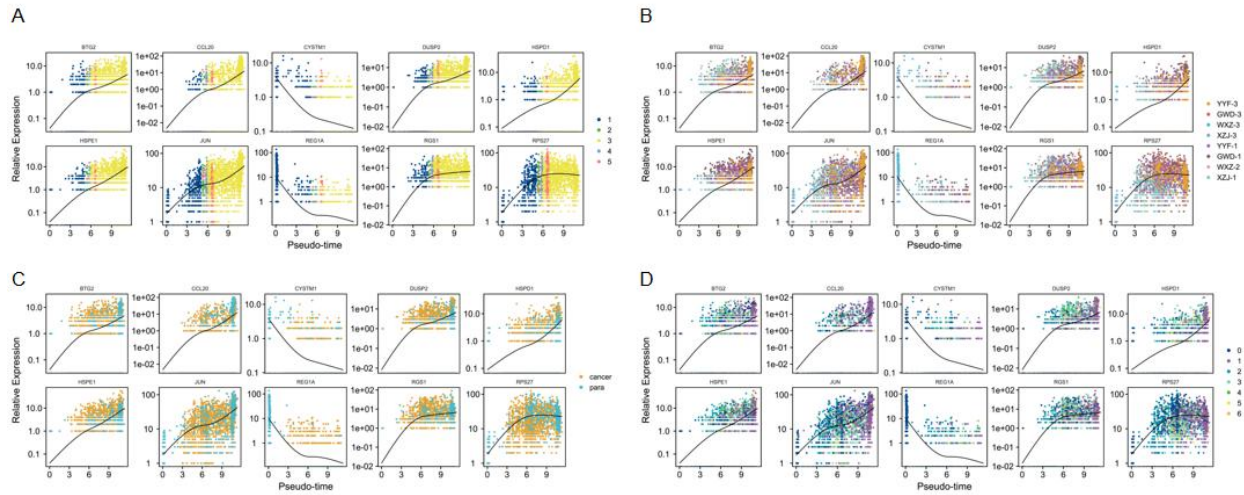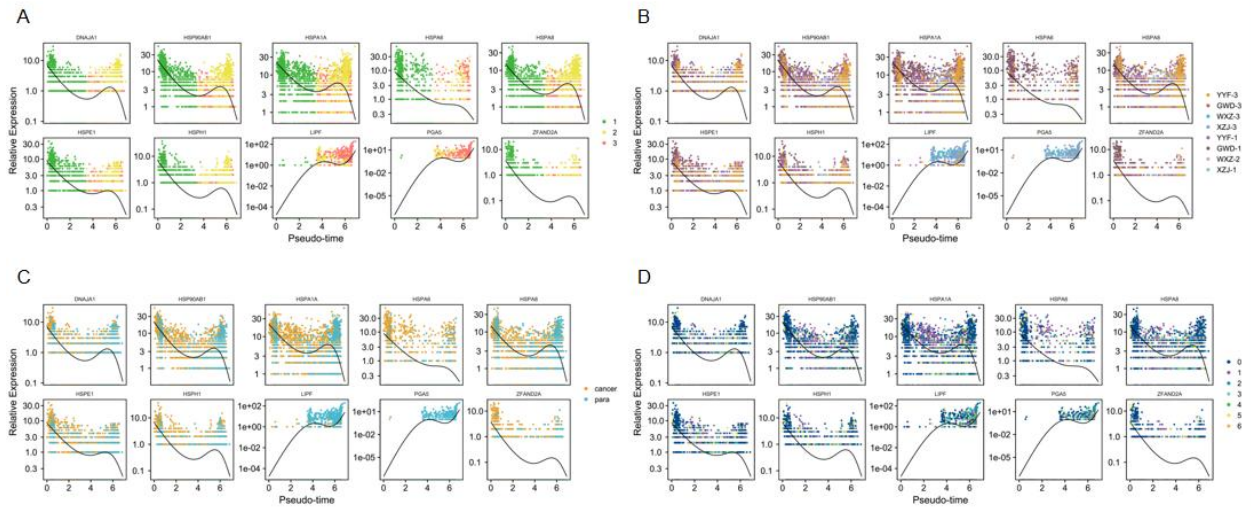**Supplementary Figure 1. T cell analysis**. A. UMAP plot of cell clusters, with cell clusters on the left and cell types on the right; B. Distribution of CD4 T cell subsets based on the T cells and CD4 T marker gene expression; C. Distribution of CD8 T cell subsets identified by the T cells and CD8 T marker gene expression. UMAP, Uniform Manifold Approximation and Projection.

Supplementary Figure 2 Top 10 differentially expressed genes in CD4 T cell branches

A–D: Trajectory diagrams of the top 10 DEG expression levels with pseudo-time line of differentiation (A), tissue samples at distinct stages (B), cancerous and paracancerous (C), and CD4T cell subsets (D). DEG, differentially expressed gene.

Supplementary Figure 3. Top 10 differentially expressed genes in the CD8 T cell branches

A. Trajectory diagrams of DEG expression in the TOP10 clusters with quasi-timeline of differentiation (A), cancerous tissues at varying stages (B), cancerous and paracancerous tissues (C), and CD8 T subsets (D). DEG, differentially expressed gene.