

Annex 2: Overview of research illustrating the role of time and timing in the emergence of negative outcomes during child development

Study	Type of mechanism	Summary of key findings
(Lupien, McEwen, Gunnar, & Heim, 2009)	Age differential effect	Stress during adolescence has more important effects on the stress system (HPA axis) than a similar stress exposure during adulthood.
(Dow-Edwards, et al., 2019)	Age differential effect	Visual stimuli are key to the development of visual system in the first year, while social, emotional and cognitive stimuli trigger changes in brain areas undergoing maturation during adolescence.
(Soares, Rocha, Kelly-Irving, Stringhini, & Fraga, 2021) (Riem & Karreman, 2018)	Age differential effect	Different types of adversity leave negative signatures (biological markers) in different systems of the child's biology depending on age and explain why exposure to adverse experiences at 11–13 years and 3–8 years is strongly associated with poor health in adulthood.
(Ho & King, 2021)	Age differential effect	Middle childhood and adolescence are two sensitive windows for the onset and maintenance of depression, when adverse experiences occur during these developmental periods.
(Mussa, Mirzabaev, Admassie, Nshakira-Rukundo, & von Braun, 2019)	Age differential effect	The age at which children start working strongly reduces the likelihood that the child transitions from primary to secondary school. The sooner a child starts working, the lower the likelihood the child transitions to secondary school, but only before the age of 7.
(Aransiola TJ, 2018)	Age differential effect	Children who started working at or before the age of 14 have a higher probability of developing depressive symptoms compared to those who started later.
(Lee & Kim, 2021)	Age differential effect	Child labour has a negative effect on learning in both younger and older groups, but the effect is higher on younger children (8–12 years, compared to those aged 13 years and over).
(Teicher, Samson, Anderson, & Ohashi, 2016)	Age differential effect	Maltreatment affects differently several regions of the brain depending on the age of exposure.
(Lupien, McEwen, Gunnar, & Heim, 2009)	Delayed effect	The negative effects of stress during adolescence can incubate until adulthood, at which time they will become apparent, but adolescence is also a period where the effects of long-term exposure to adversity during childhood start to appear.
(Troop-Gordon, Sugimura, & Rudolph, 2016)	Delayed effect	Interpersonal stress at 8 years triggers maladaptive stress response during adolescence.
(Sim, 2017)	Delayed effect	Child work has a strong negative effect on children's numeracy and cognitive skills, seven years after exposure.
(Rosati & Straub, 2007)	Delayed effect	Negative health effects of child labour take time to manifest themselves. Looking only at contemporaneous and medium-term health consequences might lead to underestimating the costs of child labour.

What makes child labour harmful and what it means for the cocoa sector?

(Goodman, Joyce, & Smith, 2011)	Cascade effect (from childhood to adulthood)	Psychological problems during childhood negatively impact family income during adulthood (28% lower net family income by age 50).
(Power, Kuh, & Morton, 2013)	Cascade effect (from childhood to adulthood)	Poor cognitive functioning in childhood predicts in adulthood: lower qualifications, lower literacy and numeracy, occupational long-term sickness absence, obesity and weight gain, biomarkers for cardiovascular diseases (blood pressure, lipids, and glucose metabolism) at 45 years, timing of menopause and premature mortality. Poorer emotional status in childhood predicts obesity at 26 years, sickness or disability at 46–51 years, injury risk and premature mortality.
(Baker, Gruber, & Milligan, 2015)	Cascade effect (from childhood to adulthood)	School environment during childhood can hinder non-cognitive skills, with negative outcomes in health and life satisfaction at the beginning of adulthood.
(Ide, 2005)	Cascade effect (from childhood to adulthood)	Exposure of working children to lead decreases IQ by 4.5 to 17.5 points, which in turn decreases lifetime earnings by 10-40%.
(Lee C. a., 2010)	Cascade effect (from childhood to adulthood)	Child labour is correlated with higher incidence of chronic disease in adulthood and functional limitations. Negative effects are mediated by years of schooling and resulting occupational choices.
(Nishijima, de Souza, & Sarti, 2015)	Cascade effect (from childhood to adulthood)	Early admission into the labour market, regardless of the type of work, adversely affects health outcomes in adulthood, both directly and indirectly (affecting educational attainment through the loss of school years)