Objectives: This study aimed to estimate the associations of chronic somatic disease-disability patterns in early adulthood and midlife with the risk of depression in later life among older adults aged 60 years or over in China.

Methods: Data were drawn from the China Health and Retirement Longitudinal Study implemented during 2011–2018. To minimizing potential for reverse causation, we evaluated association of chronic somatic disease-disability patterns between the ages of 18 and 59 and depression risk after age 60. For the purposes of this analysis, we excluded samples that were aged <60 at baseline, had incomplete data on chronic somatic diseases, disability, or depression, and those who had emotional, nervous, or psychiatric problems at their baseline assessment.

Chronic somatic disease-disability patterns between the ages of 18 and 59 were conceptualized based on the participants' self-reports at baseline. Chronic somatic diseases included hypertension, dyslipidemia, diabetes or high blood sugar, cancer or malignant tumor, lung diseases, liver disease, heart diseases, stroke, kidney disease, stomach or other digestive diseases, arthritis or rheumatism and asthma. Disabilities included physical disability, brain damage or mental retardation, vision problem, hearing problem, and speech impediment. For each participant, early-life chronic somatic disease-disability statuses were categorized based on the number of chronic somatic diseases (0/1/≥2), and disability condition (no/yes). Therefore, 41 annual variables were created, each with 6 possible values, forming a sequence of disease-disability states between the ages of 18 and 59. Sequence analysis was used to group participants with similar early-life chronic somatic disease-disability trajectories. The Center for Epidemiological Studies Depression Scale short form (CES-D 10) was used to measure symptoms of depression. The summed range of CES-D 10 item scores varied from 0 to 30, with higher scores indicating higher level of depressive symptoms. Participants with CES-D 10 scores of ≥12 were classified as having clinically significant symptoms of depression in later-life. Linear mixed effects models and generalized estimating equation models were used to estimate the associations of early-life chronic somatic disease-disability patterns with later-life symptoms of depression. Missing covariates data were handled using multiple imputation before analyses.

Sequence analysis was performed in software R version 4.1.3 for Windows (R Development Core Team, Vienna, Austria) using TraMineR package, and WeightedCluster package. The software

Stata version 15 for Windows (Stata Corp, College Station, TX, USA) was used to perform other statistical analyses. A two-sided $P < 0.05$ was considered statistically significant.

Results: Among 6,164 participants aged 60 years or over, five distinct early-life chronic somatic disease-disability patterns were identified: 'long-term health' (pattern 1), 'later transition to morbidity and multimorbidity' (pattern 2), 'long-term morbidity with later transition to multimorbidity' (pattern 3), 'long-term disability' (pattern 4), and 'fast transition to multimorbidity' (pattern 5). After adjusting for baseline age, gender, residence, marital status, education, and household wealth, smoking, alcohol drinking, chronic somatic disease incidence after age 60, and disability incidence after age 60, compared to pattern 1, pattern 2 (β = 1.41, 95% CI: 1.13, 1.68), pattern 3 (β = -1.14, 95% CI: 0.70, 1.58), pattern 4 (β = 1.62, 95% CI: 0.97, 2.28), and pattern 5 (β = 2.20, 95% CI: 1.48, 2.92) had significantly higher CES-D 10 scores in later-life. After adjusting for all covariates, participants with the pattern 2 (OR = 1.54, 95% CI: 1.40, 1.70), pattern 3 (OR = 1.44, 95% CI: 1.24, 1.68), pattern 4 (OR = 1.70, 95% CI: 1.37, 2.12), and pattern 5 (OR = 2.02, 95% CI: 1.58, 2.59) had higher risks of later-life depression compared to those with pattern 1.

Conclusions: Our findings suggest that older adults with a history of chronic somatic disease or disability during early adulthood and midlife are more likely to develop depression in later-life. Early diagnosis and interventions for chronic somatic diseases and disabilities are important for mental health in later life.

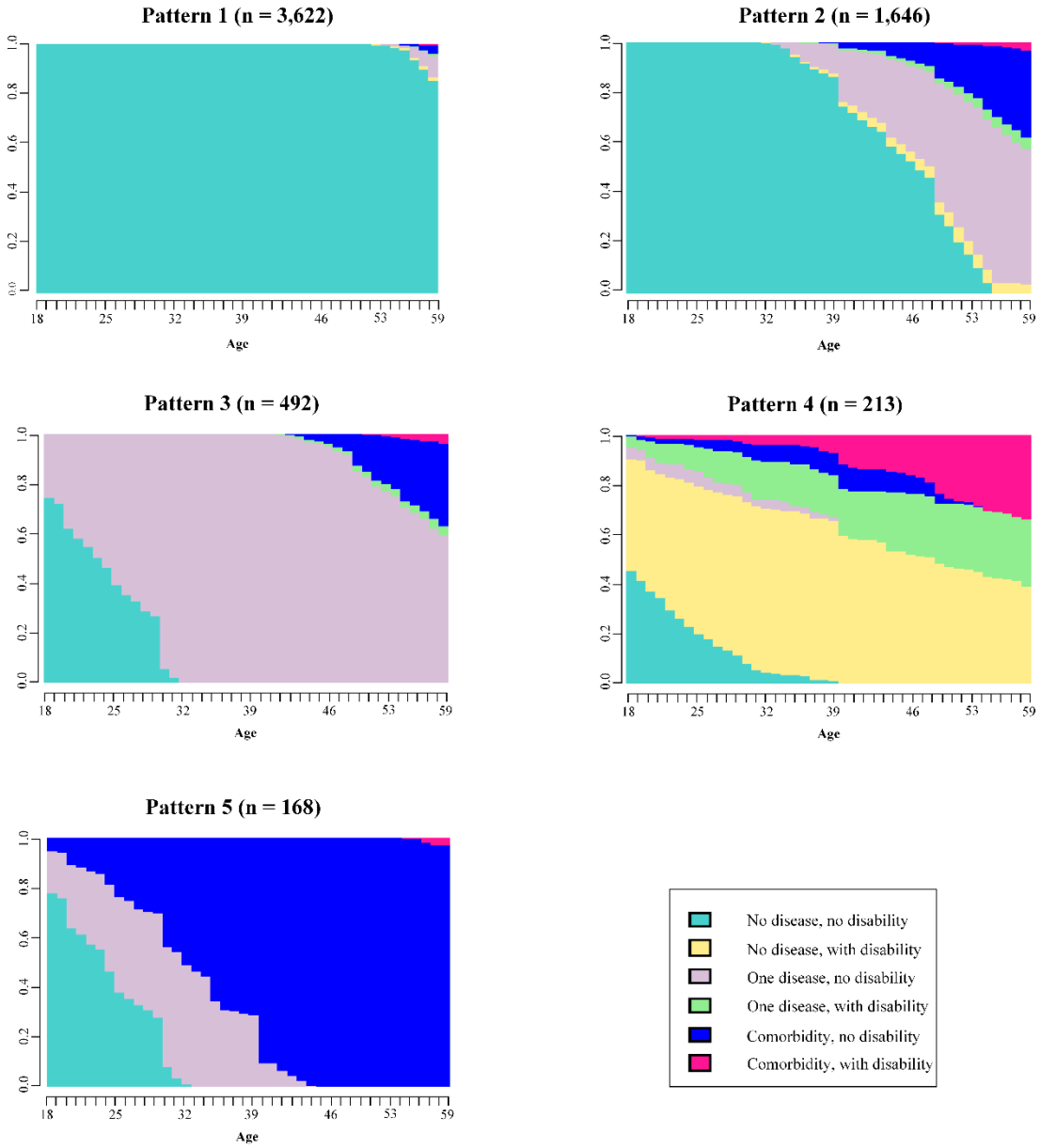

Figure 1. State distributions for the 5-patterns solution of early-life chronic somatic diseases and disabilities

Table 1. Associations between patterns of early-life chronic somatic disease-disability and later-life CES-D 10 scores, β (95% CI)

Chronic somatic disease-disability patterns	**Model 1** [a]	**Model 2** [b]	**Model 3** [c]
Pattern 1	[Reference]	[Reference]	[Reference]
Pattern 2	1.31 (1.01, 1.60)	1.49 (1.21, 1.77)	1.41 (1.13, 1.68)
Pattern 3	1.03 (0.55, 1.51)	1.24 (0.79, 1.69)	1.14 (0.70, 1.58)
Pattern 4	1.73 (1.02, 2.45)	1.71 (1.04, 2.38)	1.62 (0.97, 2.28)
Pattern 5	1.77 (0.98, 2.56)	2.22 (1.49, 2.96)	2.20 (1.48, 2.92)

Abbreviation: CI, confidence intervals.

Note. [a] Unadjusted; [b] Adjusted for baseline age, gender, residence, marital status, education, and household wealth; [c] Adjusted for baseline age, gender, residence, marital status, education, household wealth, smoking, alcohol drinking, chronic somatic disease incidence after age 60, and disability incidence after age 60.

Table 2. Associations between patterns of early-life chronic somatic disease-disability and later-life risk of depression, β (95% OR)

Chronic somatic disease-disability patterns	**Model 1** [a]	**Model 2** [b]	**Model 3** [c]
Pattern 1	[Reference]	[Reference]	[Reference]
Pattern 2	1.47 (1.33, 1.61)	1.57 (1.42, 1.72)	1.54 (1.40, 1.70)
Pattern 3	1.37 (1.18, 1.60)	1.48 (1.27, 1.73)	1.44 (1.24, 1.68)
Pattern 4	1.66 (1.33, 2.06)	1.72 (1.38, 2.15)	1.70 (1.37, 2.12)
Pattern 5	1.71 (1.35, 2.17)	2.01 (1.57, 2.57)	2.02 (1.58, 2.59)

Abbreviation: OR, odd ratio; CI, confidence intervals.

Note. [a] Unadjusted; [b] Adjusted for baseline age, gender, residence, marital status, education, and household wealth; [c] Adjusted for baseline age, gender, residence, marital status, education, household wealth, smoking, alcohol drinking, chronic somatic disease incidence after age 60, and disability incidence after age 60.