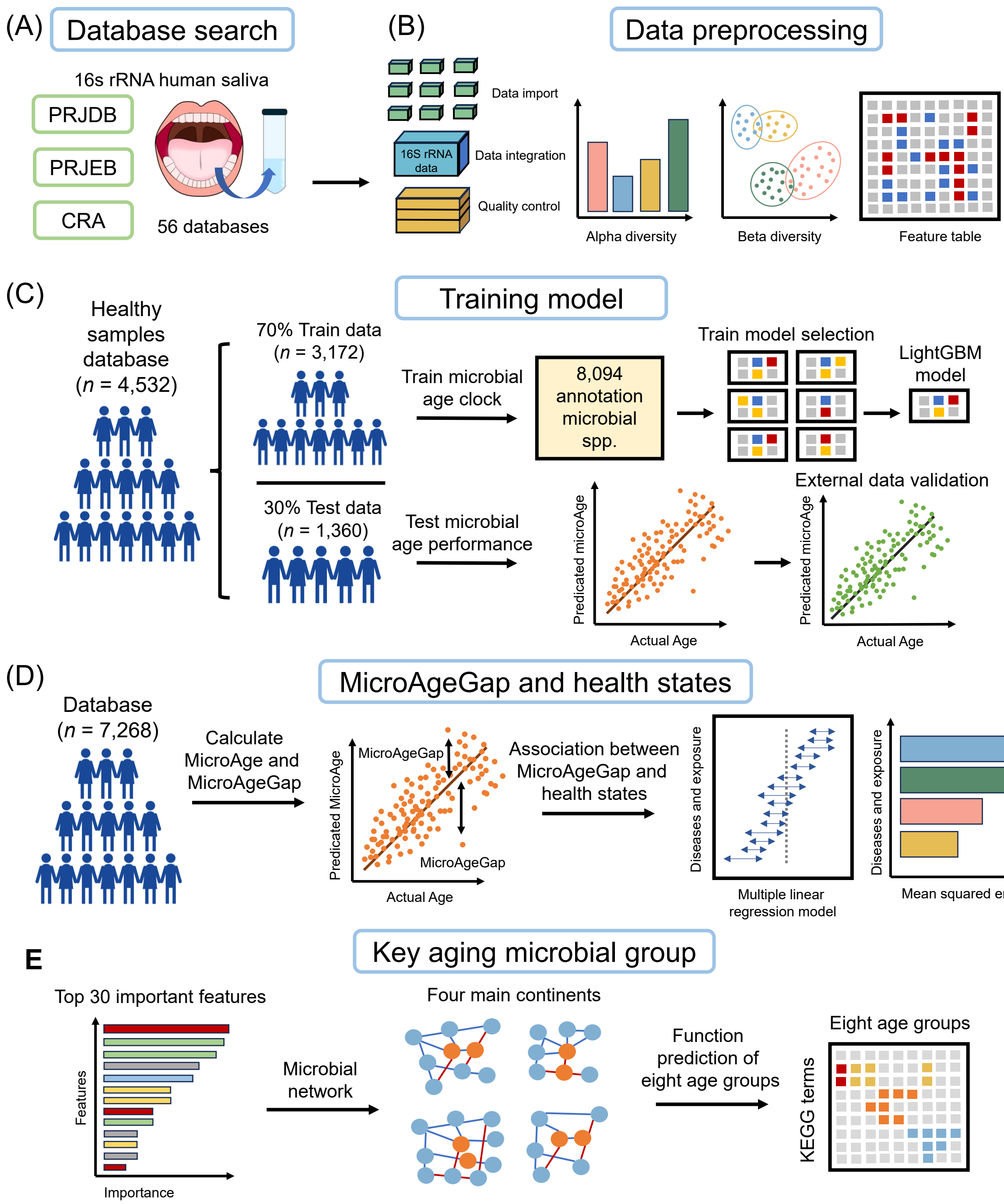
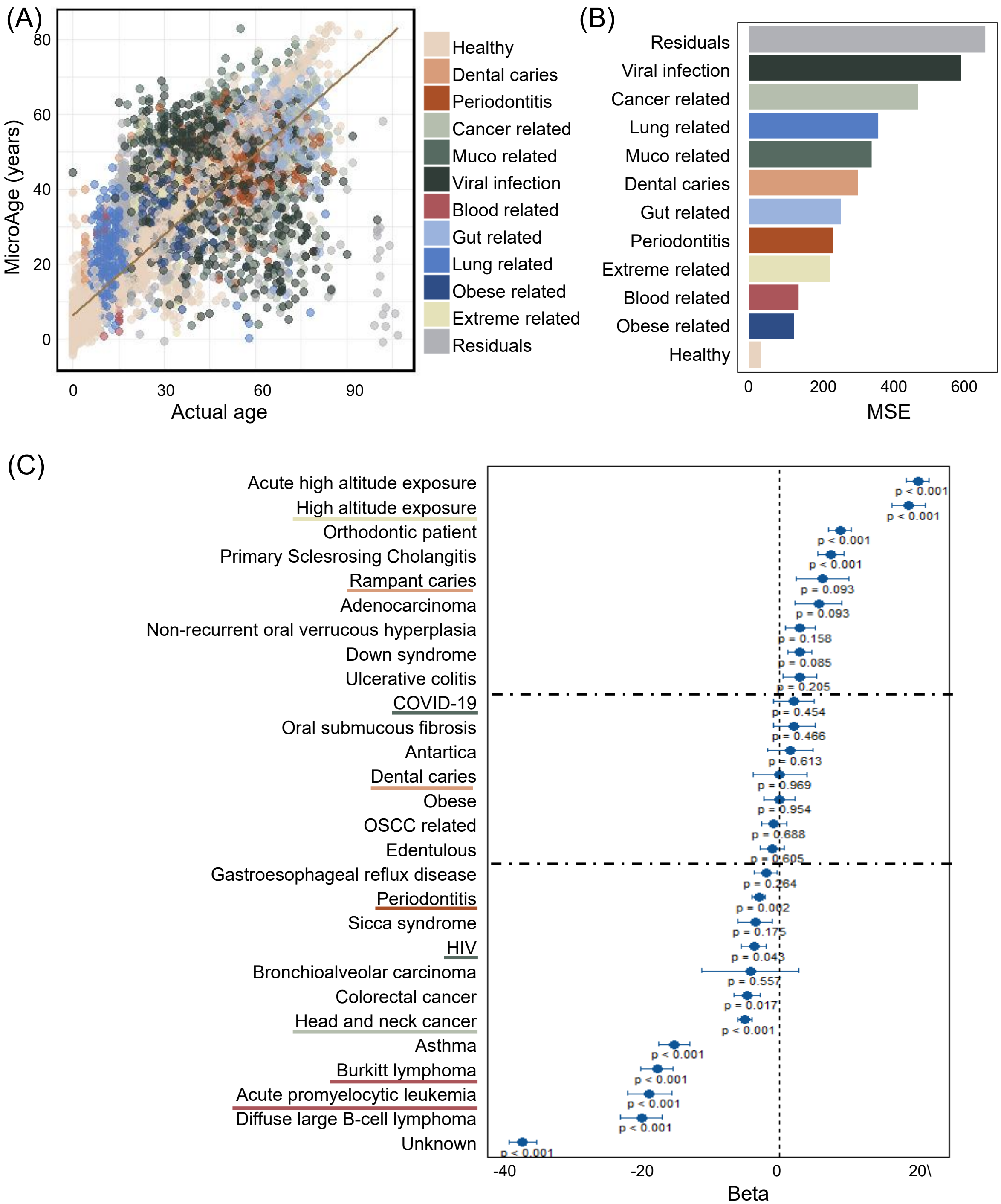

(A)
Database search
16s rRNA human saliva
PRJDB
PRJEB
CRA
56 databases
(B)
Data preprocessing
Data import
16S rRNA data
Data integration
Quality control
Alpha diversity
Beta diversity
Feature table
(C)
Training model
Healthy samples database (n = 4,532)
70% Train data (n = 3,172)
30% Test data (n = 1,360)
Train microbial age clock
8,094 annotation microbial spp.
Train model selection
LightGBM model
Test microbial age performance
Predicated microAge
Actual Age
External data validation
(D)
MicroAgeGap and health states
Database (n = 7,268)
Calculate MicroAge and MicroAgeGap
MicroAgeGap
Predicated MicroAge
Actual Age
Association between MicroAgeGap and health states
Diseases and exposure
Multiple linear regression model
Mean squared error
E
Key aging microbial group
Top 30 important features
Features
Importance
Microbial network
Four main continents
Function prediction of eight age groups
Eight age groups
KEGG terms


(A)
MicroAge (years)
Actual age
0
30
60
90
0
20
40
60
80
Healthy
Dental caries
Periodontitis
Cancer related
Muco related
Viral infection
Blood related
Gut related
Lung related
Obese related
Extreme related
Residuals
(B)
Residuals
Viral infection
Cancer related
Lung related
Muco related
Dental caries
Gut related
Periodontitis
Extreme related
Blood related
Obese related
Healthy
0
200
400
600
MSE
(C)
Acute high altitude exposure
High altitude exposure
Orthodontic patient
Primary Sclesrosing Cholangitis
Rampant caries
Adenocarcinoma
Non-recurrent oral verrucous hyperplasia
Down syndrome
Ulcerative colitis
COVID-19
Oral submucous fibrosis
Antartica
Dental caries
Obese
OSCC related
Edentulous
Gastroesophageal reflux disease
Periodontitis
Sicca syndrome
HIV
Bronchioalveolar carcinoma
Colorectal cancer
Head and neck cancer
Asthma
Burkitt lymphoma
Acute promyelocytic leukemia
Diffuse large B-cell lymphoma
Unknown
p < 0.001
p < 0.001
p < 0.001
p < 0.001
p = 0.093
p = 0.093
p = 0.158
p = 0.085
p = 0.205
p = 0.454
p = 0.466
p = 0.613
p = 0.969
p = 0.954
p = 0.688
p = 0.605
p = 0.264
p = 0.002
p = 0.175
p = 0.043
p = 0.557
p = 0.017
p < 0.001
p < 0.001
p < 0.001
p < 0.001
p < 0.001
p < 0.001
-40
-20
0
20\
Beta