Supplemental material for Multimorbidity Patterns in the US Adults with Subjective Cognitive Decline and Their Relationship with Functional Difficulties
### Appendix 1: Frequency, histogram and missing summary of all variables

| Variable | Stats. Values | Frequency (%) | Histogram | Missing (%) |
|----------|---------------|---------------|-----------|-------------|
| **Age group** | | | | |
| 1. 45-49 | | 1135 (7.30%) | | 131 (0.8%) |
| 2. 50-54 | | 1597 (10.30%) | | |
| 3. 55-59 | | 1978 (12.80%) | | |
| 4. 60-64 | | 2212 (14.30%) | | |
| 5. 65-69 | | 2034 (13.10%) | | |
| 6. 70-74 | | 2035 (13.10%) | | |
| 7. 75-79 | | 1760 (11.40%) | | |
| 8. 80+ | | 2739 (17.70%) | | |
| **Sex** | | | | |
| 1. Male | | 6889 (44.10%) | | 0 (0.0%) |
| 2. Female | | 8732 (55.90%) | | |
| **Race** | | | | |
| 1. Non-white | | 12291 (80.30%) | | 319 (2.0%) |
| 2. white | | 3011 (19.70%) | | |
| **Urban/rural** | | | | |
| 1. Rural counties | | 2509 (16.10%) | | 0 (0.0%) |
| 2. Urban counties | | 13112 (83.90%) | | |
| **Educational level** | | | | |
| 1. Did not graduate high school | | 1935 (12.40%) | | 40 (0.3%) |
| 2. Graduated high school | | 4873 (31.30%) | | |
| 3. Attended college/tech sch | | 4481 (28.80%) | | |
| 4. Graduated college/tech sch | | 4292 (27.50%) | | |
| **Household income** | | | | |
| 1. < $15,000 | | 2359 (18.40%) | | 2786 (17.8%) |
| 2. $15,000 to < $25,000 | | 3169 (24.70%) | | |
| 3. $25,000 to < $35,000 | | 1598 (12.50%) | | |
| 4. $35,000 to < $50,000 | | 1784 (13.90%) | | |
| 5. $50,000 + | | 3925 (29.60%) | | |
| **Employment status** | | | | |
| 1. Out of work/homemaker/student | | 5163 (33.20%) | | 71 (0.5%) |
| 2. Retired | | 7114 (45.70%) | | |
| 3. Unable to work | | 3273 (21.00%) | | |
| **Marital status** | | | | |
| 1. Divorced/widowed/separated/never married | | 8554 (55.10%) | | 83 (0.5%) |
| 2. Married/member of an unmarried couple | | 6984 (44.90%) | | |
| **Hypertension** | | | | |
| 1. No high blood pressure | | 5886 (37.80%) | | 54 (0.3%) |
| 2. High blood pressure | | 9681 (62.20%) | | |
| **Diabetes** | | | | |
| 1. No diabetes | | 11274 (72.40%) | | 45 (0.3%) |
| 2. Diabetes | | 4302 (27.60%) | | |
| **Cholesterol level** | | | | |
| 1. No high cholesterol | | 5955 (41.80%) | | 1383 (8.9%) |
| 2. High cholesterol | | 8283 (58.20%) | | |
| **MI/CHD** | | | | |
| 1. No myocardial infarction or coronary heart disease | | 11873 (77.90%) | | 373 (2.4%) |
| 2. Myocardial infarction or coronary heart disease | | 3375 (22.10%) | | |
| **Stroke** | | | | |
| 1. No stroke | | 13305 (86.00%) | | 147 (0.9%) |
| 2. Stroke | | 2169 (14.00%) | | |
| **Arthritis** | | | | |
| 1. No arthritis | | 5718 (36.90%) | | 128 (0.8%) |
| 2. Arthritis | | 9775 (63.10%) | | |
| **Depression** | | | | |
| 1. No depression | | 8738 (56.50%) | | 144 (0.9%) |
| 2. Depression | | 6739 (43.50%) | | |
| **Kidney disease** | | | | |
| 1. No kidney disease | | 14036 (90.70%) | | 142 (0.9%) |
| 2. Kidney disease | | 1443 (9.30%) | | |
| **Obesity** | | | | |
| 1. < 30 | | 9237 (61.60%) | | 616 (3.9%) |
| 2. > 30 | | 5768 (38.40%) | | |
| **Blind** | | | | |
| 1. No blind or serious difficulty seeing, even with glasses | | 12860 (82.80%) | | 93 (0.6%) |
| 2. Blind or serious difficulty seeing, even with glasses | | 2668 (17.20%) | | |
| **Deaf** | | | | |
| 1. No deaf or serious difficulty hearing | | 11635 (75.00%) | | 108 (0.7%) |
| 2. Deaf or serious difficulty hearing | | 3878 (25.00%) | | |
| **Blind/deaf** | | | | |
| 1. No blind or serious difficulty hearing/seeing, even with glasses | | 9944 (64.20%) | | 142 (0.9%) |
| 2. Blind or serious difficulty hearing/seeing, even with glasses | | 5535 (35.80%) | | |
| Condition                  | Description                                    | Count | Percentage | Count | Percentage |
|----------------------------|-------------------------------------------------|-------|------------|-------|------------|
| Asthma                     | 1. Asthma                                       | 12475 | 80.80%     | 2964  | 19.20%     |
|                            | 2. No Asthma                                    |       |            |       |            |
| COPD                       | 1. COPD, emphysema or chronic bronchitis        | 11806 | 76.60%     | 3603  | 23.40%     |
|                            | 2. No COPD, emphysema or chronic bronchitis    |       |            |       |            |
| Asthma/COPD                | 1. Never asthmas/no COPD                        | 10209 | 66.50%     | 5151  | 33.50%     |
|                            | 2. Former/current asthmas/CO                   |       |            |       |            |
| Skin cancer                | 1. No skin cancer                               | 12624 | 81.30%     | 2670  | 17.20%     |
|                            | 2. Skin cancer                                  |       |            |       |            |
| Other Cancer               | 1. No other cancers                             | 12624 | 81.30%     | 2670  | 17.20%     |
|                            | 2. Other cancers                                |       |            |       |            |
| Cancer                     | 1. No Cancer                                    | 10683 | 69.00%     | 4795  | 31.00%     |
|                            | 2. Cancer                                       |       |            |       |            |
| Hepatitis C                | 1. No hepatitis C                               | 2206  | 95.90%     | 95    | 4.10%      |
|                            | 2. hepatitis C                                  |       |            |       |            |
| Hepatitis B                | 1. No hepatitis B                               | 2241  | 97.80%     | 50    | 2.20%      |
|                            | 2. hepatitis B                                  |       |            |       |            |
| Hepatitis                  | 1. No hepatitis                                 | 2166  | 94.50%     | 126   | 5.50%      |
|                            | 2. Hepatitis                                    |       |            |       |            |
| Smoke status               | 1. Never smoke                                  | 2322  | 15.00%     | 818   | 5.30%      |
|                            | 2. Former smoker                                |       |            |       |            |
|                            | 3. Current smoker, smokes so                    | 5726  | 36.90%     | 6646  | 42.80%     |
|                            | 4. Current smoker, smokes ev                    |       |            |       |            |
| Heavy drinker              | 1. Not heavy drinker                            | 14511 | 94.80%     | 798   | 5.20%      |
|                            | 2. Heavy drinker                                |       |            |       |            |
| Physical exercise          | 1. No physical activity/exer                   | 6583  | 42.20%     | 9000  | 57.80%     |
|                            | 2. Physical activity/exerc                     |       |            |       |            |
| Fruit ≥ 1 per day          | 1. No fruit consumption                         | 6261  | 41.70%     | 8749  | 58.30%     |
|                            | 2. At least once fruit consu                    |       |            |       |            |
| Vegetable ≥ 1 per day      | 1. No vegetable consumption                    | 3524  | 24.00%     | 11158 | 76.00%     |
|                            | 2. At least once vegetable c                    |       |            |       |            |
| Functional impairment      | 1. No functional limitations                   | 5652  | 37.10%     | 9587  | 62.90%     |
|                            | 2. Functional limitations                      |       |            |       |            |
Appendix 2: Correlation matrix of variables for latent class analysis
Appendix 3: Assessment of inverse probability of treatment weighting method

Figure 1: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 1

Figure 2: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 2
Figure 3: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 3

Figure 4: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 4

Figure 5: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 5
Proportions in Each Pair of the Groups on Imputed Data

Figure 6: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data

Figure 7: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data
Figure 8: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data

Figure 9: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data
Figure 10: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 10

Figure 11: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 11
Figure 12: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 12

Figure 13: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 13
Figure 14: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data

Figure 15: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data
Figure 16: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 16

Figure 17: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 17
Figure 18: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 18

Figure 19: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data 19
Figure 20: Absolute Standardized Difference in Unweighted and Weighted Means and Proportions in Each Pair of the Groups on Imputed Data

Table 1: Summary statistics of estimated propensity score from GBM

| Imputation 1 | Minimum | class1 | class2 | class3 | class4 | class5 |
|--------------|---------|--------|--------|--------|--------|--------|
|              |         | 0.028  | 0.076  | 0.028  | 0.004  | 0.001  |
| Imputation | Minimum | 1st Quintile | Median | Mean | 3rd Quintile | Maximum | Standard deviation |
|------------|---------|--------------|--------|------|--------------|---------|-------------------|
| 1          | 0.038   | 0.144        | 0.193  | 0.188| 0.238        | 0.646   | 0.069             |
| 2          | 0.038   | 0.143        | 0.195  | 0.188| 0.231        | 0.675   | 0.068             |
| 3          | 0.033   | 0.146        | 0.194  | 0.189| 0.235        | 0.496   | 0.067             |
| 4          | 0.038   | 0.153        | 0.200  | 0.189| 0.234        | 0.597   | 0.064             |
| 5          | 0.038   | 0.148        | 0.197  | 0.189| 0.234        | 0.597   | 0.064             |
| 6          | 0.038   | 0.148        | 0.197  | 0.189| 0.234        | 0.597   | 0.064             |

**Summary**

- **1st Quintile**: The lowest 20% of the data.
- **Median**: The middle value of the dataset.
- **Mean**: The average of the dataset.
- **3rd Quintile**: The highest 20% of the data.
- **Maximum**: The highest value in the dataset.
- **Standard deviation**: A measure of the amount of variation or dispersion of a set of values.

**Imputation 2**

| Minimum | 1st Quintile | Median | Mean | 3rd Quintile | Maximum | Standard deviation |
|---------|--------------|--------|------|--------------|---------|-------------------|
| 0.038   | 0.143        | 0.195  | 0.188| 0.231        | 0.675   | 0.068             |

**Imputation 3**

| Minimum | 1st Quintile | Median | Mean | 3rd Quintile | Maximum | Standard deviation |
|---------|--------------|--------|------|--------------|---------|-------------------|
| 0.049   | 0.152        | 0.197  | 0.189| 0.230        | 0.535   | 0.064             |

**Imputation 4**

| Minimum | 1st Quintile | Median | Mean | 3rd Quintile | Maximum | Standard deviation |
|---------|--------------|--------|------|--------------|---------|-------------------|
| 0.033   | 0.146        | 0.194  | 0.189| 0.235        | 0.496   | 0.067             |

**Imputation 5**

| Minimum | 1st Quintile | Median | Mean | 3rd Quintile | Maximum | Standard deviation |
|---------|--------------|--------|------|--------------|---------|-------------------|
| 0.038   | 0.153        | 0.200  | 0.189| 0.234        | 0.597   | 0.064             |

**Imputation 6**

| Minimum | 1st Quintile | Median | Mean | 3rd Quintile | Maximum | Standard deviation |
|---------|--------------|--------|------|--------------|---------|-------------------|
| 0.038   | 0.148        | 0.197  | 0.189| 0.234        | 0.597   | 0.064             |
| Imputation    | Minimum | 1st Quintile | Median | Mean | 3rd Quintile | Maximum | Standard deviation |
|--------------|---------|--------------|--------|------|--------------|---------|--------------------|
| Imputation 7 | 0.041   | 0.147        | 0.201  | 0.189| 0.232        | 0.597   | 0.064              |
|              | 0.056   | 0.178        | 0.257  | 0.275| 0.342        | 0.774   | 0.128              |
|              | 0.006   | 0.120        | 0.199  | 0.223| 0.311        | 0.853   | 0.108              |
|              | 0.011   | 0.107        | 0.151  | 0.177| 0.223        | 0.640   | 0.094              |
|              | 0.001   | 0.062        | 0.114  | 0.135| 0.188        | 0.837   | 0.098              |
| Imputation 8 | 0.051   | 0.149        | 0.199  | 0.189| 0.229        | 0.552   | 0.062              |
|              | 0.059   | 0.179        | 0.249  | 0.275| 0.337        | 0.819   | 0.127              |
|              | 0.030   | 0.138        | 0.197  | 0.224| 0.306        | 0.628   | 0.107              |
|              | 0.016   | 0.106        | 0.150  | 0.177| 0.224        | 0.674   | 0.097              |
|              | 0.001   | 0.061        | 0.117  | 0.135| 0.187        | 0.717   | 0.095              |
| Imputation 9 | 0.033   | 0.144        | 0.194  | 0.188| 0.233        | 0.583   | 0.069              |
|              | 0.060   | 0.183        | 0.251  | 0.276| 0.339        | 0.815   | 0.122              |
|              | 0.036   | 0.135        | 0.197  | 0.223| 0.311        | 0.593   | 0.107              |
|              | 0.013   | 0.107        | 0.152  | 0.178| 0.224        | 0.703   | 0.100              |
|              | 0.001   | 0.063        | 0.115  | 0.134| 0.181        | 0.771   | 0.096              |
| Imputation 10| 0.041   | 0.148        | 0.198  | 0.189| 0.231        | 0.579   | 0.066              |
|              | 0.052   | 0.178        | 0.253  | 0.275| 0.340        | 0.817   | 0.127              |
|              | 0.043   | 0.138        | 0.199  | 0.224| 0.310        | 0.545   | 0.104              |
|              | 0.011   | 0.105        | 0.154  | 0.177| 0.224        | 0.674   | 0.098              |
|              | 0.002   | 0.061        | 0.122  | 0.135| 0.188        | 0.767   | 0.093              |
| Imputation 11| 0.034   | 0.151        | 0.200  | 0.189| 0.229        | 0.579   | 0.066              |
|              | 0.047   | 0.183        | 0.253  | 0.276| 0.338        | 0.817   | 0.127              |
|              | 0.029   | 0.137        | 0.202  | 0.223| 0.312        | 0.545   | 0.104              |
|              | 0.011   | 0.105        | 0.152  | 0.177| 0.226        | 0.674   | 0.098              |
|              | 0.001   | 0.068        | 0.116  | 0.135| 0.182        | 0.767   | 0.093              |
| Imputation | Minimum   | 1st Quintile | Median   | Mean      | 3rd Quintile | Maximum   | Standard deviation |
|------------|-----------|--------------|----------|-----------|--------------|-----------|--------------------|
| **12**     | 0.037     | 0.140        | 0.192    | 0.188     | 0.236        | 0.674     | 0.067              |
|            | 0.061     | 0.182        | 0.257    | 0.276     | 0.348        | 0.798     | 0.126              |
|            | 0.031     | 0.133        | 0.199    | 0.224     | 0.311        | 0.551     | 0.105              |
|            | 0.011     | 0.104        | 0.152    | 0.178     | 0.226        | 0.716     |                    |
|            | 0.000     | 0.062        | 0.116    | 0.135     | 0.183        | 0.759     |                    |
| **13**     | 0.044     | 0.145        | 0.199    | 0.189     | 0.231        | 0.462     | 0.061              |
|            | 0.074     | 0.177        | 0.254    | 0.276     | 0.342        | 0.797     | 0.125              |
|            | 0.039     | 0.137        | 0.201    | 0.224     | 0.309        | 0.574     | 0.107              |
|            | 0.006     | 0.106        | 0.152    | 0.177     | 0.227        | 0.704     | 0.099              |
|            | 0.001     | 0.058        | 0.116    | 0.135     | 0.187        | 0.899     |                    |
| **14**     | 0.038     | 0.153        | 0.201    | 0.189     | 0.233        | 0.511     | 0.063              |
|            | 0.055     | 0.176        | 0.255    | 0.275     | 0.348        | 0.809     | 0.124              |
|            | 0.037     | 0.134        | 0.196    | 0.223     | 0.311        | 0.592     | 0.107              |
|            | 0.003     | 0.097        | 0.149    | 0.177     | 0.231        | 0.788     | 0.107              |
|            | 0.000     | 0.059        | 0.119    | 0.136     | 0.187        | 0.808     |                    |
| **15**     | 0.035     | 0.143        | 0.198    | 0.189     | 0.234        | 0.513     | 0.066              |
|            | 0.066     | 0.180        | 0.263    | 0.277     | 0.347        | 0.791     | 0.123              |
|            | 0.029     | 0.138        | 0.200    | 0.223     | 0.312        | 0.655     | 0.106              |
|            | 0.016     | 0.110        | 0.151    | 0.177     | 0.222        | 0.619     | 0.091              |
|            | 0.001     | 0.062        | 0.116    | 0.135     | 0.188        | 0.766     |                    |
| **16**     | 0.016     | 0.139        | 0.193    | 0.188     | 0.233        | 0.671     | 0.071              |
|            | 0.062     | 0.184        | 0.252    | 0.276     | 0.341        | 0.780     | 0.125              |
|            | 0.035     | 0.139        | 0.196    | 0.224     | 0.311        | 0.567     | 0.107              |
|            | 0.004     | 0.099        | 0.150    | 0.177     | 0.223        | 0.778     | 0.105              |
|            | 0.001     | 0.061        | 0.115    | 0.136     | 0.182        | 0.851     |                    |
|            |           |              |          |           |              |           |                    |
| Imputation | Minimum | 1st Quintile | Median | Mean | 3rd Quintile | Maximum | Standard deviation |
|------------|---------|--------------|--------|------|--------------|---------|--------------------|
| 17         | 0.048   | 0.053        | 0.046  | 0.009| 0.000        |         |                    |
|            | 0.155   | 0.182        | 0.132  | 0.104| 0.060        |         |                    |
|            | 0.202   | 0.256        | 0.197  | 0.150| 0.116        |         |                    |
|            | 0.189   | 0.276        | 0.224  | 0.177| 0.136        |         |                    |
|            | 0.228   | 0.337        | 0.313  | 0.226| 0.186        |         |                    |
|            | 0.461   | 0.785        | 0.526  | 0.727| 0.795        |         |                    |
|            | 0.060   | 0.123        | 0.106  | 0.102| 0.101        |         |                    |
| 18         | 0.045   | 0.045        | 0.035  | 0.004| 0.000        |         |                    |
|            | 0.148   | 0.181        | 0.138  | 0.098| 0.060        |         |                    |
|            | 0.200   | 0.251        | 0.201  | 0.152| 0.116        |         |                    |
|            | 0.189   | 0.275        | 0.224  | 0.177| 0.135        |         |                    |
|            | 0.231   | 0.331        | 0.309  | 0.224| 0.184        |         |                    |
|            | 0.590   | 0.823        | 0.565  | 0.779| 0.888        |         |                    |
|            | 0.063   | 0.127        | 0.107  | 0.105| 0.098        |         |                    |
| 19         | 0.040   | 0.060        | 0.032  | 0.006| 0.002        |         |                    |
|            | 0.151   | 0.177        | 0.136  | 0.101| 0.065        |         |                    |
|            | 0.198   | 0.259        | 0.194  | 0.148| 0.121        |         |                    |
|            | 0.189   | 0.276        | 0.223  | 0.178| 0.135        |         |                    |
|            | 0.231   | 0.344        | 0.308  | 0.228| 0.187        |         |                    |
|            | 0.561   | 0.788        | 0.607  | 0.809| 0.790        |         |                    |
|            | 0.064   | 0.124        | 0.107  | 0.105| 0.091        |         |                    |
| 20         | 0.039   | 0.047        | 0.030  | 0.006| 0.001        |         |                    |
|            | 0.145   | 0.178        | 0.135  | 0.103| 0.064        |         |                    |
|            | 0.197   | 0.258        | 0.197  | 0.150| 0.118        |         |                    |
|            | 0.189   | 0.276        | 0.224  | 0.177| 0.135        |         |                    |
|            | 0.230   | 0.347        | 0.313  | 0.225| 0.185        |         |                    |
|            | 0.581   | 0.813        | 0.584  | 0.741| 0.727        |         |                    |
|            | 0.067   | 0.127        | 0.106  | 0.102| 0.094        |         |                    |
Appendix 4:

Table 1: Classification Diagnostics of the 5-class LCA Model

| Predicted class                  | AvePP | OCC  |
|----------------------------------|-------|------|
| Age associated                   | 0.62  | 5.64 |
| Severely impaired                | 0.70  | 13.89|
| Minimal chronic conditions       | 0.74  | 8.07 |
| Obesity/diabetes                 | 0.60  | 6.80 |
| Respiratory/depression           | 0.61  | 6.80 |

Figure 1: Boxplot of Estimated Propensity Scores in the Five Groups on the 20 Imputed Data
Appendix 5: Missing Pattern of Variables for Research Question 2

Note: darker colour indicates higher values; red color indicates missing; data are sorted by cognitive-related functional impairment.