**Supplementary Table S1. Presence of key neuropathological changes in cohort.**

|  |
| --- |
| **Thal Phase** (n=499) |
| ***0*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** |
| 65 (13%) | 69 (14%) | 58 (12%) | 68 (14%) | 102 (20%) | 137 (27%) |
| **Braak Neurofibrillary Tangle Stage** (n=561) |
| ***0*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** |
| 21 (3.7%) | 54 (9.6%) | 131 (23%) | 89 (16%) | 41 (7.3%) | 71 (13%) | 154 (27%) |
| **CERAD Score** (n=522) |
| ***None*** | ***Sparse*** | ***Moderate*** | ***Dense*** |
| 155 (30%) | 98 (19%) | 79 (15%) | 190 (36%) |
| **Braak Lewy body stage** (n=496) |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 366 (74%) | 7 (1.4%) | 10 (2.0%) | 16 (3.2%) | 30 (6.0%) | 31 (6.2%) | 36 (7.3%) |
| **Binary Changes Present** |
| ***VCING - Infarcts*** (n=443) | ***VCING - CAA*** (n=442) | ***VCING - arteriolosclerosis*** (n=440) | ***LATE-NC*** (n=344) |
| 67 (15%) | 176 (40%) | 109 (25%) | 114 (33%) |

**Supplementary Figure S1. Moderation analysis: presence of physical multimorbidity weakens the association between Alzheimer’s pathology and clinical dementia.**



**Supplementary Figure S2. Posterior distributions of associations between multimorbidity categories and presence of dementia before death.**

 **Supplementary Figure S3. Associations of brain comorbidities with dementia and Lewy pathology**

Parkinson’s disease, depression, and other mental disorders are associated with dementia (A) and Lewy body disease (B). Psychiatric (multi)morbidity alone is associated with dementia (C) but not Lewy body disease (D).

