

# Package ‘Maaslin2’

May 15, 2024

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

**Year** 2021

**Version** 1.19.0

**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, pbapply, car,  
dplyr, vegan, chemometrics, ggplot2, pheatmap, logging,  
data.table, lmerTest, hash, optparse, grDevices, stats, utils,  
glmmTMB, MASS, cplm, pscl, lme4, tibble

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

**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>

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## Contents

Maaslin2 .....	2
<b>Index</b>	<b>5</b>

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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,
  heatmap_first_n = 50,
  plot_scatter = TRUE,
  max_pngs = 10,
  save_scatter = FALSE,
  save_models = FALSE,
```

```

    reference = NULL
  )

```

### Arguments

<code>input_data</code>	The tab-delimited input file of features.
<code>input_metadata</code>	The tab-delimited input file of metadata.
<code>output</code>	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>max_pngs</code>	Set the maximum number of scatter plots for significant associations to save as png files.
<code>save_scatter</code>	Save all scatter plot ggplot objects to an RData file.
<code>cores</code>	The number of R processes to run in parallel.
<code>save_models</code>	Return the full model outputs and save to an RData file.
<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

List containing the results from applying the model.

### Author(s)

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 Ali Rahnavard<gholamali.rahnavard@gmail.com>,  
 Maintainers: Lauren McIver<lauren.j.mciver@gmail.com>,

**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)
```

# Index

Maaslin2, [2](#)