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Early-life droughts and cognitive performance among children in rural India

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Introduction:

Organisms adapt to prenatal conditions in a way that prepares for similar postnatal circumstances. Fetal programming research has identified associations between various prenatal shocks and numerous health outcomes, yet the role of the postnatal environment for effect manifestation remains understudied. This is the first study to investigate the interplay of pre- and postnatal environmental conditions for cognitive health among school-aged children. We focus on nutrition, a cognitive health risk factor in both pre- and postnatal life.

Methods:

Data from the 2007-2018 Annual Status of Education Report (ASER) on 5-16-year-olds from rural India (N = 4,589,590) were linked to University of Delaware rainfall data. As rural India heavily depends on rainfed agriculture, we exploit droughts - i.e. rainfall below the 20th percentile of the district-specific mean - as a quasi-experiment for nutritional shocks. Drought exposure is assigned based on birth year. We first test if prenatal drought exposure is associated with test scores, and then interact prenatal exposure with exposure in the first years of life, while controlling for household, district, birth year, and interview year.

Results:

Our results show that prenatal drought exposure is associated with lower scores in math and reading, and a lower probability

of being on track in school, particularly among 11-16 year-olds. Droughts in the first few years after birth, too, are associated with poorer scores. However, this effect is alleviated among adolescents who had previously experienced a drought prenatally.

Conclusions:

Prenatal exposure to suboptimal conditions might mitigate the effects of similar shocks in early postnatal life for cognitive health. Future research on interactions between such pre- and postnatal factors is needed, e.g. to gain insights for resilience-building in face of the climate crisis.

Key messages:

- The occurrence of droughts during the prenatal phase, as well as during the first few years after birth, lead Indian adolescents to perform worse in school.
- Prenatal circumstances prepare for postnatal ones. This explains our finding that the effects of droughts after birth are alleviated among those who had already been prenatally drought-exposed.