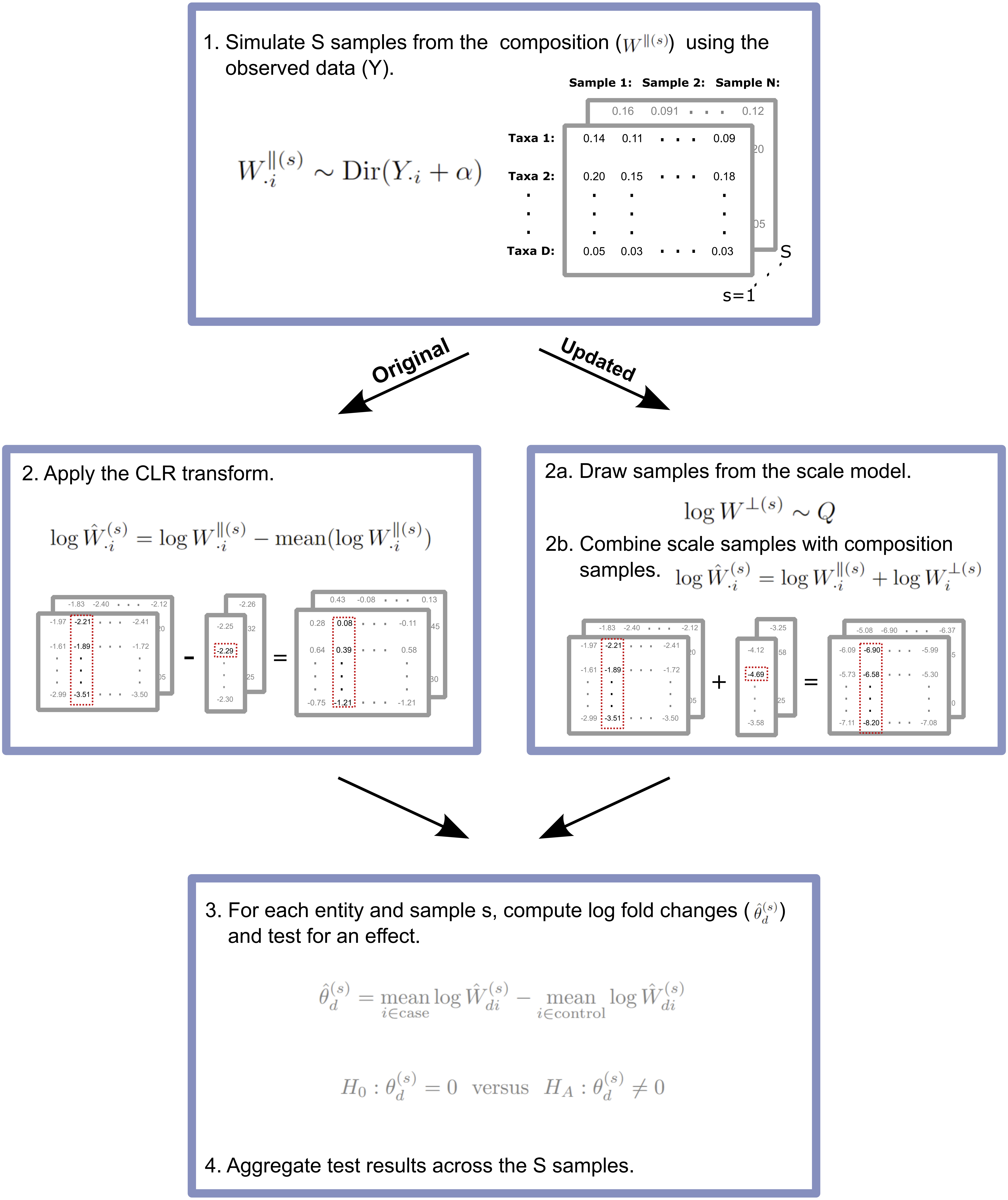

1. Simulate S samples from the composition ($W^{\parallel(s)}$) using the observed data (Y).
$W_{\cdot i}^{\parallel(s)} \sim \mathrm{Dir}(Y_{\cdot i} + \alpha)$
Sample 1: Sample 2: Sample N:
0.16 0.091 0.12
Taxa 1: 0.14 0.11 0.09
Taxa 2: 0.20 0.15 0.18
Taxa D: 0.05 0.03 0.03
S
s=1
Original
Updated
2. Apply the CLR transform.
$\log \hat{W}_{\cdot i}^{(s)} = \log W_{\cdot i}^{\parallel(s)} - \mathrm{mean}(\log W_{\cdot i}^{\parallel(s)})$
2a. Draw samples from the scale model.
$\log W^{\perp(s)} \sim Q$
2b. Combine scale samples with composition samples. $\log \hat{W}_{\cdot i}^{(s)} = \log W_{\cdot i}^{\parallel(s)} + \log W_{i}^{\perp(s)}$
3. For each entity and sample s, compute log fold changes ($\hat{\theta}_d^{(s)}$) and test for an effect.
$\hat{\theta}_d^{(s)} = \underset{i \in \text{case}}{\mathrm{mean}} \log \hat{W}_{di}^{(s)} - \underset{i \in \text{control}}{\mathrm{mean}} \log \hat{W}_{di}^{(s)}$
$H_0 : \theta_d^{(s)} = 0 \quad \text{versus} \quad H_A : \theta_d^{(s)} \neq 0$
4. Aggregate test results across the S samples.