

Title: Longitudinal Associations Between Chronic Health Condition Burden and Financial Hardship Among Adult Survivors of Childhood Cancer: A Report from the Childhood Cancer Survivor Study (CCSS)

Authors: Tara K. Suntu, MD; Yan Chen, MM; Nickhill Bhakta, MD, MPH; Wendy Leisenring, ScD; Anne C. Kirchhoff, PhD; Tara O. Henderson, MD, MPH, FASCO; K. Robin Yabroff, PhD; Rena Conti, PhD; Elyse R. Park, PhD, MPH; Melissa M. Hudson, MD; Kirsten K. Ness, PhD; Claire Snyder, PhD; Eric J. Chow, MD, MPH; Yutaka Yasui, PhD; Gregory T. Armstrong, MD, MSCE; Paul C. Nathan, MD, MSc; I-Chan Huang, PhD

Background: Childhood cancer survivors experience a large burden of chronic health conditions (CHCs) with the progression of these conditions facilitating potential economic burden. This study examined the association between CHC progression and financial hardship in adult survivors of childhood cancer.

Methods: The study included CCSS participants diagnosed with pediatric cancer (1970–1999) who survived >5 years post-diagnosis and were ≥26 years old at the assessment of financial burden. Participants completed surveys (2017-2019) assessing three financial hardship domains: behavioral, material, and psychological. CHCs were self-reported at baseline and on up to 4 follow-ups. CHC severity was graded using CTCAE v4.03. To estimate the impact of multiple CHCs, a severity score was calculated based on published methods (PMID: 17595271) accounting for the frequency and grade of conditions. Notable CHC burden was defined as any CHC above low severity grade. Multivariable logistic regression evaluated associations of CHC burden with financial hardship adjusting for age at diagnosis, attained age, sex, insurance, personal income, education, marital status, smoking status, and body mass index. Additional analyses examined whether neighborhood deprivation using the Area Deprivation Index (ADI) (range 0-100) modified the relationship between CHC burden and financial hardship.

Results: Among 3,638 evaluable participants, the prevalence of notable CHC burden was 66%, material hardship 16%, psychological hardship 26%, and behavioral hardship 21%. Survivors with very high CHC burden had 2.6-fold (95%CI 1.6-4.1) higher odds of material and 1.6-fold (95%CI 1.0-2.4) higher odds of psychological hardship vs. those with low CHC burden. Survivors who progressed to moderate, high, or very high CHC burden had 1.7-fold (95%CI 1.2-2.5) higher odds of material hardship and 1.6-fold (95%CI 1.1-2.2) higher odds of psychological hardship vs. those with persistent low CHC burden. For survivors living in more deprived neighborhoods (ADI≥50), having notable CHC burden was associated with 2.5-fold (95%CI 1.5-4.3) higher odds of material hardship vs. those without notable CHC burden. For survivors living in less deprived neighborhoods (ADI<50), having notable CHC burden was associated with 1.5-fold (95%CI 1.1-2.2) higher odds of psychological hardship and 1.6-fold (95%CI 1.1-2.1) higher odds of behavioral hardship vs. those without notable CHC burden.

Conclusions: Longitudinal CHC burden shows strong temporal associations with material and psychological financial hardship. Neighborhood deprivation is associated with financial hardship, beyond individual sociodemographic factors. Multi-level interventions will be crucial to address financial hardship in survivors who develop CHCs earlier than peers.