At this point, we don't know the lifelong impact of higher reactivity and lower surgency and
self-regulation for these babies, said first author of the study Nicole Bush, PhD. A lot will depend on other factors, such as families and communities. Providing healthy environments postnatally could buffer the negative impact of high reactivity and lower surgency and self-regulation.

Maternal stress during the second trimester of pregnancy may influence the nervous system of the developing child, both before and after birth, and may have subtle effects on temperament, resulting in less smiling and engagement, as well as diminished ability to regulate emotions.

In a study led by UC San Francisco, researchers looked at the stress levels of 151 low-to-middle-income women who were between 12 and 24 weeks pregnant. The study was published in the journal Development and Psychopathology on Nov. 22, 2017.

The researchers followed the women throughout pregnancy and after delivery, and conducted a test to compare their reported stress levels during pregnancy with objective levels of stress in their 6-month-old offspring. In the test, the infants’ cardiac function was monitored while the mothers were instructed to look at the infant’s face but not interact with or touch them for two minutes following a brief play session.

The mothers reported the number of stressful life events they had experienced during pregnancy, which included illness, relationship problems, housing difficulties and legal issues. The babies of mothers with the highest number of these stressful life events 22 of the 67 who completed the testing were 22 percent more reactive than the 22 infants of mothers reporting the lowest number of stressful life events. They also recovered less quickly from the stressor, demonstrating lower resilience.

Reactivity places children at risk
High reactivity, which is assessed by measuring the variability in the heart rate in conjunction with breathing, is indicative of a stronger decrease in parasympathetic nervous system activity in response to challenge, said first author Nicole Bush, PhD, of the UCSF Departments of Psychiatry and Pediatrics, and UCSF Weill Institute for Neurosciences. The parasympathetic nervous system enables the body to rest and digest food, by slowing the heart rate and increasing intestinal and glandular activity.

“This isn’t automatically good or bad, but we know that being highly reactive places children at risk for a range of psychopathological problems, particularly anxiety and depression, as well as externalizing problems, such as disruptive behavior, especially if they experience adverse family and school environments.”

However, in an optimal environment with few adversities, children with higher stress reactivity don’t have their stress response triggered too often and may exhibit better-than-average social skills and emotional and behavioral well-being, because greater reactivity can make them more sensitive to the benefits of positive relationships and experiences in their environments, said Bush, who is also associate director of research at the UCSF Division of Developmental Medicine.

Additionally, questionnaires from the 151 mothers revealed that those in the top third, who had higher levels of perceived stress in pregnancy and post-delivery, had babies with temperamental “surgency” levels that were 8 percent lower than those babies of mothers in the lower third, who reported less perceived stress in pregnancy and post-delivery.

Surgency includes traits such as willingness to approach and engage with the outside world, as well as laughter and smiles. These same babies born to the highly-stressed mothers were also found to have 8 percent lower levels of self-regulation, the ability to manage emotions such as soothing themselves in periods of high stress, compared with the babies of mothers with less perceived stress during pregnancy and post-delivery.

**Healthy families, communities may offset high reactivity impact**

This combination of lower surgency and lower self-regulation can place individuals at added risk for depression, anxiety and difficulties with their social relationships, said Bush.

“At this point, we don’t know the lifelong impact of higher reactivity and lower surgency and self-regulation for these babies,” she said. “A lot will depend on other factors, such as families and communities. Providing healthy environments postnatally could buffer the negative impact of high reactivity and lower surgency and self-regulation.”

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Co-authors are Karen Jones-Mason, PhD; Michael Coccia; Zoe Caron; Abbey Alkon, PhD, RN; Melanie Thomas, MD, MS [11]; Kim Coleman-Phox; Nancy Adler, PhD [12]; and Elissa Epel, PhD [13], of UCSF; Prathik Wadhwa, MD, PhD, of UC Irvine; and Barbara Laraia, PhD, RD, of UC Berkeley.

Read the study

- Journal of Development and Psychopathology: Effects of pre- and postnatal maternal stress on infant temperament and autonomic nervous system reactivity and regulation in a diverse, low-income population [14]

About UCSF Psychiatry

The UCSF Department of Psychiatry [15] and the Langley Porter Psychiatric Institute are among the nation's foremost resources in the fields of child, adolescent, adult, and geriatric mental health. Together they constitute one of the largest departments in the UCSF School of Medicine and the UCSF Weill Institute for Neurosciences, with a mission focused on research (basic, translational, clinical), teaching, patient care and public service.

UCSF Psychiatry conducts its clinical, educational and research efforts at a variety of locations in Northern California, including UCSF campuses at Parnassus Heights, Mission Bay and Laurel Heights, UCSF Medical Center, UCSF Benioff Children's Hospitals, Zuckerberg San Francisco General Hospital and Trauma Center, the San Francisco VA Health Care System and UCSF Fresno.

About the UCSF Weill Institute for Neurosciences

The UCSF Weill Institute for Neurosciences [16], established by the extraordinary generosity of Joan and Sanford I. "Sandy" Weill, brings together world-class researchers with top-ranked physicians to solve some of the most complex challenges in the human brain.

The UCSF Weill Institute leverages UCSF's unrivaled bench-to-bedside excellence in the neurosciences. It unites three UCSF departments?Neurology, Psychiatry, and Neurological Surgery?that are highly esteemed for both patient care and research, as well as the Neuroscience Graduate Program, a cross-disciplinary alliance of nearly 100 UCSF faculty members from 15 basic-science departments, as well as the UCSF Institute for Neurodegenerative Diseases, a multidisciplinary research center focused on finding effective treatments for Alzheimer's disease, frontotemporal dementia, Parkinson's disease, and other neurodegenerative disorders.

About UCSF

UC San Francisco (UCSF) [17] is a leading university dedicated to promoting health worldwide through advanced biomedical research, graduate-level education in the life sciences and health professions, and excellence in patient care. It includes top-ranked graduate schools of dentistry, medicine, nursing and pharmacy; a graduate division with nationally renowned programs in basic, biomedical, translational and population sciences; and a preeminent biomedical research enterprise. It also includes UCSF Health, which comprises top-ranked
hospitals? UCSF Medical Center [18] and UCSF Benioff Children?s Hospitals in San Francisco [19] and Oakland [20]? and other partner and affiliated hospitals and healthcare providers throughout the Bay Area.

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