**From midlife to early old age: Health trajectories associated with retirement**

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eTable 1 shows the percentage of person-observations belonging to the various retirement status

groups by age group. eTables 2 and 3 present the statistical details for results presented in figures 2

and 3 of the main article. Given that the piecewise model centers age at year 60, the main effects of

retirement give the average health differences between different retirement status groups of age 60.

eFigures 1 and 2 present the modeling of retirement-related health trajectories and within-

participant analyses separately by sex. For instance, at age 60 men who had left labor force via

statutory retirement scored 2.34 points higher on mental health scale and 1.26 points higher on

physical functioning scale compared to 60-years-old men who remained in employment. The

corresponding differences were 2.00 and 0.57 points in women. These findings are in agreement

with the results from the within-participant analyses; the differences were fairly similar in men and

women, and the confidence intervals of the estimates also suggest that there were no substantial sex

differences.

To examine differences in retirement-related health trajectories and within-participant effects of

retirement by employment grades, we fitted the models separately in participants with low

employment grade (two lowest employment grades on the six-point scale) and in participants with

high employment grade (two of the highest employment grade groups).  The shapes of health

trajectories (eFigure 3) were qualitatively similar in high and low employment grades, although the

mental health benefits of retirement were stronger among high-grade participants. For instance, at

age 60 statutory retirees with high employment grades had 2.68 (1.76 to 3.60) points higher mental health and 0.98 (0.29 to 1.66) points higher physical functioning compared to their counterparts in the workforce. These advantages were 1.67 (0.66 to 2.69) and 0.97 (0.12 to 1.81) points in participants with low employment grades. In general, within-participant analyses (eFigure 4) showed fairly similar patterns of statutory and voluntary retirement with health in participants with high and low employment grades. However, mental health decreased over time among high-grade participants retiring due to ill health but not among low-grade participants. In addition, low-grade participants who retired due to ill health had initially low physical functioning which improved over time, whereas those retiring due to ill health from a high-grade job had not initially decreased physical functioning.

eTable 1. Percentage of participants by retirement status and age.

| | Age group | | | | | | |
|---|---|---|---|---|---|---|---|
| | 39-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70-76 |
| Civil service | 100.0 | 98.5 | 89.3 | 70.3 | 23.0 | 7.0 | 9.0 |
| Statutory retirement | 0.0 | 0.0 | 0.0 | 0.0 | 32.6 | 52.6 | 68.2 |
| Ill-health retirement | 0.0 | 0.9 | 2.3 | 3.8 | 6.4 | 6.3 | 4.3 |
| Voluntary early retirement | 0.0 | 0.6 | 8.4 | 25.9 | 38.1 | 34.2 | 18.5 |
| Number of person-observations | 2592 | 5277 | 7060 | 8117 | 5769 | 3272 | 1498 |

eTable 2. Predicting mental health and physical functioning trajectories by retirement status. Two random-intercept multilevel models (n=7584 participants, 33585 observations).
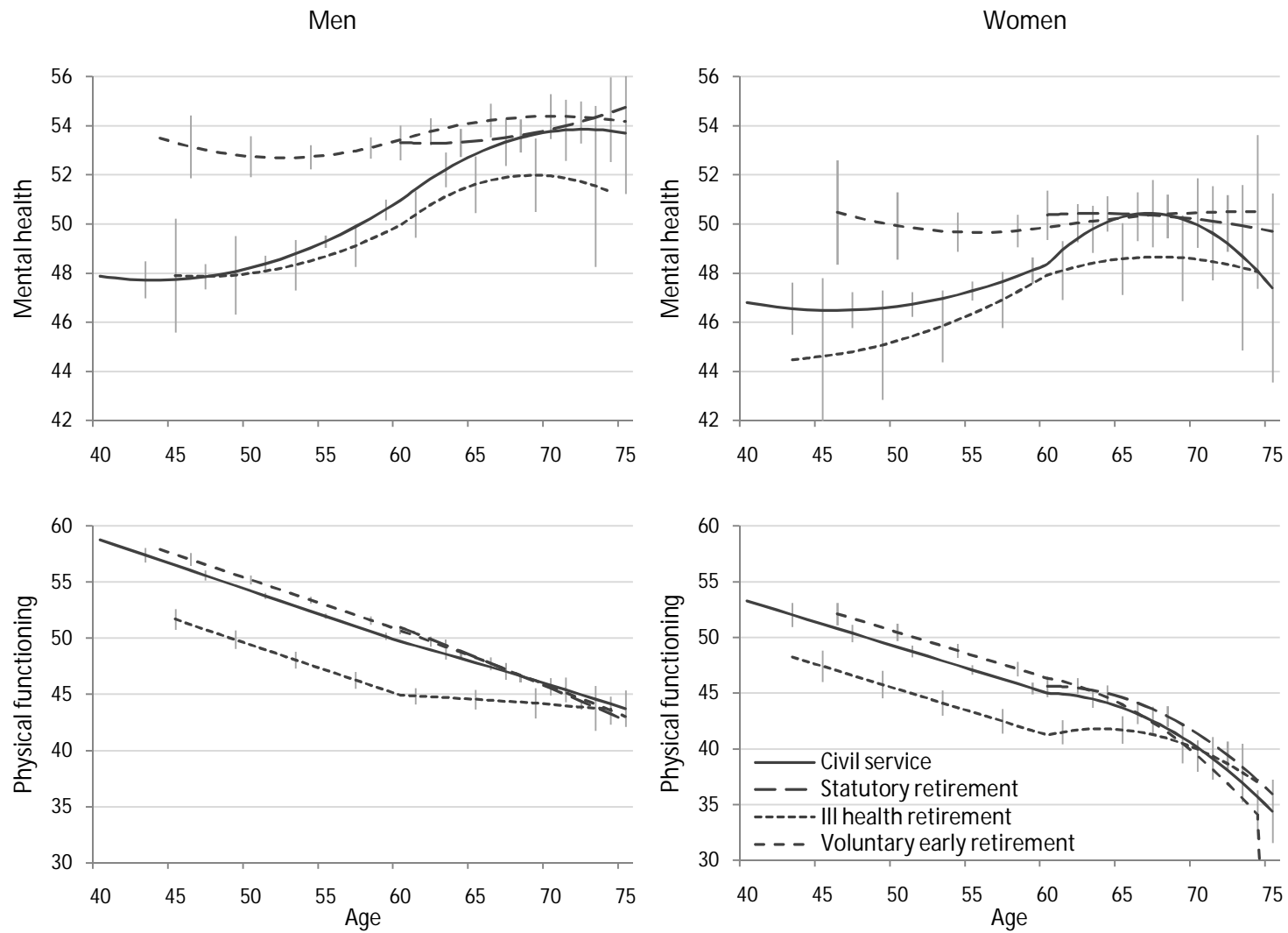
| | Outcome | |
|---|---|---|
| | Mental health | Physical functioning |
| Constant | 53.67 (52.69 to 54.64) | 49.42 (48.53 to 50.31) |
| Age before 60 (linear) | 0.34 (0.26 to 0.42) | -0.44 (-0.49 to -0.40) |
| Age before 60 (quadratic) | 0.01 (0.01 to 0.01) | - |
| Age after 60 (linear) | 0.53 (0.30 to 0.77) | -0.27 (-0.38 to -0.15) |
| Age after 60 (quadratic) | -0.03 (-0.05 to -0.01) | -0.02 (-0.02 to -0.01) |
| Period | | |
| Phase 3 | (reference) | (reference) |
| Phase 4 | -1.99 (-2.23 to -1.74) | -0.69 (-0.92 to -0.46) |
| Phase 5 | -2.38 (-2.70 to -2.06) | 0.38 (0.09 to 0.67) |
| Phase 6 | -2.81 (-3.18 to -2.44) | -0.28 (-0.63 to 0.07) |
| Phase 7 | -3.13 (-3.57 to -2.70) | 0.25 (-0.16 to 0.66) |
| Phase 8 | -2.80 (-3.31 to -2.29) | 0.84 (0.37 to 1.31) |
| Female sex | -1.94 (-2.36 to -1.51) | -3.33 (-3.72 to -2.93) |
| SES | 0.50 (0.37 to 0.64) | 1.12 (0.99 to 1.24) |
| SES × age before 60 (linear) | 0.04 (0.03 to 0.05) | 0.03 (0.02 to 0.04) |
| Retirement status | | |
| Civil service | (reference) | (reference) |
| Statutory retirement | 2.23 (1.66 to 2.80) | 1.04 (0.60 to 1.48) |
| Ill-health retirement | -0.74 (-1.62 to 0.15) | -4.47 (-5.08 to -3.86) |
| Voluntary early retirement | 2.21 (1.76 to 2.66) | 1.07 (0.78 to 1.35) |
| Retirement status × age before 60 (linear) | | |
| Civil service | (reference) | - |
| Statutory retirement | - | - |
| Ill-health retirement | -0.01 (-0.17 to 0.14) | - |
| Voluntary early retirement | -0.20 (-0.29 to -0.10) | - |
| Retirement status × age after 60 (linear) | | |
| Civil service | (reference) | (reference) |
| Statutory retirement | -0.53 (-0.82 to -0.25) | -0.09 (-0.18 to 0.01) |
| Ill-health retirement | -0.18 (-0.61 to 0.26) | 0.33 (0.18 to 0.47) |
| Voluntary early retirement | -0.37 (-0.66 to -0.09) | -0.14 (-0.23 to -0.04) |
| Retirement status × age after 60 (quadratic) | | |
| Civil service | (reference) | - |
| Statutory retirement | 0.03 (0.01 to 0.06) | - |
| Ill-health retirement | 0.01 (-0.03 to 0.05) | - |
| Voluntary early retirement | 0.02 (-0.01 to 0.05) | - |

Note: Values are coefficients (and 95% confidence intervals) of random-intercept multilevel models. Mental health and physical functioning scored as T-scores (M=50, SD=10). Only statistically significant interaction effects with age are included. A dash denotes an omitted variable. The results are illustrated in figure 1.
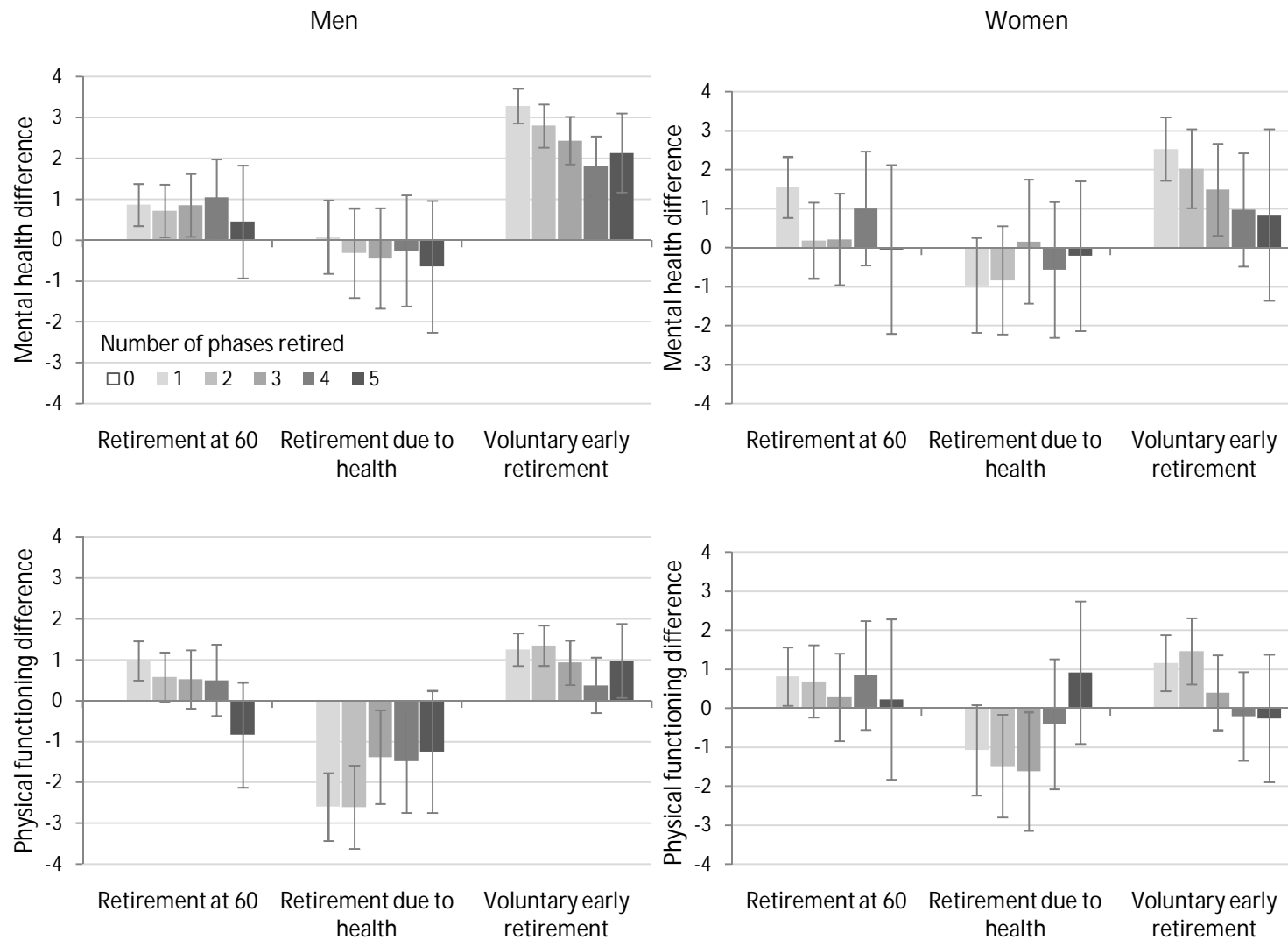
eTable3. Predicting mental health and physical functioning by length of retirement. Six separate multilevel models assessing within-participant effects.

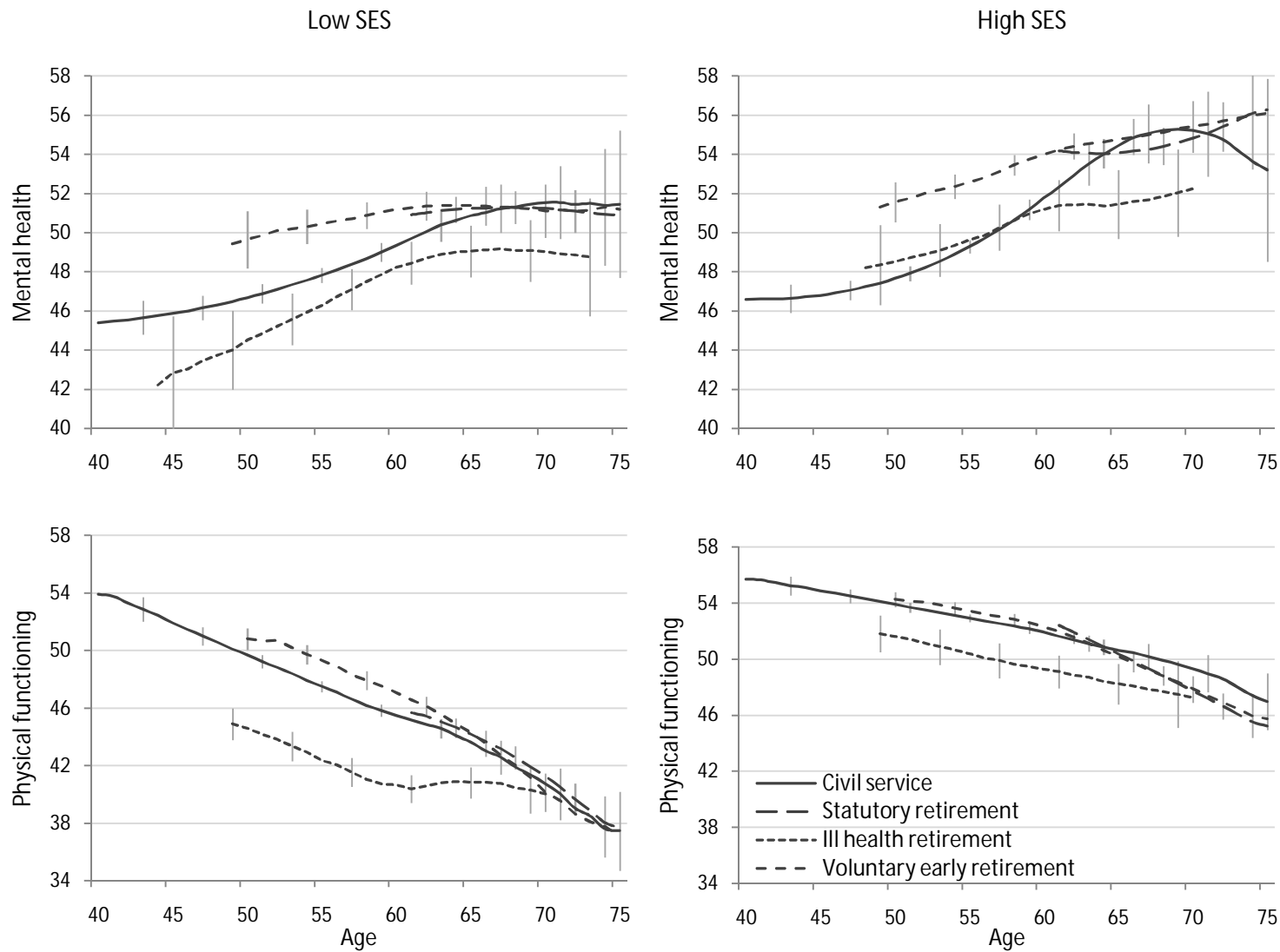| Number of phases retired | Outcome | | n |
| --- | --- | --- | --- |
| | Mental health | Physical functioning | |
| **Statutory retirement** | | | |
| None | (reference) | (reference) | 26354 |
| One | 1.09 (0.66 to 1.52) | 0.92 (0.52 to 1.33) | 1596 |
| Two | 0.54 (0.00 to 1.07) | 0.61 (0.10 to 1.11) | 1203 |
| Three | 0.65 (0.01 to 1.29) | 0.43 (-0.18 to 1.35) | 944 |
| Four | 1.04 (0.26 to 1.83) | 0.61 (-0.13 to 1.35) | 711 |
| Five | 0.30 (-0.87 to 1.46) | -0.46 (-1.56 to 0.63) | 297 |
| **Ill-health retirement** | | | |
| None | (reference) | (reference) | 29175 |
| One | -0.40 (-1.11 to 0.32) | -2.00 (-2.68 to -1.33) | 607 |
| Two | -0.59 (-1.44 to 0.26) | -2.18 (-2.97 to -1.38) | 444 |
| Three | -0.23 (-1.20 to 0.73) | -1.59 (-2.50 to -0.68) | 338 |
| Four | -0.48 (-1.54 to 0.58) | -1.07 (-2.07 to -0.08) | 295 |
| Five | -0.53 (-1.74 to 0.69) | -0.35 (-1.49 to 0.79) | 246 |
| **Voluntary early retirement** | | | |
| None | (reference) | (reference) | 24120 |
| One | 3.09 (2.71 to 3.46) | 1.22 (0.87 to 1.58) | 2231 |
| Two | 2.60 (2.14 to 3.05) | 1.36 (0.94 to 1.79) | 1710 |
| Three | 2.21 (1.70 to 2.71) | 0.78 (0.30 to 1.26) | 1559 |
| Four | 1.60 (0.98 to 2.22) | 0.19 (-0.39 to 0.78) | 997 |
| Five | 1.79 (0.95 to 2.63) | 0.66 (-0.14 to 1.45) | 488 |

Note: Values are within-participant coefficients (and 95% confidence intervals) of multilevel models and indicate the within-participant difference in health associated with retirement compared to not being retired (reference category). Separate models are fitted for statutory retirement, ill health retirement, and voluntary early retirement. All models adjust for age and period effects (data not shown). Mental health and physical functioning are scored as T-scores (M=50, SD=10). Number of observations is shown in the right-most column. The results are illustrated in figure 2.
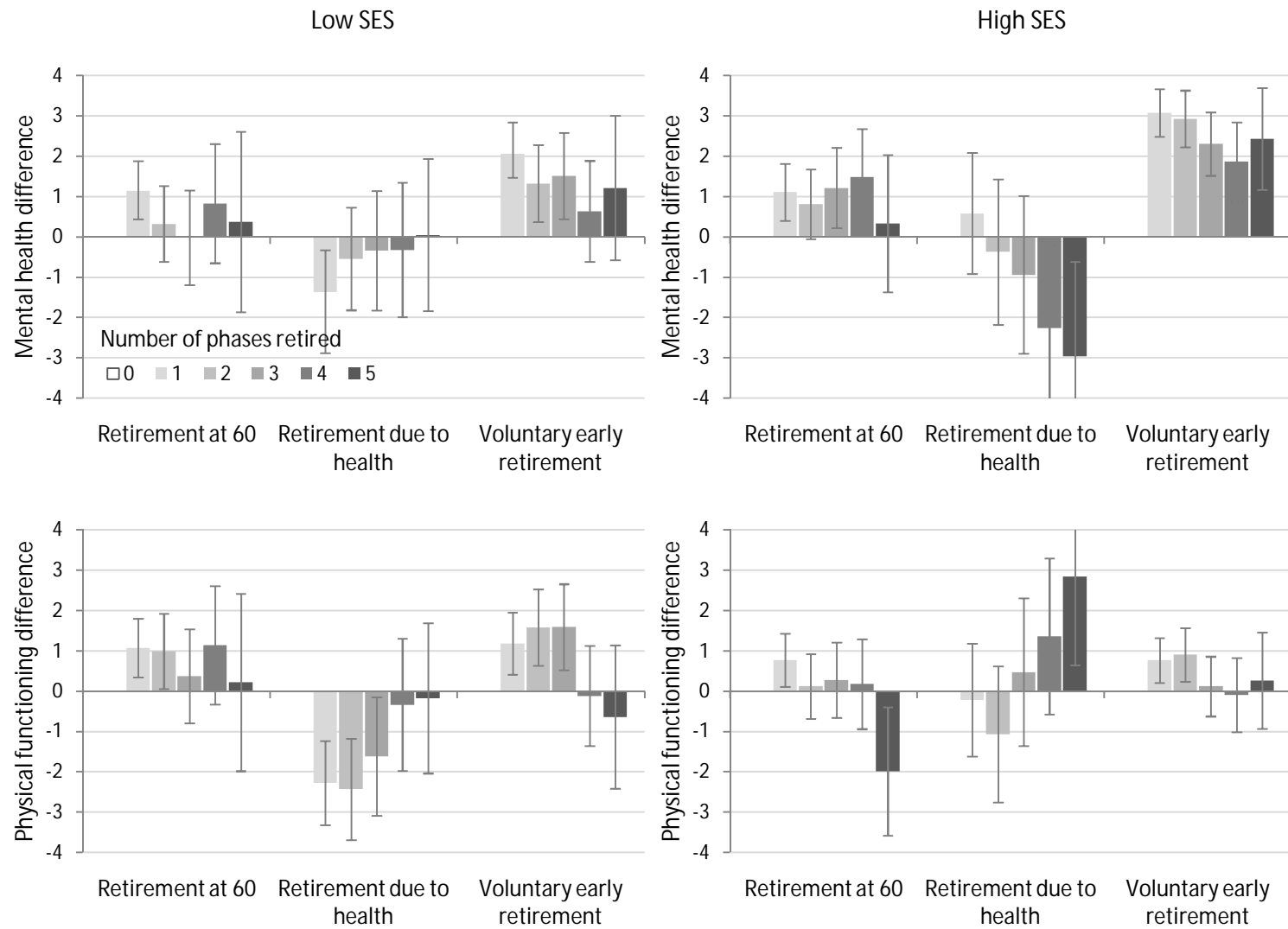
eFigure 1. Trajectories of mental health and physical functioning as a function of retirement status and age fitted separately by sex. Mental health and physical functioning are scored as T-scores (M=50, SD=10). The vertical lines are 95% confidence intervals.

eFigure 2. Associations between length of retirement (number of follow-up phases being retired) and differences in mental health (upper panels) and physical functioning (lower panels). The values are within-participants regression coefficients from separate multilevel models for each reason for retirement. Mental health and physical functioning are scored as T-scores (M=50, SD=10). The vertical lines are 95% confidence intervals.

eFigure 3. Trajectories of mental health (upper panel) and physical functioning (lower panel) as a function of retirement status and age fitted separately by employment grade (socioeconomic status, SES). Mental health and physical functioning are scored as T-scores (M=50, SD=10). The vertical lines are 95% confidence intervals.

eFigure 4. Associations between length of retirement (number of follow-up phases being retired) and differences in mental health (upper panels) and physical functioning (lower panels) by socioeconomic status (SES). The values are within-participants regression coefficients from separate multilevel models for each reason for retirement. Mental health and physical functioning are scored as T-scores (M=50, SD=10). The vertical lines are 95% confidence intervals.