**Results**

**Subgroup <50 years (df\_under50)**

In participants younger than 50 years (2,700), logistic regression revealed modest but consistent associations:

**Depression**: Both continuous PHQ-9 score and categorical severity showed higher odds of cancer in participants reporting greater depressive symptoms.

**Inflammation** (**hsCRP**): High hsCRP levels were positively associated with cancer history.

**Smoking**: Current and former smokers showed elevated risk compared with never-smokers.

Model discrimination was modest, with AUC 0.63 for both continuous and categorical predictor models

**Subgroup ≥50 years (df\_over50)**

In older participants (3,000), associations were weaker:

**Depression**: Neither continuous PHQ-9 scores nor categorical depression showed meaningful associations with cancer.

**Inflammation** (hsCRP): Patterns were inconsistent; hsCRP was less predictive in this group.

**Smoking**: Remained directionally positive but attenuated compared with the u50 group.

Predictive performance was poor, with AUC 0.59, close to random classification, suggesting minimal predictive value in older adults.

Overall, depression and hsCRP demonstrated stronger associations in the <50 group compared with the ≥50 group. Smoking remained relevant in both data subgroups but appeared more pronounced in younger participants. These results suggest stress- and inflammation-related pathways may play a larger role in younger-onset cancers.