

Supplementary Information

Supplementary Table 1: Characteristics of individuals in the discovery and replication proteomic datasets as well as of the transcriptomic dataset.

Supplementary Table 2: The discovery PWAS of AD

Supplementary Table 3: Correlation of the estimated protein weights in the discovery and replication proteomic datasets.

Supplementary Table 4: The confirmatory PWAS of AD

Supplementary Table 5: COLOC test results for the 13 significant genes from the discovery AD PWAS

Supplementary Table 6: Summary data-level Mendelian randomization (SMR) for the 13 significant genes from the discovery AD PWAS

Supplementary Table 7: The discovery PWAS of AD adjusting for *APOE E4*

Supplementary Table 8: COLOC for the significant genes from the discovery AD PWAS adjusting for *APOE E4*.

Supplementary Table 9: SMR test results for the significant genes from the discovery AD PWAS adjusting for *APOE E4*.

Supplementary Table 10: PWAS of AD using Kunkle et al GWAS

Supplementary Table 11: PWAS of ALS

Supplementary Table 12: PWAS of Parkinson's disease

Supplementary Table 13: PWAS of neuroticism

Supplementary Table 14: PWAS of BMI

Supplementary Table 15: PWAS of WHR

Supplementary Table 16: PWAS of height

Supplementary Table 17: TWAS of AD

Supplementary Table 18: Comparison of 11 potentially causal AD genes at the transcript and protein levels

Supplementary Table 19: Cell type enrichment of gene expression for the genes consistent with being causal in AD

Supplementary Table 20: The first two genetic principal components from subjects of the a) discovery proteomic dataset; b) replication proteomic dataset; c) transcriptomic dataset