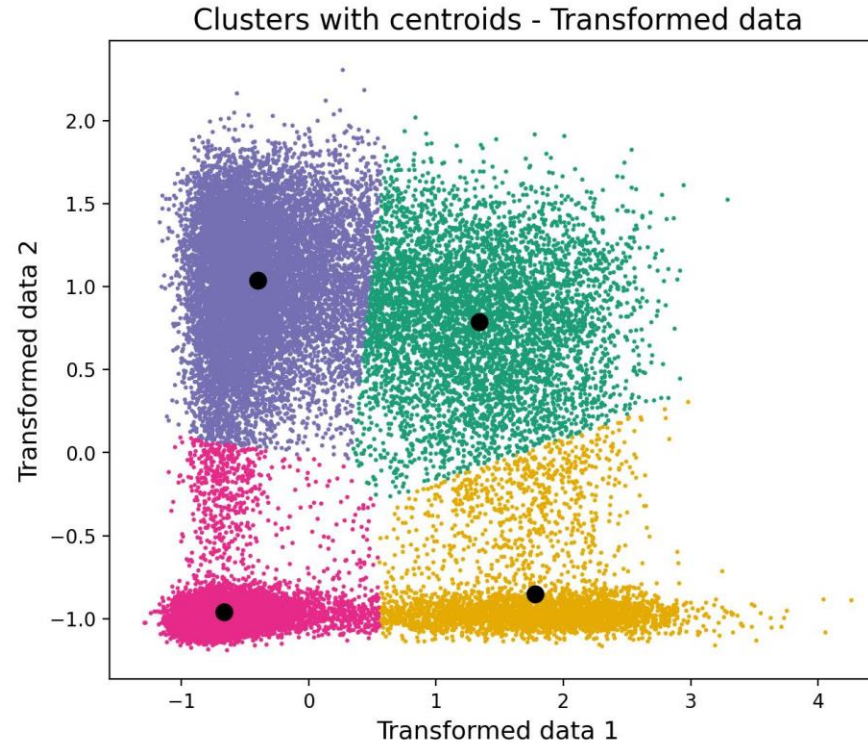
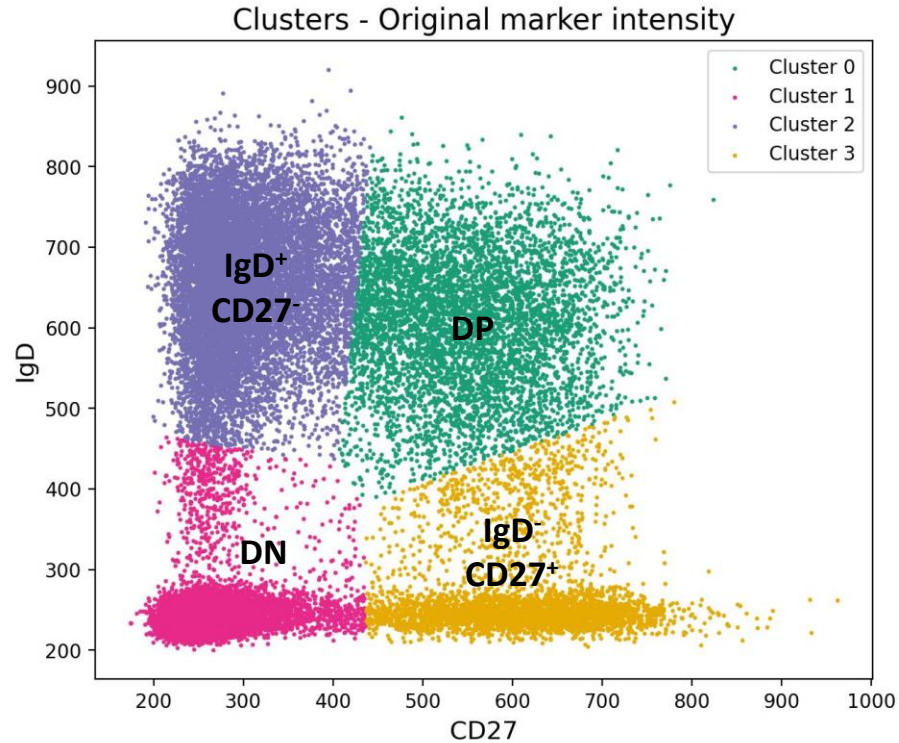
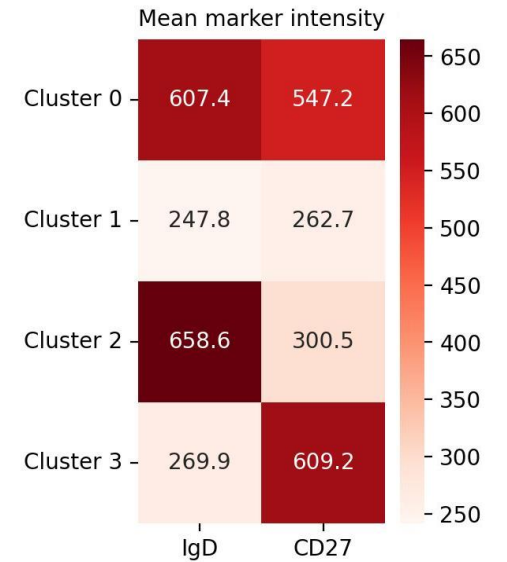


Results of K-Means clustering with four clusters

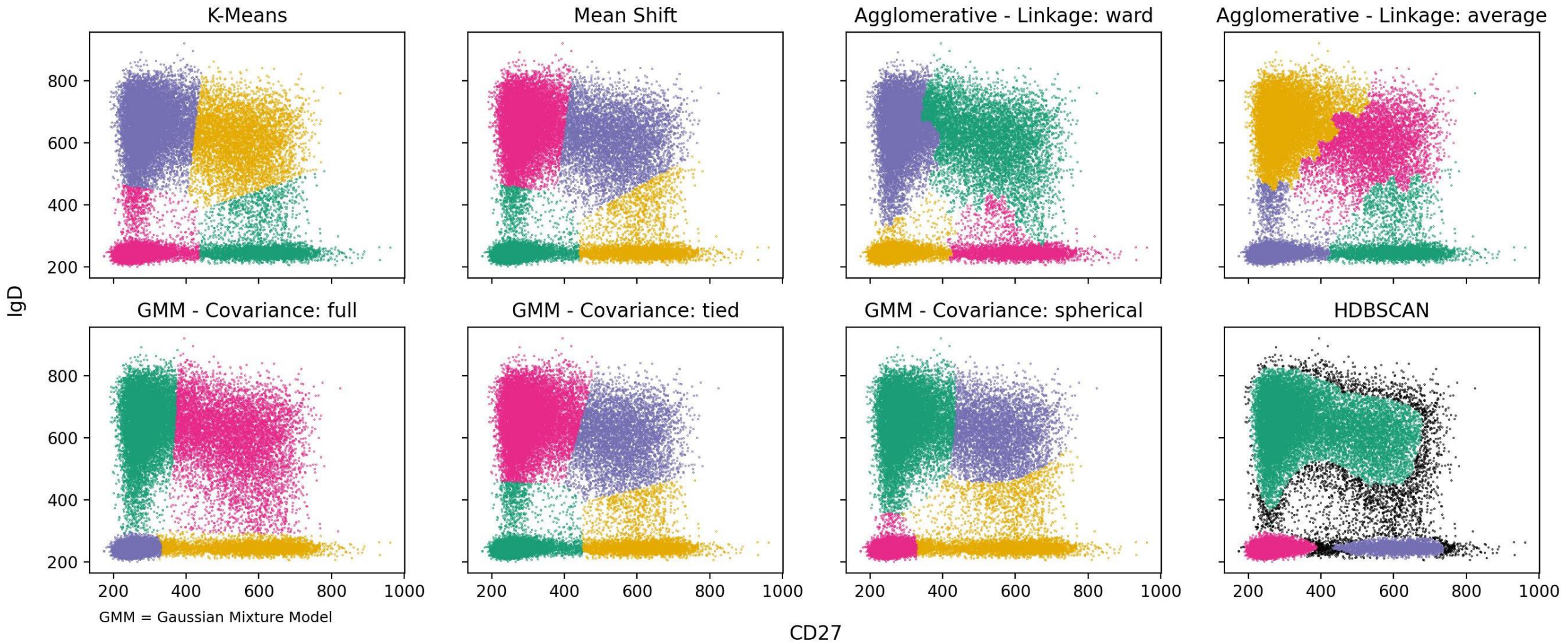


Identified cell groups:

- Cluster 0 – double positive (DP)
- Cluster 1 – double negative (DN)
- Cluster 2 – IgD⁺CD27⁻
- Cluster 3 – IgD⁻CD27⁺

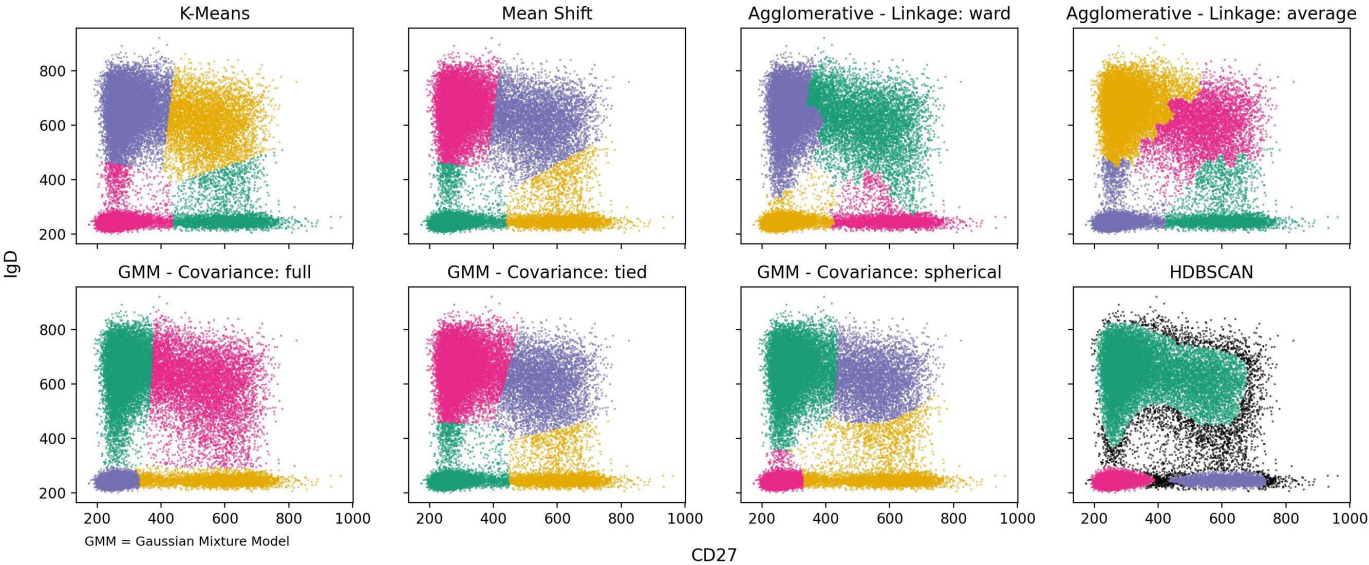


Comparison of different clustering methods



HDBSCAN did not separate IgD⁺ cells into two populations along the marker CD27. These cells remained in the same cluster even with notably higher number of clusters.

Comparison of different clustering methods



Metrics for evaluation

