

## SCIENCE BRIEF

# Effects of Childhood Stress Can Accumulate in the Body

*A review of a recent study of the affects of “allostatic load” on children in poverty at age 9 and 13.*

Each Science Brief summarizes the findings and implications of a recent study in basic science or clinical research. Studies are selected for review based on their scientific merit and contributions to understanding early development. No single study is definitive, of course. Understanding of early development is based on many studies that, taken together, permit broad conclusions and human applications. Generalizing to human children the results of studies with animals, for example, must be done cautiously and confirmed by research with children and their families. The National Scientific Council rests its work on a rigorous discussion of the validity of many studies like these conducted over many years and using different methodologies and samples. For more information, go to [www.developingchild.net](http://www.developingchild.net)

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## Why was the study done?

Stress activates many of the body’s physical systems that assist in coping. However, children experience different amounts and intensity of stress owing to family difficulties, economic stress, and other factors, and their capacities to cope depend crucially on the support of adults. “Allostatic load” refers to the measurement of the cumulative wear and tear on the body that results from experiencing stress. Research shows that high allostatic load in childhood is associated with long-term vulnerability to poor health and mental health outcomes, and that these effects begin early in life. As the term implies, children carry a high burden of potential vulnerability when the allostatic load is high. But are there factors, such as support from close relationships, which can help to buffer children from the effects of stress on allostatic load?

## How was the study conducted?

In this longitudinal study, 207 children from a poor rural community were studied first when they were 9 years old, and again four years later when they were 13. At both of these points, the allostatic load of each child was measured using a combination of several physiological assessments associated with physical stress, including resting blood pressure; overnight assessments of stress hormones cortisol, epinephrine, and norepinephrine; and a measure of body fat. When children were 13, an index of cumulative risk for stress caused by the environment in which a child lives was obtained from the child and mother. Risk factors included family turmoil, poor housing, and low income. Maternal responsiveness was measured from the child’s reports and observations of mother-child interaction. Finally, a measure of heart-rate reactivity and recovery was obtained while the child was responding to an unexpected test of mental arithmetic.

## What did the study find?

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Children with more of the risk factors for stress had higher allostatic load at age 13. Children experiencing a greater number of these risk factors exhibited greater physiological vulnerability to health and mental health problems. This remained true even when allostatic load four years earlier—when children were age 9—was controlled. Thus, children experiencing cumulative risk showed increased physiological vulnerability over this four-year period. However, the association between cumulative risk and allostatic load was true only for children whose mothers demonstrated low levels of responsiveness to them. By contrast, children with responsive mothers showed no association between cumulative risk and allostatic load. Regardless of levels of maternal responsiveness, cumulative risk was associated with diminished reactivity and less efficient heart-rate recovery in the mental arithmetic task.

## What do the findings mean?

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These findings indicate that, for children, chronic stress gets built into the body, and its cumulative effects are linked to increased physiological risk of long-term health problems. This association is found at a younger age than has previously been studied. Findings regarding the effects of allostatic load provide a link between adverse environments and impaired reactions to stress, greater behavioral problems, and poorer academic achievement. However, because the effects of cumulative stress are buffered by maternal responsiveness, it is likely that supportive relationships with adults can provide an important coping resource for children and may prevent chronic stress from damaging the developing stress response systems of children. Children in supportive families, or in families where parental support can be enhanced, do not experience enhanced physiological risk from cumulative stress.

## Study Title and Authors

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Evans, G. W., Kim, P., Ting, A. H., Tessler, H. B.G., & Shannis, D. (2007). Cumulative risk, maternal responsiveness, and allostatic load among young adolescents. *Developmental Psychology*, 43:341-351.