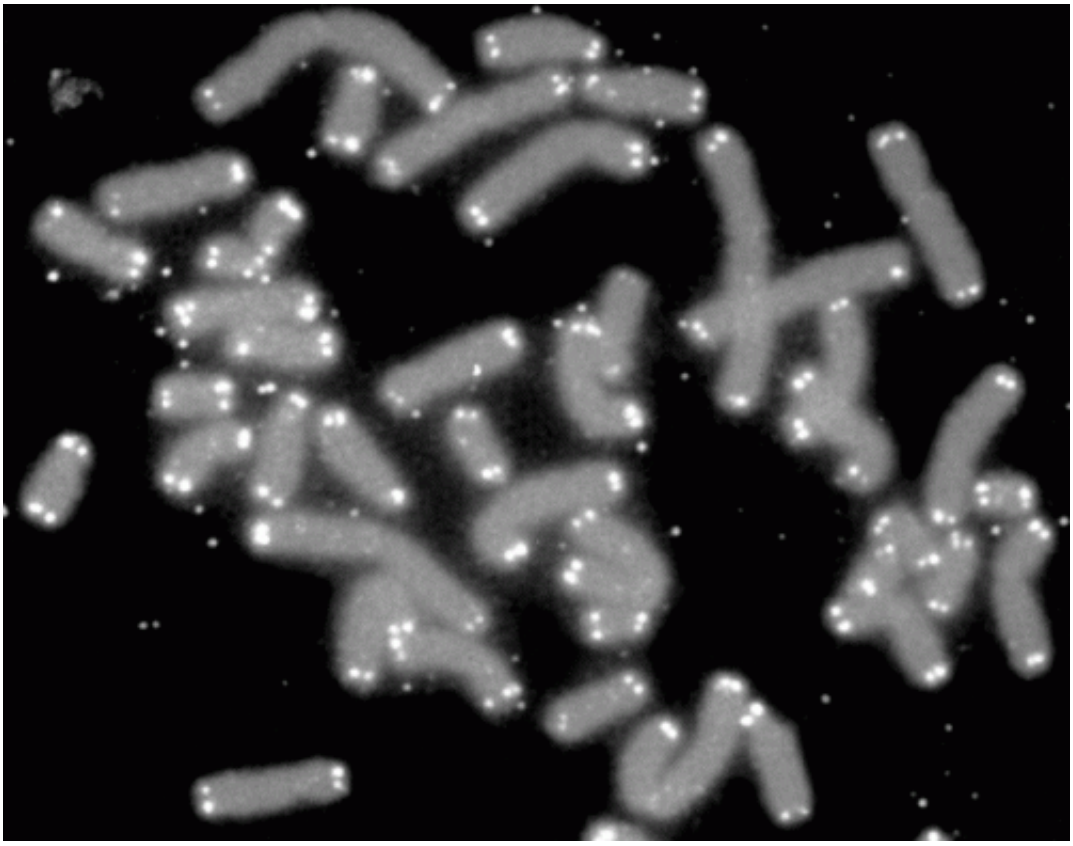

Human chromosomes (grey) capped by telomeres (white). Credit: PD-NASA; PD-USGOV-NASA

A small study of new mothers suggests that not having graduated from high school – possibly an indicator of socioeconomic stress—may impact the likelihood of babies being born with shortened telomeres,

molecules that cap the ends of chromosomes and protect them from damage. While the consequences of being born with shortened telomeres are not fully understood, reduced telomere length is a hallmark of cellular aging that, in adults, is associated with shorter lifespan and increased risk for conditions such as diabetes, obesity and cancer.

"As far as we know, this is the first study to suggest that, right from the gate, a mother's education may impact what's going on in her newborn at the cellular level," said Janet Wojcicki, PhD, MPH, associate professor of pediatrics at UCSF and lead author on the study, which was published online Dec. 3 in the *Journal of Perinatology*. "It suggests that kids whose mothers aren't afforded a real education may already be disadvantaged in their health at birth."

The finding, which the researchers emphasized requires more study, given the small sample size and the restriction to a specific group of Latina women, is part of an ongoing longitudinal study that aims to track several hundred Latino children from the womb to adolescence and beyond to see how genetic, hormonal and environmental factors affect the children's risk of developing chronic diseases that plague the Latino community.

"This study is just a first step," said Elissa Epel, PhD, a professor of psychiatry and associate director of the Center for Health and Community at UCSF who was co-senior author on the new study. "Further research with more participants is needed to replicate this finding, determine the broader clinical significance of shorter telomeres at birth and understand whether this tracks through adulthood."

Likened to the plastic tips of shoelaces, telomeres are repeating units of DNA at the ends of chromosomes that act as buffers against the loss of protein-coding DNA during cell division. While telomere shortening happens naturally with aging, mounting research indicates that the

process is accelerated by psychological and biological stress.

Several recent studies have found significant variability in telomere length among newborns, which researchers have attributed to differences in genetic ancestry and to in utero stress factors such as smoking, drug use, or poor nutrition. Few studies have directly assessed the health consequences of shortened telomeres at birth, though one report published earlier this year by researchers at the University of Sydney found that shorter telomeres in very young children predicted increased arterial thickness, an early sign of vascular disease, by age eight.

Early results suggest more focus on maternal education

In the newly published portion of their ongoing longitudinal study, the team recruited expectant Latina mothers from Zuckerberg San Francisco General Hospital's prenatal clinics between 2012 and 2013, and took cord blood samples from 54 infants at birth. The researchers analyzed telomere length in the newborns' immune cells and searched for correlations with a host of health and sociodemographic factors affecting children and their parents, including maternal education level, ethnicity and prenatal body mass index (BMI), maternal and paternal age, and the child's sex, gestational age, birth weight and head circumference.

Just two factors correlated with cord blood telomere length: both male babies and infants whose mothers had not graduated from high school had telomeres about 5 to 6 percent shorter than females and infants whose mothers had diplomas, respectively.

"We already know that a woman's education level is critically important for her child's health for myriad biological, behavioral and social reasons," Epel said. "Now we are getting a glimpse of a potential

mechanism for how socioeconomic disparities may be passed on from generation to generation."

The finding that male infants may have shorter telomeres than do females is also intriguing, said study co-author Rebecca Olveda, a UCSF medical student who joined the research team as part of a summer research program. "It raises the question of whether well-known differences between men and women in health and mortality risk in adulthood are influenced by biological differences already present on the first day of life."

The finding contrasts with previous studies that had found no sex differences in telomere length, which the authors speculate may have to do with the present study's focus on genetically similar women of Mexican and Central American origin. "Our study's genetically homogenous group of subjects may be an advantage over larger studies of more diverse populations, whose varied genetics might mask other important risk factors for shortened telomeres," Wojcicki said.

As further research into these questions continues, the authors hope the early findings will inform efforts to break the cycle of poverty and chronic disease, particularly as experienced by immigrant communities in the United States.

"The fact that we found an effect of maternal education on cellular health when infants are essentially still in the womb emphasizes the importance of access to education, particularly for at-risk families," Wojcicki said. "Recently there's been so much focus on quality preschool education, which is wonderful, but if children are already disadvantaged at birth by their mother's education level, then we need to think about providing resources even earlier in the pipeline to mothers and families."

More information: J M Wojcicki et al. Cord blood telomere length in Latino infants: relation with maternal education and infant sex, *Journal of Perinatology* (2015). DOI: 10.1038/jp.2015.178