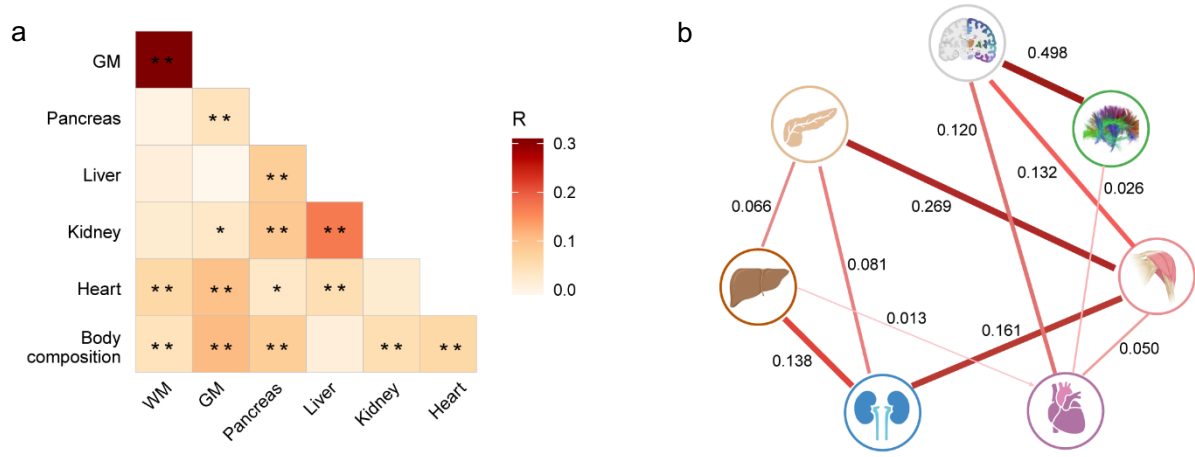


14 **Supplementary Figures**

15

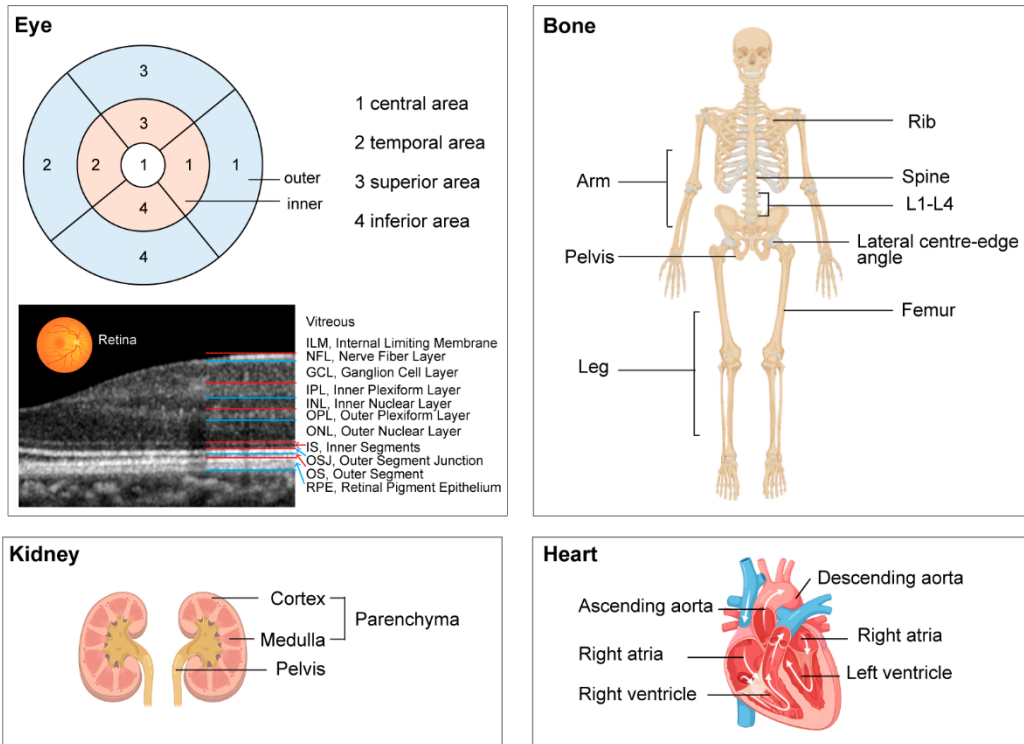


16

17 **Supplementary Figure 1 Interrelationships between age gap across organs in sensitivity analysis.**

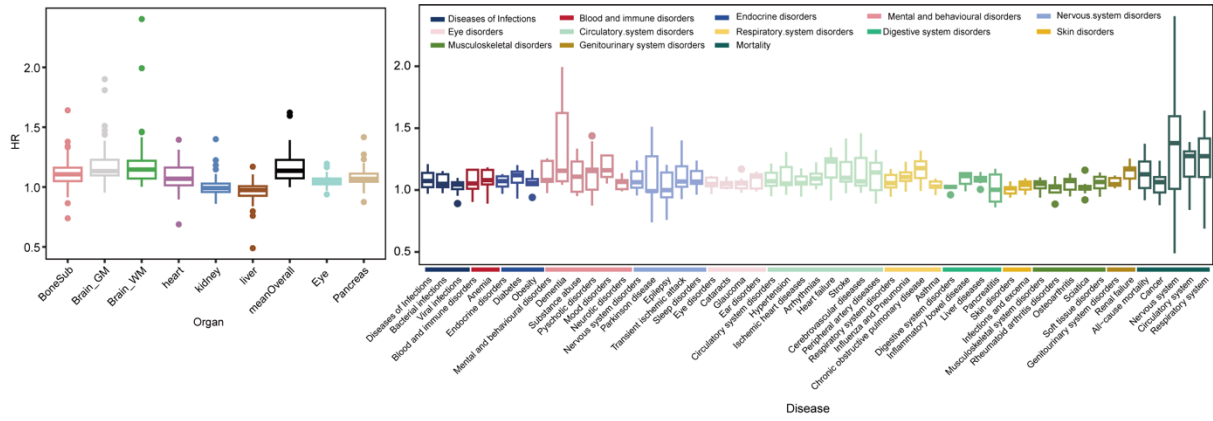
18 The organ age gap was calculated as the difference between predicted age and chronological age. after
 19 which chronological age, sex and scanning site were regressed out from age gaps. The residuals were
 20 used for following analysis. **(a)** The Pearson' s coefficients of associations between the age gap of
 21 different organs are shown, with darker represent higher relationships. * < 0.05, ** < 0.01. **(b)** The
 22 multi-organ aging networks characterizing the influence of the age gap of one organ on another.
 23 Significant links were inferred by SEM at a threshold of Bonferroni-corrected $P < (0.05/11 \text{ pairs})$,
 24 thicker and darker lines represent stronger influence.

25



26
 27
 28
 29
 30

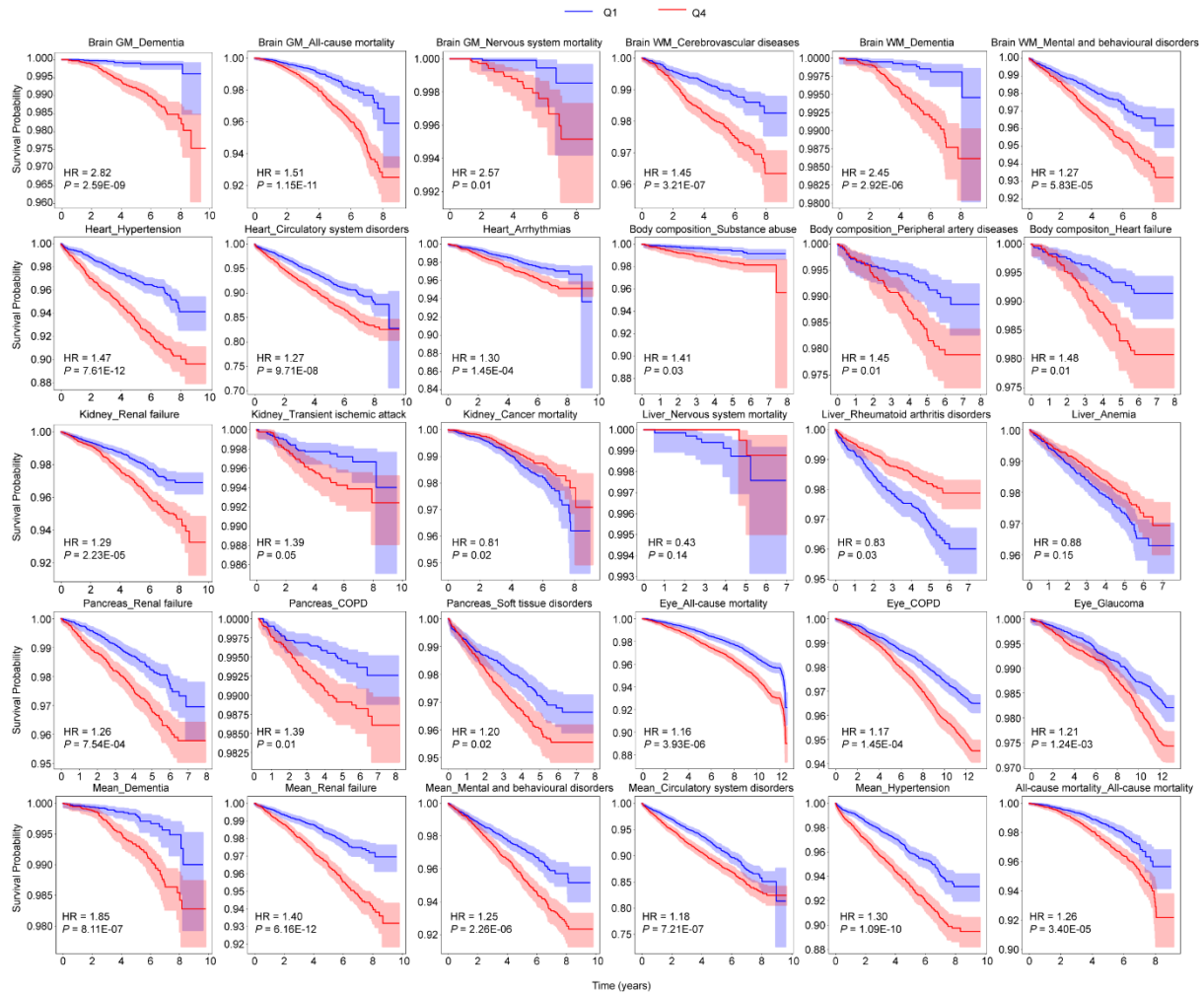
Supplementary Figure 2 Diagram of the anatomy of different human organs used in the study. To enhance readability, this diagram illustrates the top anatomical structures involved in the IDPs contributing most to the biological age of the organs.



31

32 **Supplementary Figure 3 Distributions of hazard ratios (HRs) or regression coefficients (betas) for**

33 **each organ/outcome category.**

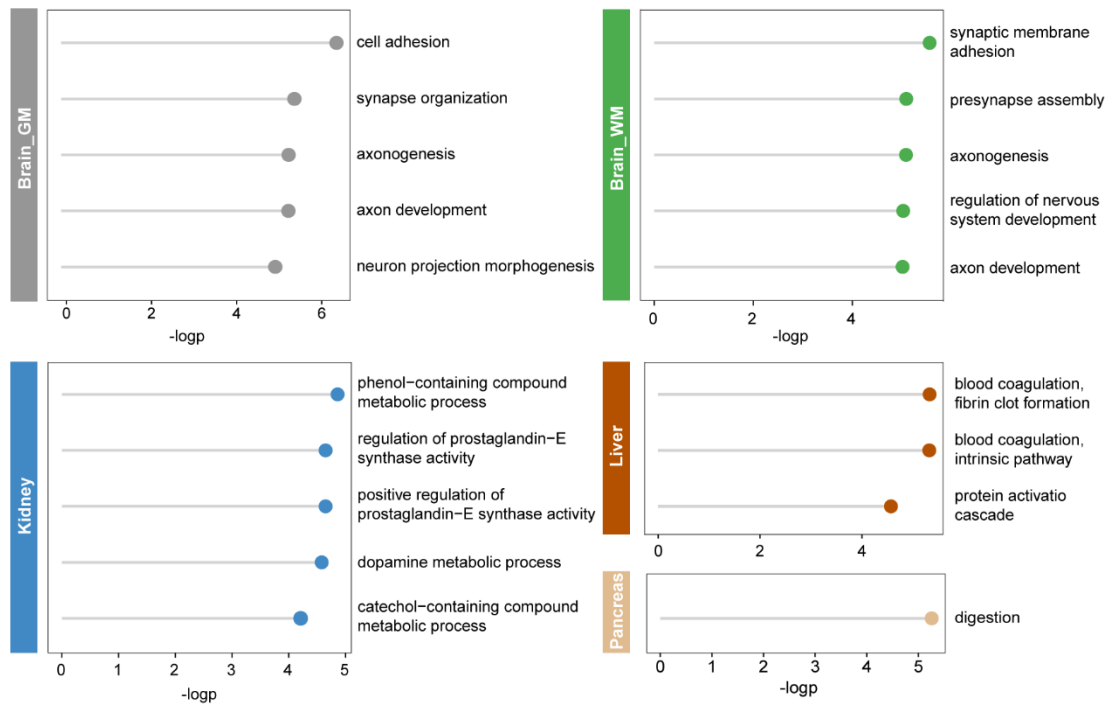


34

35 **Supplementary Figure 4 Stratified organ age influence risk of disease and health outcomes.** The
 36 survival curve demonstrating the association between stratified organ-specific age gap and incident of
 37 13 different categories of diseases or health outcomes during follow-up. The organ-specific age gap was
 38 grouped to quantiles from lowest to highest, the Q4 is shown red and Q1 is shown in blue. The same
 39 associations as those presented in the main text are displayed. The associations between mean age gap
 40 across organs and disease risk is demonstrated in the last row.

51 composition. **(c)** The same as B but taking 30% participants as hold-out test data.

52



53

54

Supplementary Figure 6 GO biological process enrichment of positively and negatively associated

55

proteins for different organs. The lollipop plots demonstrating the enrichment of the associated

56

proteins of organ-specific age gap in different GO biological processes. The x axis represents $-\log_{10}$

57

transformation of the uncorrected P values, the y axis represents the top five biological processes in

58

enrichment results of the corresponding organ. The significance was determined by FDR-corrected $P <$

59

0.05 for each organ.

