

Supplementary Materials

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Table S1. Age- and education-stratified means and standard deviations for cognitive function

| Age groups | Below high school | | High school | | College | | University and above | |
|------------|-------------------|------|-------------|------|---------|------|----------------------|------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 50–55 | 13.32 | 4.02 | 15.25 | 3.75 | 16.23 | 3.49 | 18.00 | 3.34 |
| 56–60 | 12.74 | 4.08 | 15.25 | 3.90 | 16.36 | 3.83 | 18.04 | 3.33 |
| 61–65 | 12.92 | 4.18 | 15.59 | 3.77 | 16.50 | 3.79 | 18.28 | 3.51 |
| 66–70 | 12.45 | 4.02 | 15.42 | 3.91 | 16.40 | 3.61 | 17.85 | 3.38 |
| 71–75 | 11.97 | 4.18 | 14.84 | 3.80 | 15.92 | 3.61 | 17.09 | 3.52 |
| 76–80 | 11.47 | 4.13 | 14.04 | 3.84 | 14.69 | 3.76 | 16.03 | 3.96 |
| 81–85 | 10.30 | 4.24 | 13.03 | 3.93 | 13.59 | 3.55 | 14.67 | 3.33 |
| 86–90 | 9.30 | 4.23 | 11.74 | 3.85 | 12.09 | 3.92 | 13.13 | 3.42 |
| >90 | 8.46 | 3.67 | 10.17 | 4.40 | 11.10 | 4.20 | 11.66 | 3.58 |

Notes: SD, standard deviation.

Table S2. Fitted statistics for independent trajectories of depressive symptoms and cognitive function from 1996 to 2010

| Number of classes | BIC | AIC | Entropy |
|----------------------------|-------------------|-------------------|--------------|
| Depressive symptoms | | | |
| 1 | 121 866.55 | 121 851.64 | 1.000 |
| 2 | 107 762.86 | 107 733.04 | 0.938 |
| 3 | 104 958.07 | 104 913.34 | 0.902 |
| 4 | 103 778.83 | 103 719.2 | 0.892 |
| 5 | 103 049.79 | 102 975.25 | 0.831 |
| 6 | 103 068.7 | 102 979.25 | 0.717 |
| Cognitive function | | | |
| 1 | 121 561.97 | 121 547.06 | 1.000 |
| 2 | 110 356.32 | 110 326.50 | 0.793 |
| 3 | 106 852.04 | 106 807.32 | 0.786 |
| 4 | 105 730.55 | 105 670.91 | 0.763 |
| 5 | 105 324.63 | 105 250.09 | 0.730 |
| 6 | 105 038.34 | 104 948.89 | 0.760 |
| 7 | 104 953.80 | 104 849.43 | 0.739 |
| 8 | 104 795.74 | 104 676.47 | 0.732 |

Notes: AIC, Akaike's information criterion. BIC, Bayesian information criteria.

Table S3. Growth parameters of independent trajectories of depressive symptoms and cognitive function from 1996 to 2010

| Trajectory group | Parameter | Estimate | SE | P value |
|------------------------------|-----------|----------|---------|---------|
| Depressive trajectory | | | | |
| High | Intercept | 1.520 | 0.036 | <0.001 |
| | Linear | 0.080 | 0.021 | <0.001 |
| | Quadratic | 0.001 | 0.003 | 0.746 |
| | Cubic | 0.000 | 0.000 | 0.024 |
| Decrease | Intercept | 0.743 | 0.037 | <0.001 |
| | Linear | 0.166 | 0.019 | <0.001 |
| | Quadratic | -0.029 | 0.003 | <0.001 |
| | Cubic | 0.001 | 0.000 | <0.001 |
| Emerging | Intercept | -0.053 | 0.031 | 0.087 |
| | Linear | -0.005 | 0.019 | 0.802 |
| | Quadratic | 0.015 | 0.003 | <0.001 |
| | Cubic | -0.001 | 0.0002 | <0.001 |
| No | Intercept | -0.448 | 0.009 | <0.001 |
| | Linear | 0.034 | 0.005 | <0.001 |
| | Quadratic | -0.006 | 0.001 | <0.001 |
| | Cubic | 0.0003 | 0.00004 | <0.001 |
| Cognitive trajectory | | | | |
| Poor | Intercept | -1.032 | 0.050 | <0.001 |
| | Linear | -0.053 | 0.013 | <0.001 |
| | Quadratic | 0.0004 | 0.001 | 0.607 |
| Slightly poor | Intercept | -0.274 | 0.026 | <0.001 |
| | Linear | -0.016 | 0.006 | 0.005 |
| | Quadratic | -0.001 | 0.0004 | <0.001 |
| Slightly good | Intercept | 0.491 | 0.026 | <0.001 |
| | Linear | -0.027 | 0.004 | <0.001 |
| | Quadratic | -0.001 | 0.0003 | 0.049 |
| Good | Intercept | 1.128 | 0.027 | <0.001 |
| | Linear | -0.023 | 0.004 | <0.001 |
| | Quadratic | -0.001 | 0.0003 | 0.005 |
| Very good | Intercept | 1.900 | 0.033 | <0.001 |
| | Linear | -0.027 | 0.007 | <0.001 |
| | Quadratic | -0.001 | 0.001 | 0.004 |
| Good and rapid decrease | Intercept | 1.303 | 0.076 | <0.001 |
| | Linear | -0.165 | 0.020 | <0.001 |
| | Quadratic | -0.002 | 0.001 | 0.177 |
| Very good and rapid decrease | Intercept | 1.829 | 0.089 | <0.001 |
| | Linear | -0.031 | 0.024 | 0.197 |
| | Quadratic | -0.010 | 0.002 | <0.001 |

Notes: *SE*, standard error.

Table S4. Associations of independent trajectories of depressive symptoms and cognitive function from 1996 to 2010 with new-onset all-cause dementia, Alzheimer's disease, and all-cause death from 2010 to 2020: subdistribution hazard regression

| Trajectories | All-cause dementia | AD | All-cause death |
|------------------------------|---------------------|----------------------|---------------------|
| | sHR (95% CI) | | |
| Depressive trajectory | | | |
| No | Reference | Reference | Reference |
| Emerging | 1.60 (1.34 to 1.92) | 1.65 (1.24 to 2.20) | 1.28 (1.15 to 1.43) |
| Decrease | 1.24 (1.02 to 1.50) | 1.14 (0.83 to 1.57) | 1.22 (1.10 to 1.36) |
| High | 2.21 (1.79 to 2.72) | 2.32 (1.69 to 3.19) | 1.30 (1.13 to 1.50) |
| Cognitive trajectory | | | |
| Very good | Reference | Reference | Reference |
| Good | 1.18 (0.91 to 1.53) | 1.32 (0.82 to 2.11) | 0.99 (0.87 to 1.12) |
| Slightly good | 1.57 (1.22 to 2.03) | 1.96 (1.24 to 3.10) | 1.10 (0.97 to 1.25) |
| Slightly poor | 2.63 (2.01 to 3.45) | 3.58 (2.23 to 5.74) | 1.26 (1.10 to 1.46) |
| Poor | 4.06 (2.84 to 5.80) | 6.48 (3.67 to 11.44) | 1.76 (1.43 to 2.18) |
| Very good and rapid decrease | 2.38 (1.57 to 3.61) | 2.73 (1.33 to 5.57) | 1.40 (1.11 to 1.76) |
| Good and rapid decrease | 5.49 (3.90 to 7.73) | 8.85 (5.12 to 15.31) | 1.85 (1.49 to 2.30) |

Notes: AD, Alzheimer's disease. CI, confidence interval. sHR, subdistribution hazard ratio. All models were adjusted for age, sex, race, education, household income, marital status, smoking history, drinking history, vigorous exercise, weight status, and number of chronic diseases.

Table S5. Sensitivity analysis: complete-case associations of independent trajectories of depressive symptoms and cognitive function from 1996 to 2010 with new-onset all-cause dementia, Alzheimer's disease, and all-cause death from 2010 to 2020: subdistribution hazard regression

| Trajectories | All-cause dementia | AD | All-cause death |
|------------------------------|---------------------|----------------------|---------------------|
| | sHR (95% CI) | | |
| Depressive trajectory | | | |
| No | Reference | Reference | Reference |
| Emerging | 1.59 (1.33 to 1.92) | 1.62 (1.21 to 2.18) | 1.30 (1.16 to 1.45) |
| Decrease | 1.26 (1.03 to 1.53) | 1.14 (0.82 to 1.57) | 1.23 (1.10 to 1.37) |
| High | 2.26 (1.83 to 2.79) | 2.29 (1.65 to 3.18) | 1.31 (1.13 to 1.51) |
| Cognitive trajectory | | | |
| Very good | Reference | Reference | Reference |
| Good | 1.19 (0.92 to 1.54) | 1.38 (0.85 to 2.24) | 0.99 (0.87 to 1.12) |
| Slightly good | 1.56 (1.21 to 2.02) | 2.02 (1.26 to 3.23) | 1.09 (0.96 to 1.24) |
| Slightly poor | 2.62 (1.99 to 3.44) | 3.63 (2.24 to 5.90) | 1.26 (1.09 to 1.45) |
| Poor | 4.02 (2.79 to 5.78) | 6.51 (3.63 to 11.68) | 1.75 (1.41 to 2.17) |
| Very good and rapid decrease | 2.51 (1.66 to 3.81) | 2.98 (1.45 to 6.10) | 1.34 (1.05 to 1.70) |
| Good and rapid decrease | 5.63 (3.99 to 7.94) | 9.52 (5.48 to 16.54) | 1.83 (1.46 to 2.28) |

Notes: AD, Alzheimer's disease. CI, confidence interval. sHR, subdistribution hazard ratio. All models were adjusted for age, sex, race, education, household income, marital status, smoking history, drinking history, vigorous exercise, weight status, and number of chronic diseases.

Table S6. Model selection of joint trajectories of depressive symptoms and cognitive function from 1996 to 2010

| Number of classes | BIC | AIC | Entropy |
|--------------------------|-------------------|-------------------|----------------|
| 1 | 243 712.19 | 243 678.54 | 1.000 |
| 2 | 225 958.17 | 225 894.60 | 0.946 |
| 3 | 217 713.25 | 217 619.78 | 0.852 |
| 4 | 214 905.28 | 214 781.90 | 0.828 |
| 5 | 211 430.15 | 211 276.85 | 0.842 |
| 6 | 209 819.54 | 209 636.33 | 0.842 |
| 7 | 209 084.69 | 208 871.57 | 0.826 |
| 8 | 207 895.19 | 207 652.16 | 0.830 |
| 9 | 207 087.55 | 206 814.61 | 0.837 |
| 10 | 206 526.14 | 206 223.29 | 0.833 |
| 11 | 206 028.04 | 205 695.28 | 0.829 |
| 12 | 205 605.10 | 205 242.42 | 0.827 |
| 13 | 205 562.95 | 205 170.36 | 0.805 |
| 14 | 204 959.67 | 204 537.17 | 0.807 |
| 15 | 204 763.13 | 204 310.72 | 0.811 |
| 16 | 204 676.92 | 204 194.60 | 0.799 |
| 17 | 204 009.77 | 203 497.54 | 0.806 |
| 18 | 203 917.27 | 203 375.13 | 0.802 |
| 19 | | False convergence | |
| 20 | | False convergence | |

Notes: AIC, Akaike's information criterion. BIC, Bayesian information criteria.

Table S7. Growth parameters of joint trajectories of depressive symptoms and cognitive function from 1996 to 2010

| Trajectory group | Depressive trajectory | | | | Cognitive trajectory | | |
|---|-----------------------|--------|-----------|--------|----------------------|--------|-----------|
| | Intercept | Linear | Quadratic | Cubic | Intercept | Linear | Quadratic |
| No depressive symptoms and very good cognitive function | | | | | | | |
| Estimate | -0.484 | 0.037 | -0.007 | 0.0003 | 1.924 | -0.028 | -0.002 |
| SE | 0.027 | 0.017 | 0.003 | 0.0001 | 0.039 | 0.009 | 0.001 |
| P value | <0.001 | 0.026 | 0.011 | 0.008 | <0.001 | 0.002 | 0.007 |
| No depressive symptoms and good cognitive function | | | | | | | |
| Estimate | -0.277 | 0.161 | -0.022 | 0.001 | 1.411 | -0.160 | -0.002 |
| SE | 0.059 | 0.038 | 0.007 | 0.0003 | 0.090 | 0.020 | 0.001 |
| P value | <0.001 | <0.001 | 0.001 | 0.004 | <0.001 | <0.001 | 0.199 |
| No depressive symptoms and slightly good cognitive function | | | | | | | |
| Estimate | -0.497 | 0.042 | -0.007 | 0.0003 | 1.148 | -0.024 | -0.001 |
| SE | 0.015 | 0.009 | 0.001 | 0.0001 | 0.034 | 0.005 | 0.0003 |
| P value | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| No depressive symptoms and slightly poor cognitive function | | | | | | | |
| Estimate | -0.198 | 0.036 | -0.006 | 0.0003 | -1.092 | -0.036 | -0.001 |
| SE | 0.066 | 0.040 | 0.006 | 0.0003 | 0.074 | 0.019 | 0.001 |
| P value | 0.003 | 0.361 | 0.312 | 0.291 | <0.001 | 0.063 | 0.444 |
| No depressive symptoms and poor cognitive function | | | | | | | |
| Estimate | -0.349 | 0.043 | -0.008 | 0.0004 | -0.260 | -0.013 | -0.002 |
| SE | 0.026 | 0.014 | 0.002 | 0.0001 | 0.034 | 0.007 | 0.000 |
| P value | <0.001 | 0.002 | <0.001 | <0.001 | <0.001 | 0.078 | 0.001 |
| No depressive symptoms and good and rapid decrease cognitive function | | | | | | | |
| Estimate | -0.013 | -0.122 | 0.059 | -0.004 | 0.536 | -0.035 | -0.0001 |
| SE | 0.048 | 0.033 | 0.006 | 0.0003 | 0.046 | 0.012 | 0.001 |
| P value | 0.786 | <0.001 | <0.001 | <0.001 | <0.001 | 0.005 | 0.868 |
| No-increase-decrease depressive symptoms and slightly good cognitive function | | | | | | | |
| Estimate | -0.492 | 0.030 | -0.005 | 0.0002 | 0.481 | -0.024 | -0.001 |
| SE | 0.016 | 0.009 | 0.002 | 0.0001 | 0.036 | 0.005 | 0.0003 |
| P value | <0.001 | 0.002 | 0.001 | 0.001 | <0.001 | <0.001 | 0.022 |
| Low depressive symptoms and good cognitive function | | | | | | | |
| Estimate | 0.444 | 0.693 | -0.118 | 0.005 | 0.722 | -0.038 | -0.001 |
| SE | 0.066 | 0.036 | 0.006 | 0.0003 | 0.053 | 0.014 | 0.001 |
| P value | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.007 | 0.516 |
| Low depressive symptoms and slightly poor cognitive function | | | | | | | |
| Estimate | 0.712 | 0.241 | -0.031 | 0.001 | -0.579 | -0.047 | 0.0005 |
| SE | 0.068 | 0.039 | 0.006 | 0.0003 | 0.053 | 0.015 | 0.001 |
| P value | <0.001 | <0.001 | <0.001 | 0.003 | <0.001 | 0.002 | 0.641 |
| Low-increase-decrease depressive symptoms and slightly good cognitive function | | | | | | | |
| Estimate | 0.312 | 0.052 | -0.002 | 0.0005 | -0.120 | -0.028 | -0.002 |
| SE | 0.067 | 0.040 | 0.007 | 0.0003 | 0.057 | 0.016 | 0.001 |
| P value | <0.001 | 0.192 | 0.777 | 0.110 | 0.034 | 0.086 | 0.055 |
| Decrease depressive symptoms and slightly | | | | | | | |

| Trajectory group | Depressive trajectory | | | | Cognitive trajectory | | |
|--|-----------------------|--------|-----------|---------|----------------------|--------|-----------|
| | Intercept | Linear | Quadratic | Cubic | Intercept | Linear | Quadratic |
| good cognitive function | | | | | | | |
| Estimate | 1.941 | -0.620 | 0.067 | -0.002 | 0.439 | -0.022 | -0.0005 |
| SE | 0.068 | 0.037 | 0.006 | 0.0003 | 0.055 | 0.015 | 0.001 |
| P value | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.139 | 0.648 |
| Emerging depressive symptoms and slightly good cognitive function | | | | | | | |
| Estimate | -0.230 | 0.165 | -0.040 | 0.003 | 0.944 | -0.023 | -0.002 |
| SE | 0.051 | 0.031 | 0.005 | 0.0003 | 0.052 | 0.015 | 0.001 |
| P value | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.124 | 0.026 |
| High depressive symptoms and good cognitive function | | | | | | | |
| Estimate | 0.184 | 0.128 | -0.011 | 0.0002 | 1.590 | -0.025 | -0.002 |
| SE | 0.054 | 0.029 | 0.005 | 0.0002 | 0.041 | 0.012 | 0.001 |
| P value | 0.001 | <0.001 | 0.037 | 0.491 | <0.001 | 0.032 | 0.040 |
| High depressive symptoms and slightly good cognitive function | | | | | | | |
| Estimate | 1.363 | 0.057 | 0.009 | -0.001 | 0.992 | -0.050 | 0.0003 |
| SE | 0.064 | 0.031 | 0.005 | 0.0002 | 0.047 | 0.013 | 0.001 |
| P value | <0.001 | 0.072 | 0.098 | 0.005 | <0.001 | <0.001 | 0.703 |
| High depressive symptoms and slightly poor cognitive function | | | | | | | |
| Estimate | 2.051 | 0.029 | 0.002 | -0.0003 | -0.390 | -0.043 | 0.0003 |
| SE | 0.065 | 0.036 | 0.006 | 0.0003 | 0.066 | 0.016 | 0.001 |
| P value | <0.001 | 0.419 | 0.697 | 0.220 | <0.001 | 0.008 | 0.780 |

Notes: SE, standard error.

Table S8. Sex-stratified associations of joint trajectories of depressive symptoms and cognitive function from 1996 to 2010 with new-onset all-cause dementia, Alzheimer's disease, and all-cause death from 2010 to 2020: subdistribution hazard regression

| Joint trajectories | | All-cause dementia | AD | All-cause death |
|-----------------------|-------------------------|----------------------|-----------------------|---------------------|
| Depressive symptom | Cognitive function | sHR (95% CI) | | |
| Men | | | | |
| No | Very good | Reference | Reference | Reference |
| No | Good | 0.82 (0.45 to 1.50) | 0.53 (0.19 to 1.44) | 1.03 (0.80 to 1.34) |
| No | Slightly good | 1.40 (0.79 to 2.50) | 1.34 (0.54 to 3.34) | 1.17 (0.91 to 1.51) |
| No | Slightly poor | 2.46 (1.36 to 4.44) | 2.79 (1.12 to 6.97) | 1.46 (1.11 to 1.92) |
| No | Poor cognitive | 3.86 (1.78 to 8.35) | 3.56 (1.03 to 12.32) | 1.71 (1.12 to 2.59) |
| No | Good and rapid decrease | 4.83 (2.27 to 10.30) | 5.51 (1.65 to 18.38) | 2.34 (1.61 to 3.41) |
| No-increase-decrease | Slightly good | 1.93 (0.97 to 3.86) | 1.99 (0.68 to 5.83) | 1.30 (0.94 to 1.79) |
| Low | Good | 1.41 (0.65 to 3.06) | 1.36 (0.38 to 4.83) | 1.14 (0.81 to 1.61) |
| Low | Slightly poor | 4.59 (2.38 to 8.85) | 4.90 (1.80 to 13.36) | 1.58 (1.12 to 2.23) |
| Low-increase-decrease | Slightly good | 2.56 (1.12 to 5.84) | 2.81 (0.78 to 10.19) | 1.79 (1.14 to 2.82) |
| Decrease | Slightly good | 1.87 (0.75 to 4.64) | - | 1.35 (0.88 to 2.07) |
| Emerging | Slightly good | 1.93 (0.87 to 4.27) | 1.35 (0.33 to 5.59) | 1.70 (1.16 to 2.48) |
| High | Good | 1.77 (0.51 to 6.08) | 1.62 (0.20 to 13.01) | 1.24 (0.67 to 2.27) |
| High | Slightly good | 2.90 (0.99 to 8.45) | 1.55 (0.18 to 13.66) | 1.41 (0.82 to 2.43) |
| High | Slightly poor | 5.95 (2.63 to 13.46) | 9.50 (2.95 to 30.53) | 1.21 (0.69 to 2.13) |
| Women | | | | |
| No | Very good | Reference | Reference | Reference |
| No | Good | 1.11 (0.78 to 1.58) | 1.68 (0.82 to 3.43) | 0.99 (0.81 to 1.20) |
| No | Slightly good | 1.36 (0.94 to 1.96) | 2.81 (1.37 to 5.77) | 0.98 (0.80 to 1.22) |
| No | Slightly poor | 2.05 (1.38 to 3.05) | 3.04 (1.39 to 6.62) | 1.19 (0.93 to 1.52) |
| No | Poor cognitive | 2.47 (1.15 to 5.27) | 6.24 (2.12 to 18.41) | 2.16 (1.41 to 3.31) |
| No | Good and rapid decrease | 4.43 (2.76 to 7.11) | 7.64 (3.28 to 17.78) | 1.59 (1.14 to 2.22) |
| No-increase-decrease | Slightly good | 1.93 (1.29 to 2.88) | 3.08 (1.40 to 6.74) | 1.19 (0.94 to 1.52) |
| Low | Good | 1.13 (0.72 to 1.77) | 2.16 (0.94 to 4.94) | 1.17 (0.93 to 1.49) |
| Low | Slightly poor | 2.55 (1.61 to 4.01) | 4.47 (1.97 to 10.15) | 1.77 (1.34 to 2.34) |
| Low-increase-decrease | Slightly good | 2.21 (1.38 to 3.53) | 3.04 (1.23 to 7.52) | 1.22 (0.92 to 1.61) |
| Decrease | Slightly good | 1.42 (0.83 to 2.45) | 2.51 (0.97 to 6.54) | 1.36 (1.03 to 1.80) |
| Emerging | Slightly good | 1.62 (0.98 to 2.66) | 2.53 (0.99 to 6.43) | 1.49 (1.13 to 1.96) |
| High | Good | 1.78 (1.01 to 3.14) | 1.76 (0.54 to 5.74) | 1.21 (0.88 to 1.67) |
| High | Slightly good | 3.02 (1.79 to 5.11) | 3.24 (1.13 to 9.28) | 1.57 (1.12 to 2.19) |
| High | Slightly poor | 3.89 (2.41 to 6.27) | 10.41 (4.68 to 23.16) | 1.67 (1.21 to 2.30) |

Notes: AD, Alzheimer's disease. CI, confidence interval. sHR, subdistribution hazard ratio. All models were adjusted for age, race, education, household income, marital status, smoking history, drinking history, vigorous exercise, weight status, and number of chronic diseases.

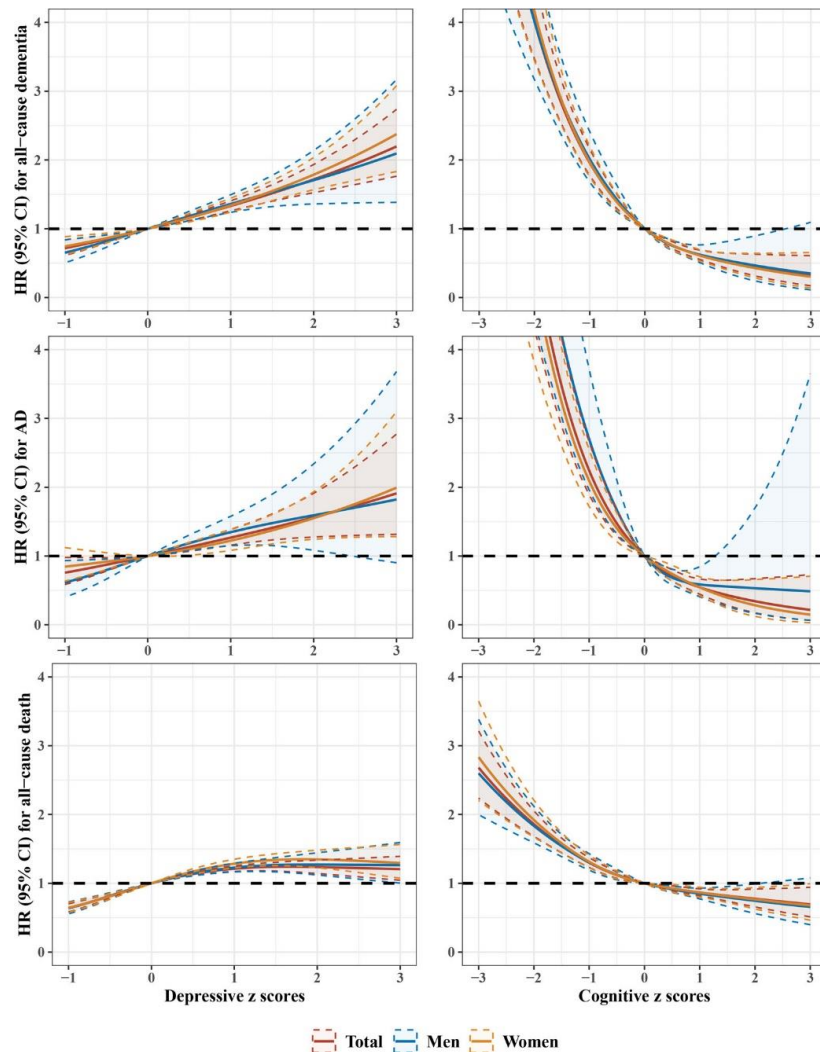


Figure S1. Dose-risk associations of depressive symptoms and cognitive function in 2010 with new-onset all-cause dementia, Alzheimer's disease, and all-cause death from 2010 to 2020: restricted cubic spline

Notes: AD, Alzheimer's disease. CI, confidence interval. HR, hazard ratio. All models were adjusted for age, sex, race, education, household income, marital status, smoking history, drinking history, vigorous exercise, weight status, and number of chronic diseases.

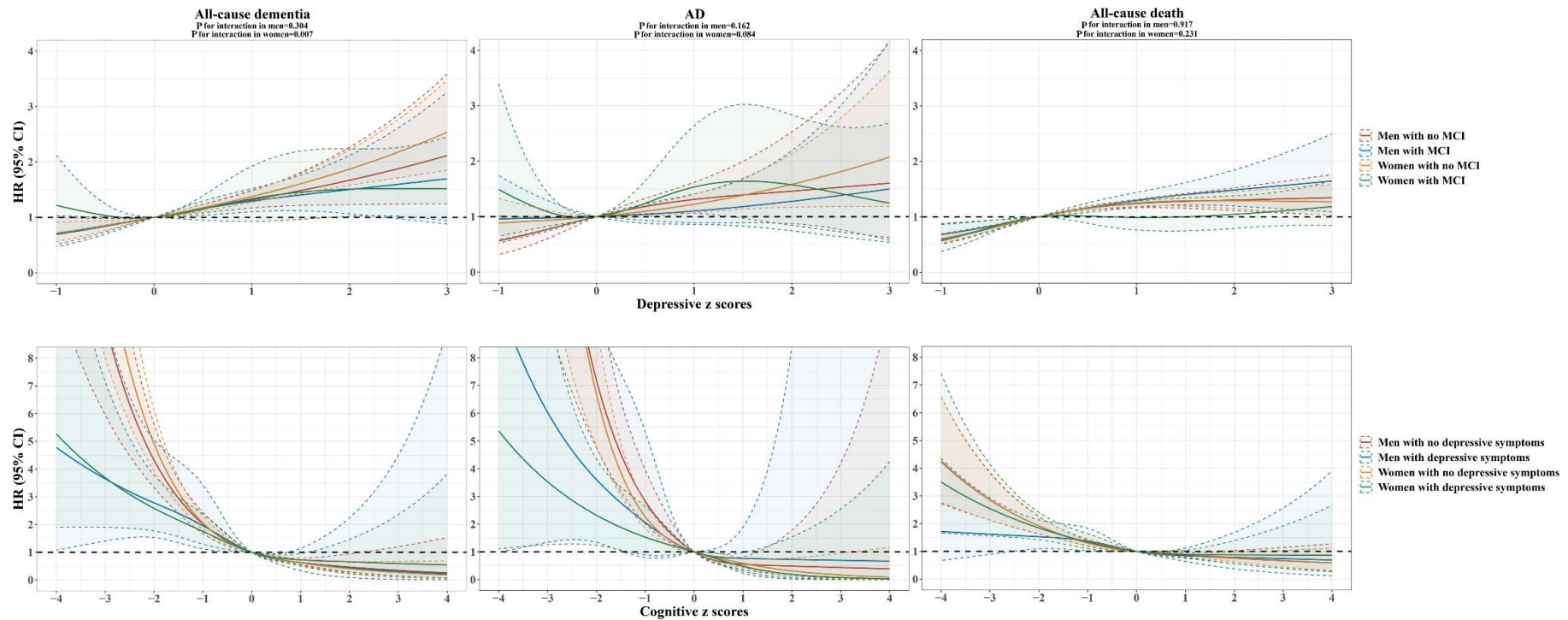


Figure S2. Sex-stratified dose-risk associations of interacted depressive symptoms and cognitive function in 2010 with new-onset all-cause dementia, Alzheimer's disease, and all-cause death from 2010 to 2020: restricted cubic spline

Notes: AD, Alzheimer's disease. CI, confidence interval. HR, hazard ratio. MCI, mild cognitive impairment. All models were adjusted for age, race, education, household income, marital status, smoking history, drinking history, vigorous exercise, weight status, and number of chronic diseases. P for interaction refers to the interaction between depressive symptoms and cognitive function.

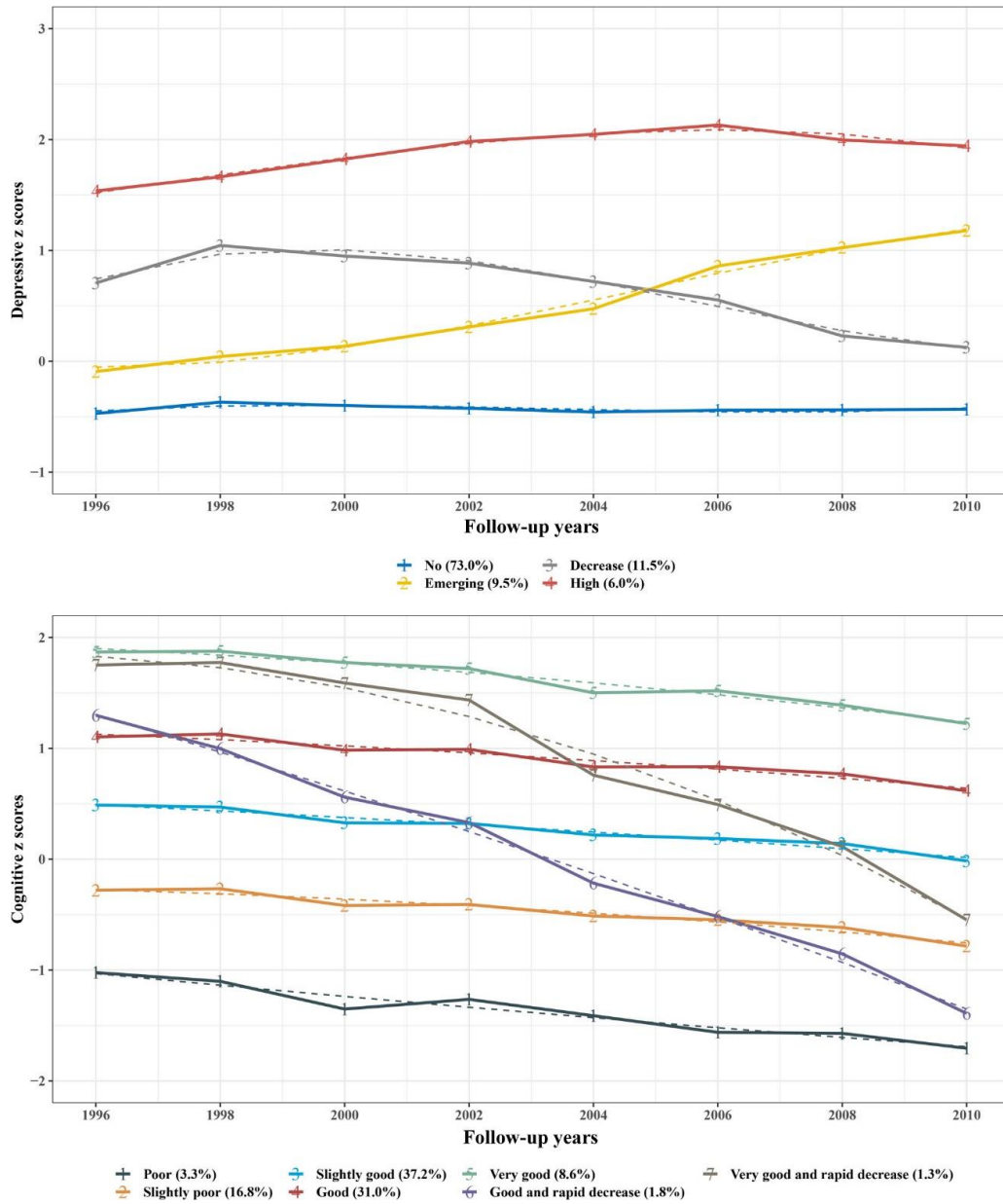


Figure S3. Independent trajectories of depressive symptoms and cognitive function from 1996 to 2010: group-based trajectory model