

# Package ‘Maaslin2’

January 25, 2022

**Title** ``Multivariable Association Discovery in Population-scale  
Meta-omics Studies''

**Year** 2021

**Version** 1.8.0

**Depends** R (>= 3.6)

**Description** MaAsLin2 is comprehensive R package for efficiently determining multivariable association between clinical metadata and microbial meta'omic features. MaAsLin2 relies on general linear models to accommodate most modern epidemiological study designs, including cross-sectional and longitudinal, and offers a variety of data exploration, normalization, and transformation methods. MaAsLin2 is the next generation of MaAsLin.

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**LazyData** false

**Imports** robustbase, biglm, pcaPP, edgeR, metagenomeSeq, lpsymphony,  
pbapply, car, dplyr, vegan, chemometrics, ggplot2, pheatmap,  
logging, data.table, lmerTest, hash, optparse, grDevices,  
stats, utils, glmmTMB, MASS, cplm, pscl, lme4

**Suggests** knitr, testthat (>= 2.1.0), rmarkdown

**VignetteBuilder** knitr

**Collate** fit.R utility\_scripts.R viz.R Maaslin2.R

**URL** <http://huttenhower.sph.harvard.edu/maaslin2>

**biocViews** Metagenomics, Software, Microbiome, Normalization

**BugReports** <https://github.com/biobakery/maaslin2/issues>

**git\_url** <https://git.bioconductor.org/packages/Maaslin2>

**git\_branch** RELEASE\_3\_14

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Maaslin2	<i>MaAsLin2 is the next generation of MaAsLin, a multivariable statistical framework for finding associations between clinical metadata and potentially high-dimensional microbial multi-omics data.</i>
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### Description

MaAsLin2 finds associations between microbiome meta-omics features and complex metadata in population-scale epidemiological studies. The software includes multiple analysis methods (including support for multiple covariates and repeated measures), filtering, normalization, and transform options to customize analysis for your specific study.

### Usage

```
Maaslin2(
  input_data,
  input_metadata,
  output,
  min_abundance = 0.0,
  min_prevalence = 0.1,
  min_variance = 0.0,
  normalization = "TSS",
  transform = "LOG",
  analysis_method = "LM",
  max_significance = 0.25,
  random_effects = NULL,
  fixed_effects = NULL,
  correction = "BH",
  standardize = TRUE,
  cores = 1,
  plot_heatmap = TRUE,
  plot_scatter = TRUE,
  heatmap_first_n = 50,
  reference = NULL
)
```

### Arguments

input_data	The tab-delimited input file of features.
input_metadata	The tab-delimited input file of metadata.
output	The output folder to write results.

<code>min_abundance</code>	The minimum abundance for each feature.
<code>min_prevalence</code>	The minimum percent of samples for which a feature is detected at minimum abundance.
<code>min_variance</code>	Keep features with variance greater than.
<code>max_significance</code>	The q-value threshold for significance.
<code>normalization</code>	The normalization method to apply.
<code>transform</code>	The transform to apply.
<code>analysis_method</code>	The analysis method to apply.
<code>random_effects</code>	The random effects for the model, comma-delimited for multiple effects.
<code>fixed_effects</code>	The fixed effects for the model, comma-delimited for multiple effects.
<code>correction</code>	The correction method for computing the q-value.
<code>standardize</code>	Apply z-score so continuous metadata are on the same scale.
<code>plot_heatmap</code>	Generate a heatmap for the significant associations.
<code>heatmap_first_n</code>	In heatmap, plot top N features with significant associations.
<code>plot_scatter</code>	Generate scatter plots for the significant associations.
<code>cores</code>	The number of R processes to run in parallel.
<code>reference</code>	The factor to use as a reference for a variable with more than two levels provided as a string of 'variable,reference' semi-colon delimited for multiple variables.

**Value**

Data.frame containing the results from applying the model.

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**Examples**

```
input_data <- system.file(
  'extdata', 'HMP2_taxonomy.tsv', package="Maaslin2")
input_metadata <- system.file(
  'extdata', 'HMP2_metadata.tsv', package="Maaslin2")
fit_data <- Maaslin2(
  input_data, input_metadata, 'demo_output', transform = "AST",
  fixed_effects = c('diagnosis', 'dysbiosisnonIBD', 'dysbiosisUC', 'dysbiosisCD', 'antibiotics', 'age'),
  random_effects = c('site', 'subject'),
  normalization = 'NONE',
  reference = 'diagnosis,nonIBD',
  standardize = FALSE)
```

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