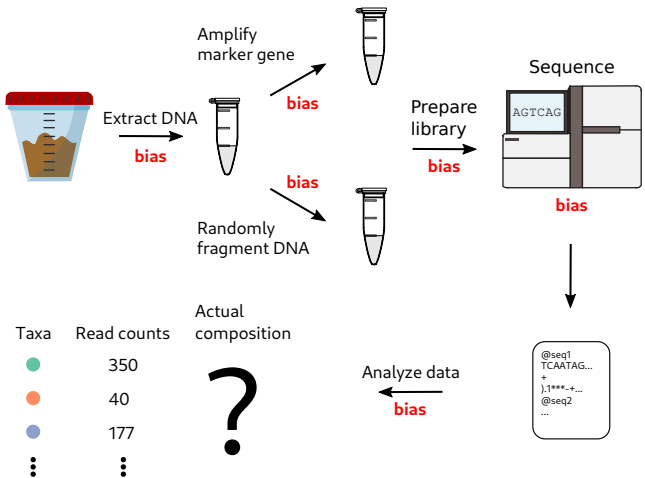


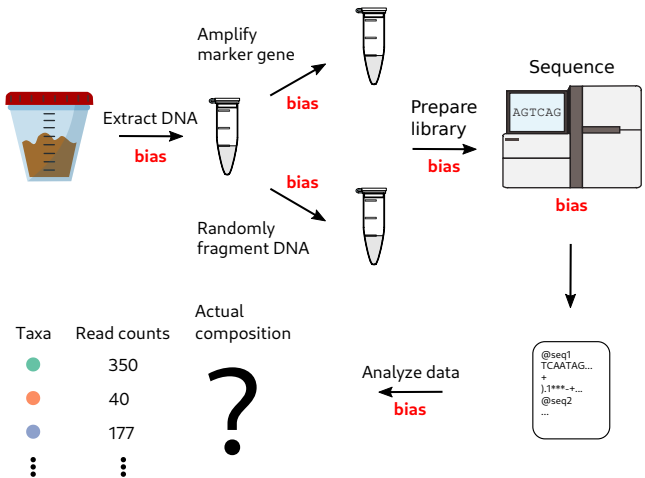
Michael McLaren • NC State
mikemc.cc • @mikemc423

New methods to control for experimental bias
in microbiome differential abundance analysis

Experimental bias makes microbiome measurements inaccurate and incomparable across experiments



Experimental bias makes microbiome measurements inaccurate and incomparable across experiments



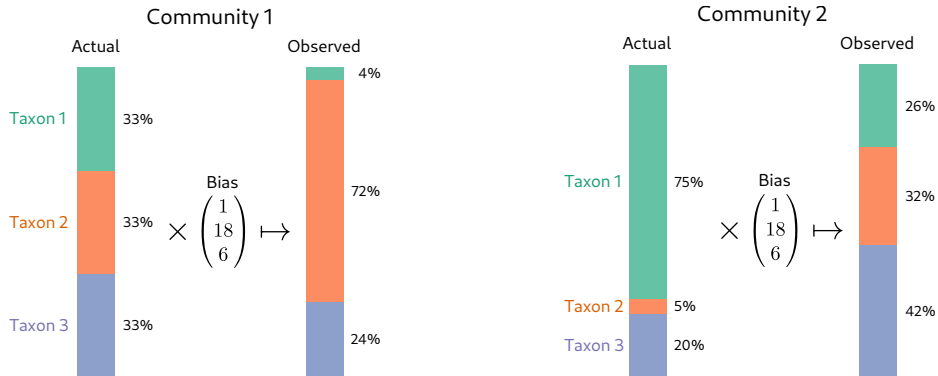
We proposed that

observed;
 \propto actual; \times efficiency;

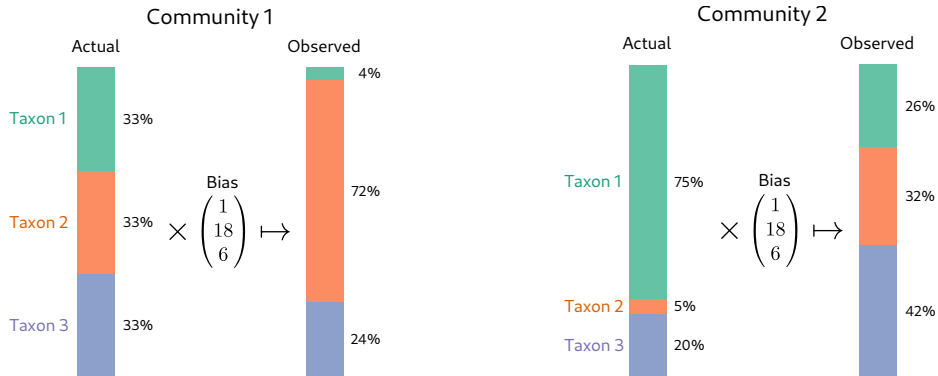
McLaren, Willis, Callahan
 eLife 2019; 8:e46923.

```
@seq1
TCAATAG...
+
),1***-+...
@seq2
...
```

Bias cancels in analysis of ratios, but not proportions

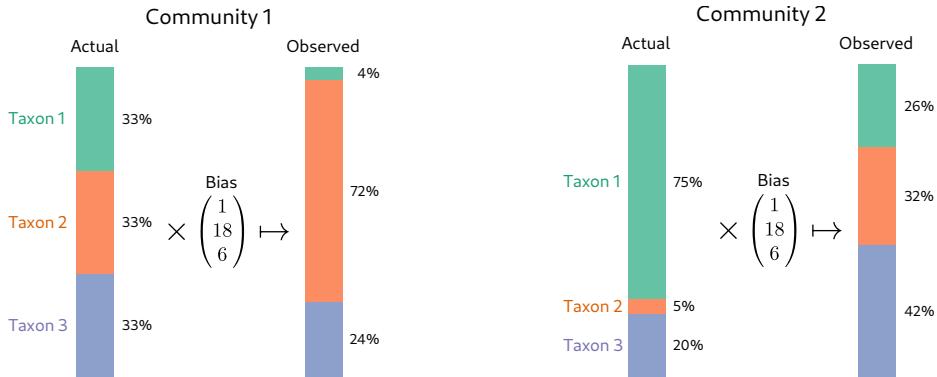


Bias cancels in analysis of ratios, but not proportions



The ratio of Taxon 2:Taxon 3 decreases by 4X (actual and observed)

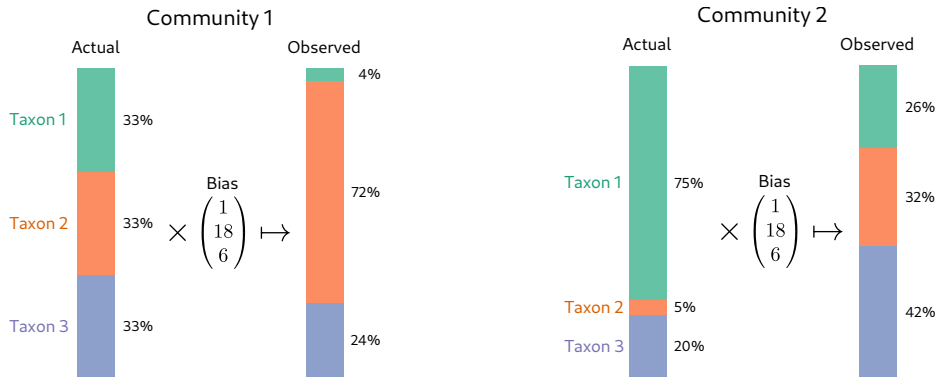
Bias cancels in analysis of ratios, but not proportions



The ratio of Taxon 2:Taxon 3 decreases by 4X (actual and observed)

The proportion of Taxon 3 **actually decreases but is observed to increase**

Bias cancels in analysis of ratios, but not proportions

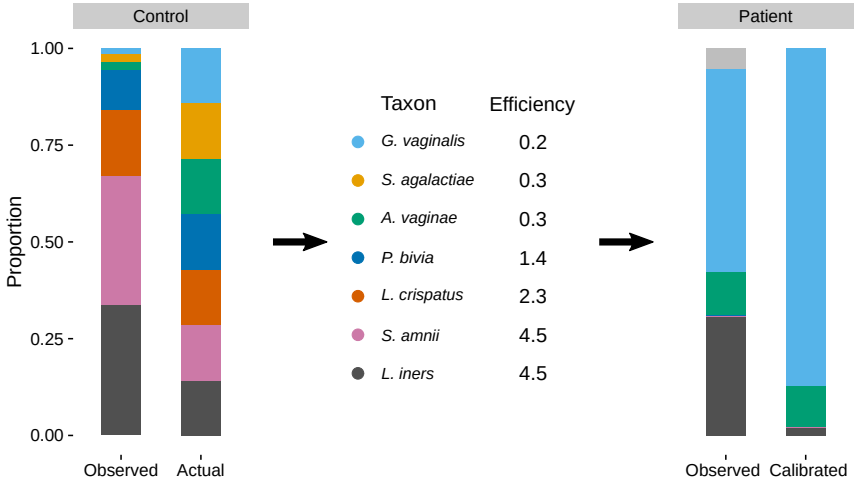


The ratio of Taxon 2:Taxon 3 decreases by 4X (actual and observed)

The proportion of Taxon 3 **actually decreases but is observed to increase**

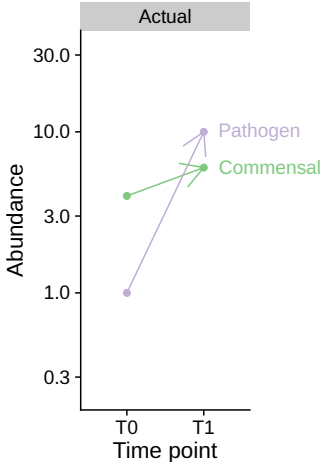
$$\text{observed}_i = \text{actual}_i \times \frac{\text{efficiency}_i}{\text{mean efficiency in sample}}$$

Bias estimated from controls can be used to calibrate the measurements of unknown samples

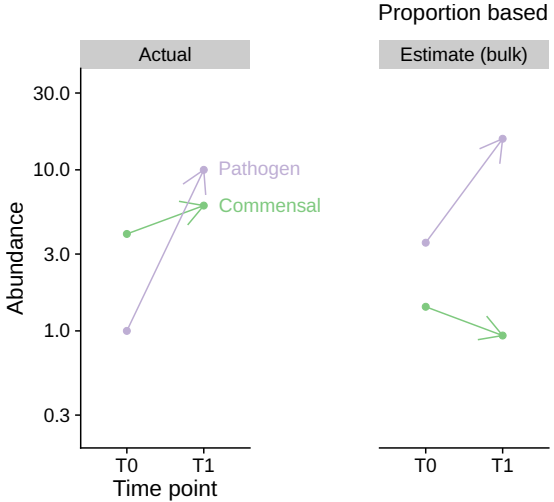


Data from Brooks et al (2015, doi:10.1186/s12866-015-0351-6)

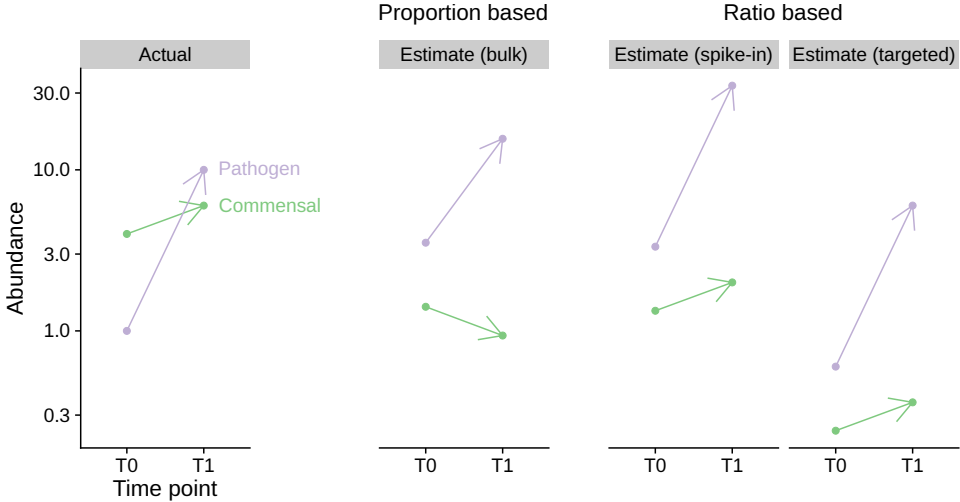
Absolute-abundance methods based on ratios are less susceptible to bias than methods based on proportions



Absolute-abundance methods based on ratios are less susceptible to bias than methods based on proportions



Absolute-abundance methods based on ratios are less susceptible to bias than methods based on proportions



Learn more / get in touch



Consistent and correctable bias in metagenomic sequencing experiments

Michael R McLaren¹, Amy D Willis², Benjamin J Callahan^{1,3*}

McLaren et al. eLife 2019;8:e46923. DOI: <https://doi.org/10.7554/eLife.46923>

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Watch manuscript in progress at github.com/mikemc/bda-theory

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Discussions

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