

Title: Association of neurocognitive impairment and financial hardship in adult survivors of childhood cancer: a report from the Childhood Cancer Survivor Study (CCSS)

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Track 1: Pediatric Oncology
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Background/Purpose: Adult survivors of childhood cancer are at high risk for financial hardship due to the cumulative lifetime costs of cancer-directed therapy and chronic health conditions. Whether neurocognitive impairment increases the risk for financial hardship is unknown.

Methods: Childhood cancer survivors (≥ 5 -year survivors, diagnosed < 21 years of age between 1970-1999) enrolled in CCSS completed a validated self-report Neurocognitive Questionnaire (NCQ) in 2014 and a subsequent financial hardship survey (age ≥ 26 at survey completion) 3 years later. The NCQ measured neurocognitive impairment in four domains: (1) memory; (2) task efficiency; (3) organization; (4) emotional regulation. NCQ was the exposure and operationalized as the number of impaired domains (0-4); in each domain, impairment was defined as a Z-score $> 90^{\text{th}}$ percentile. Financial hardship outcomes were measured in behavioral (e.g., delaying care due to cost), material (e.g., high out-of-pocket costs), and psychological (e.g., worry about financial situation) domains, as well as two discrete outcomes of debt collection and bankruptcy. Multivariable linear and logistic regressions were used to analyze associations adjusting for age, sex, and race/ethnicity.

Results: 3023 survivors completed the NCQ (mean age 38.8, SD=8.6 years) and a subsequent financial hardship survey (mean age 41.5, SD=8.7 years). 13.9%, 8.1%, 6.0%, and 2.6% of survivors had neurocognitive impairments in 1-4 domains, respectively. Individuals with NCQ impairment had significantly higher mean standardized scores across all three financial hardship domains than those without NCQ impairments (Table). Each ordinal increase in the number of impaired NCQ domains was associated with a higher mean standardized score for both behavioral and material financial hardship. Individuals with impairments in all four NCQ domains were more likely to be sent to debt collection (54% vs. 25%, OR=3.82, 95% CI: 2.27-6.43) and file for bankruptcy protection (21% vs. 8%, OR=2.81, 95% CI: 1.53-5.17) compared to those without impairments.

Conclusions: Cancer survivors with neurocognitive impairment are particularly vulnerable to financial hardship. This survivor population should be specifically assessed for these outcomes and offered support to prevent and mitigate financial challenges.

Table. Standardized mean differences (SMD) of each financial hardship domain by number of NCQ impairments compared to no NCQ impairments

Number of NCQ domains impaired	Behavioral Domain SMD (95% CI)	Material Domain SMD (95% CI)	Psychological Domain SMD (95% CI)
1	0.21 (0.11-0.31)	0.20 (0.10-0.29)	0.41 (0.31-0.50)
2	0.39 (0.27-0.51)	0.32 (0.20-0.44)	0.38 (0.25-0.50)
3	0.48 (0.34-0.63)	0.35 (0.20-0.49)	0.44 (0.30-0.58)
4	0.72 (0.51-0.93)	0.72 (0.52-0.94)	0.74 (0.53-0.94)

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