Can exposure to pollution, chronic stress, poor diet, and low resources before birth affect future wellbeing?

Although low socioeconomic status (SES) has been repeatedly associated with a higher rate of chronic health problems and mental disorders, explicit characterization of the factors that underlie this phenomenon remains elusive. A growing body of research suggests that maternal well-being during pregnancy is a crucial determinant of lifelong physical and mental health of the offspring. Notably, expectant mothers living in low SES conditions experience the greatest burden of toxins and pollutants, along with fewer resources and high psychological stress, the combined effects of which may have an impact on their developing or newborn children. While chemical toxins such as lead exposure are well known to adversely affect brain development, “social toxins” such as violence, poverty, and other factors that generate psychological stress in low SES parents and children, have only recently begun to gain recognition as risk factors that can alter the trajectory of brain development. Our data in mice demonstrate that co-occurring maternal stress worsens the impact of prenatal exposure to air pollution on offspring mental health outcomes (increased anxiety and impaired cognition) compared to either pollution or maternal stress alone. Mice exposed to air pollution prenatally also exhibit increased vulnerability to high fat diet-induced obesity and metabolic dysregulation later in life. These changes in combined exposure offspring are linked to exaggerated neuroinflammatory changes within the brain, which began in utero and persist into adulthood. Together these results reveal a potential biological pathway in which social and environmental conditions during pregnancy can increase the susceptibility of offspring to adverse physical and mental health outcomes later life, which has implications for intervention strategies and potentially even policy decisions.