Keyword analysis: Progress through regression **(?)**

Lukas Sönning
University of Bamberg

lsoenning.github.io

Objectives

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- Explore use of regression for keyness analysis
- Illustration: Key verbs in academic writing
- Advantages + disadvantages
- Conclusion
- Manuscript: psyarxiv.com/**25mwj**

Keyness

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Keyness analysis

- Identification of items that are typical of a particular text variety
- Target corpus vs. reference corpus
- Keyness metrics: Ranking of items

Keyness as a multidimensional construct

- Most keyness metrics: Frequency comparisons (target vs. reference corpus)
- Different aspects of keyness: **Distinctiveness** vs. **generality** Egbert & Biber 2019, Gries 2021
- **Frequency**-oriented vs. **dispersion**-oriented approaches

Four dimensions

	Frequency-oriented	Dispersion-oriented
Target corpus in isolation	Discernibility • Occurrence rate (e.g. pmw)	Generality • Range [l] • *TD* [m] • D_{KL} [g] • D, S_{adj}, D_{2}, D_{P}, D_{A} [b]
Comparison to reference corpus	Distinctiveness • Rate ratio [a] • Rate difference [b] • *PS* [b] • Log ratio [c] • Difference coefficient [d] • %DIFF [e] • Odds ratio [f] • Signed D_{KL} [g] • Chi-squared test [d] • Likelihood-ratio test [h] • Wilcoxon test [j] • t-test [j] • BIC [k]	Comparative generality • *TD* ratio [m] • *TD* difference[b] • D_{KL} difference [g] • D, S_{adj}, D_{2}, D_{P}, D_{A} difference [b] • *TD*-based LR test [m]

Descriptive
Inferential

[a] Kilgarriff 2009
[b] Sönning 2022a
[c] Hardie 2014
[d] Hofland & Johansson 1982
[e] Gabrielatos & Marchi 2011
[f] Pojanapunya & Watson Todd 2016
[g] Gries 2021
[h] Dunning 1993
[j] Kilgarriff 1996
[k] Wilson 2013
[l] Rayson 2003
[m] Egbert & Biber 2019

Count regression models

- Data type: Non-negative integers
- Large family e.g. Cameron & Trivedi 2013
- Basic version: Poisson regression
- Count regression underused in linguistics Winter & Bürkner 2021

- We will use: **Negative binomial regression**

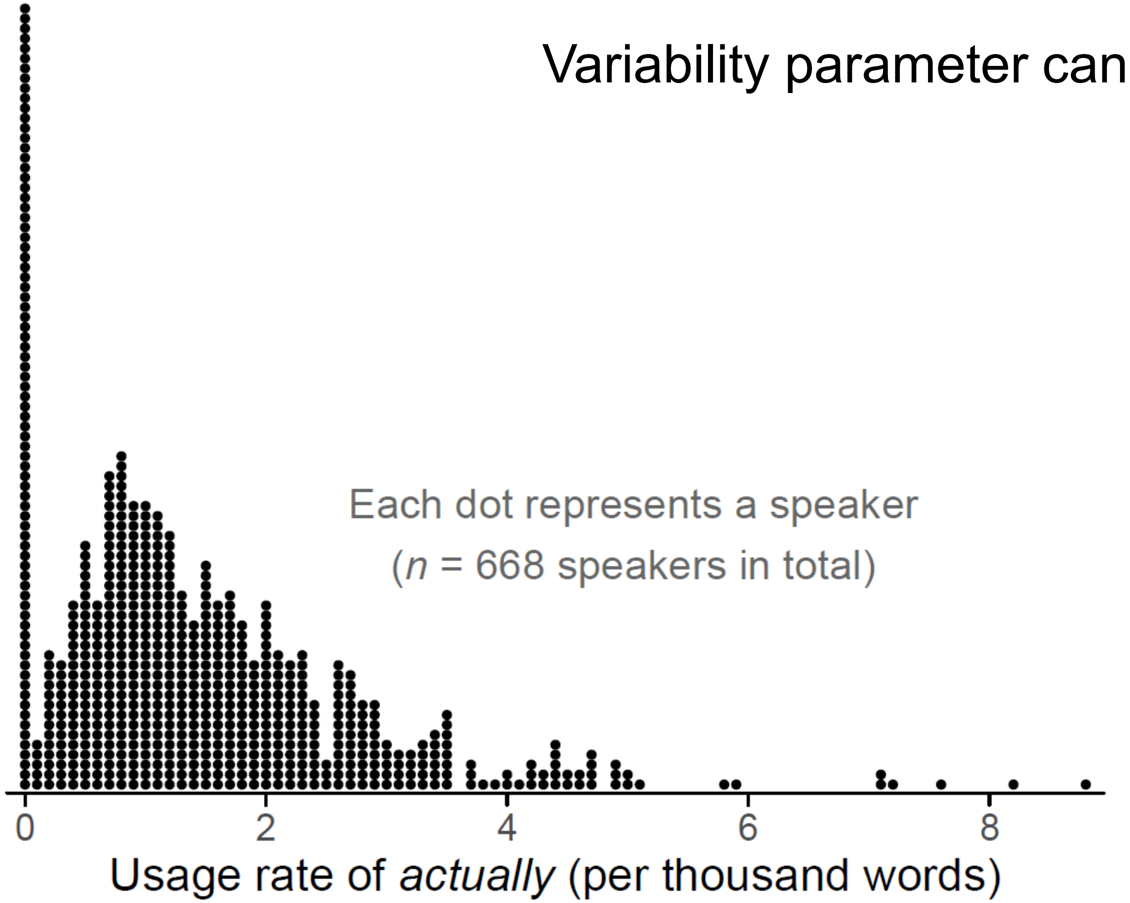
Keyness regression

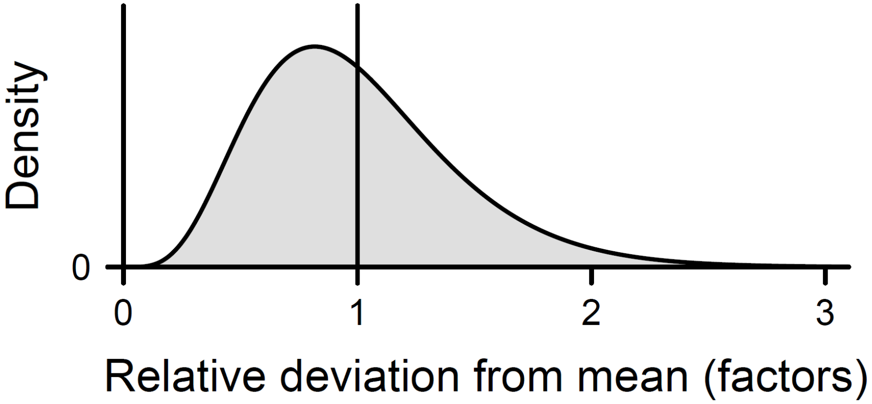
Negative binomial regression

- Poisson too restrictive: Assumes probability of *actually* is constant across speakers/situations
- Negative binomial: Allows for variation among speakers/texts

  Additional parameter describing variability

  Variability parameter can be converted into a dispersion measure (D_{NB})





Data: SpokenBNC2014 Love et al. 2017

Keyness regression

Keyness metrics

	Frequency-oriented	Dispersion-oriented
Target corpus in isolation	Discernibility **Occurrence rate** (normalized frequency) **+ 95% CI**	Generality **Dispersion D_{NB}** **+ 95% CI**
Comparison to reference corpus	Distinctiveness **Rate ratio** **+ 95% CI**	Comparative generality **Difference in dispersion D_{NB}** **+ 95% CI**

Case study

Key verbs in published academic writing

- COCA Davies 2008-
  - Year 2019 only
  - Target corpus: ACAD
  - Reference corpus: NEWS

- Focus on **578 verb lemmas** (data: Sönning 2022b)
  - Higher normalized frequency in ACAD
  - Normalized frequency > 10 pmw in ACAD

- **Ranking** Discernibility

  Distinctiveness

  Generality

  Comparative generality

  Equal weight

Keyness regression

Error bars: 95% CIs

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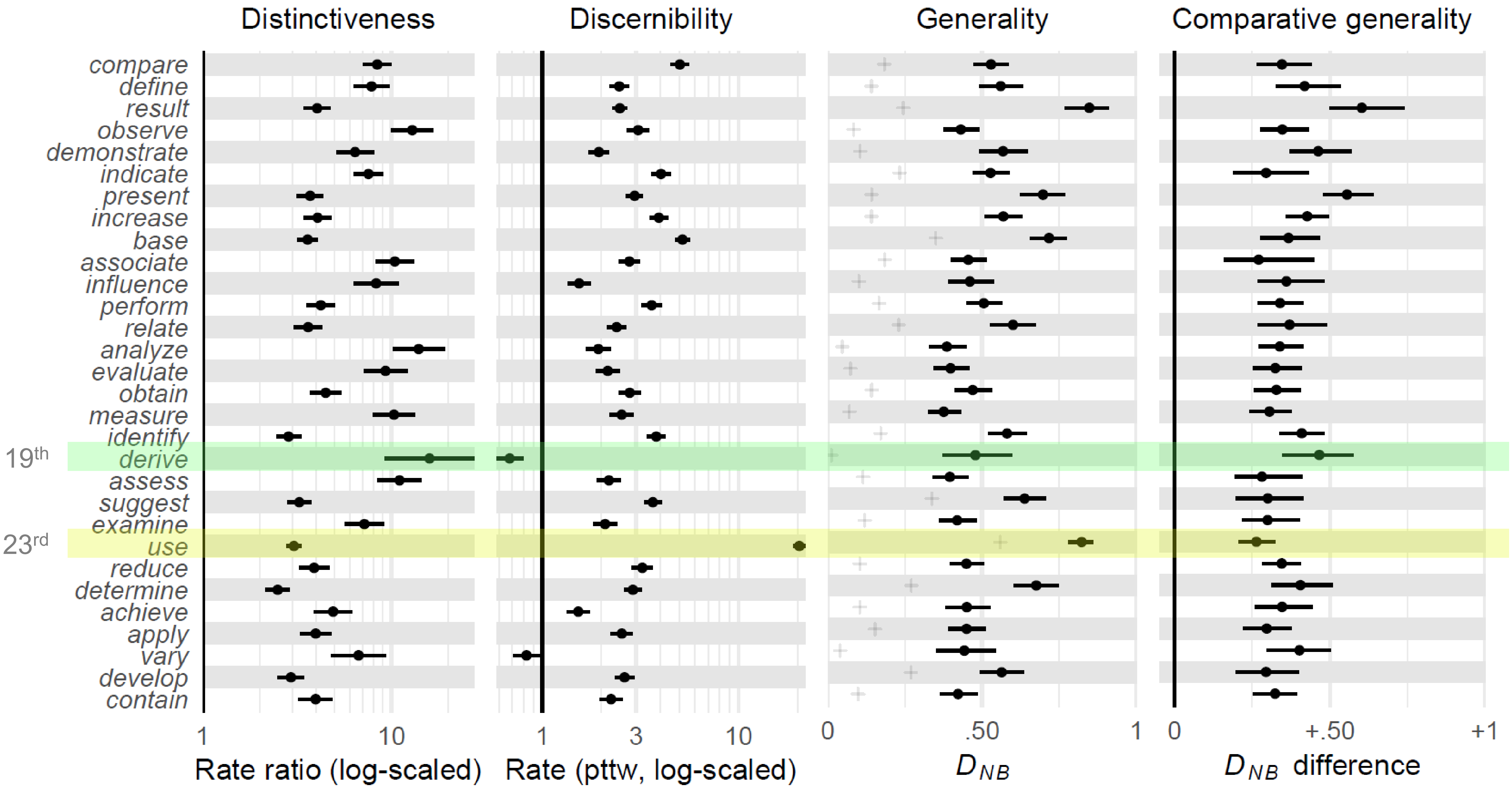

Keyness regression

Advantages

- Text-level analysis e.g. Baroni & Evert 2009; Lijffijt et al. 2014
- Confidence intervals for all keyness metrics cf. Gries 2022
- Descriptive and inferential information
- Interpretable metrics cf. Sönning 2022a

Keyness regression

Disadvantages

- Specialized statistical software needed
  - R package gamlss Rigby & Stasinopoulos 2005
- Data-hungry
- Computationally expensive

Conclusion

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Keyness regression (?)

- Unsuited as a routine tool
- Implementation in corpus analysis software not possible

- Generally: Use of simpler metrics as screening devices

- Feasibility depends on analysis task
    - Unattractive for supplementary keyness analyses
    - Attractive for first-rate keyness analyses (e.g. for producing vocabulary lists)

Thanks for listening.

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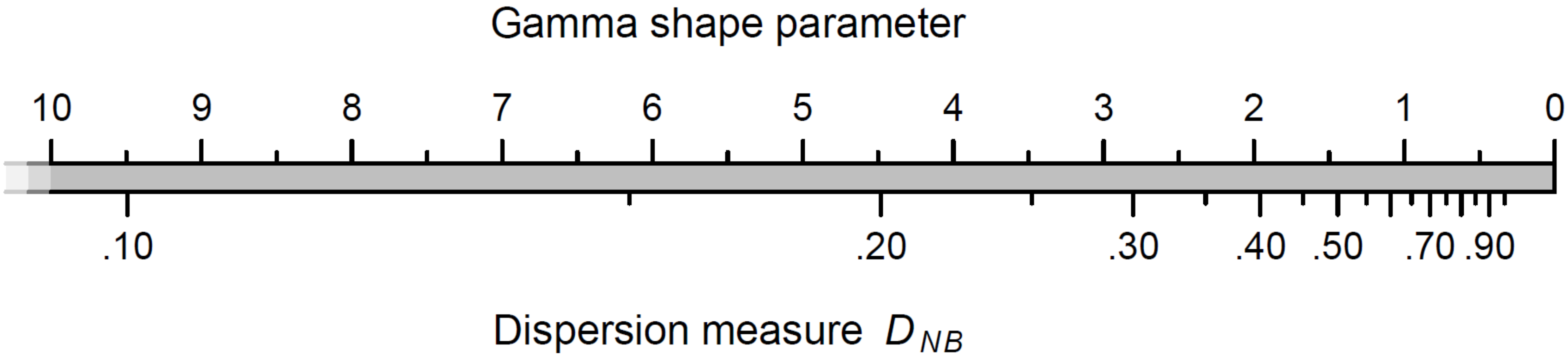
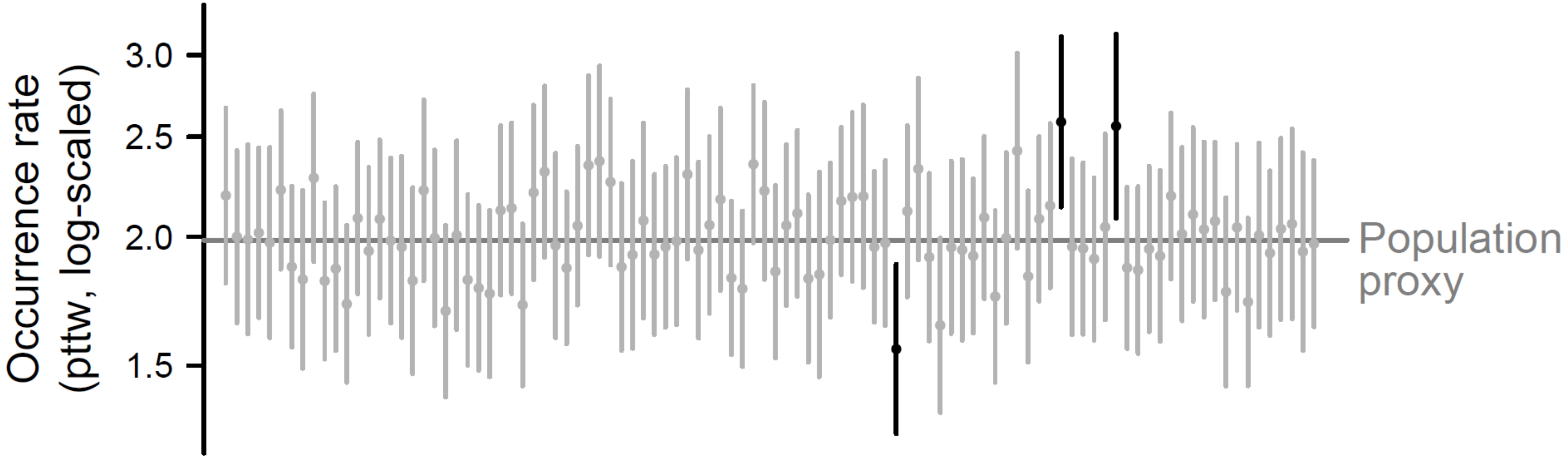
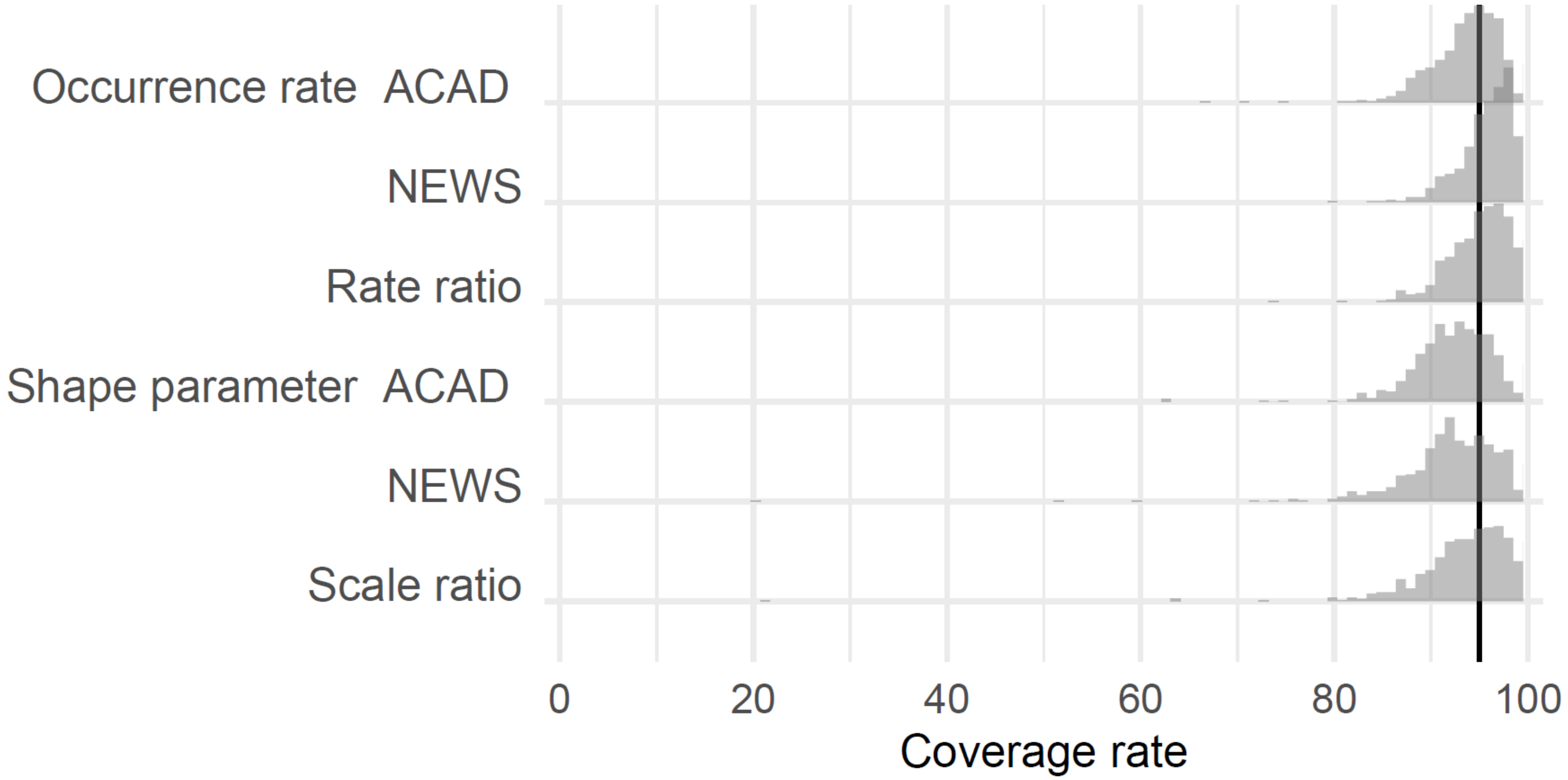
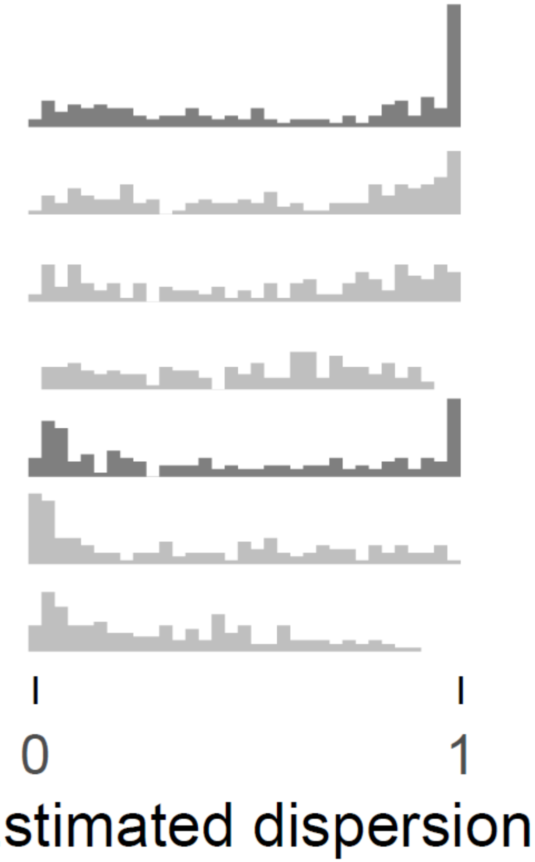

Gamma shape parameter
10
9
8
7
6
5
4
3
2
1
0
.10
.20
.30
.40
.50
.70
.90
Dispersion measure D_{NB}

Estimates (+ 95% CIs) from 100 different data subsets

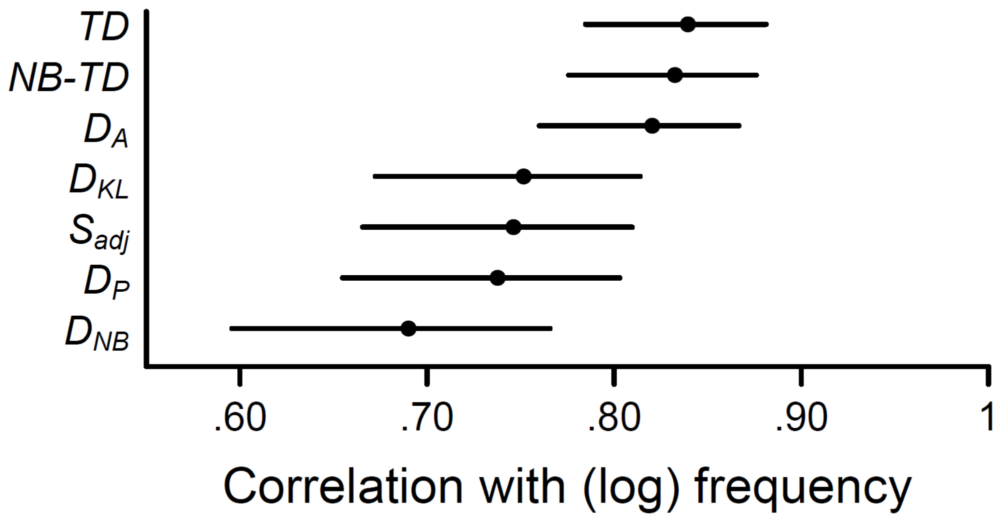
Verb: DEFINE

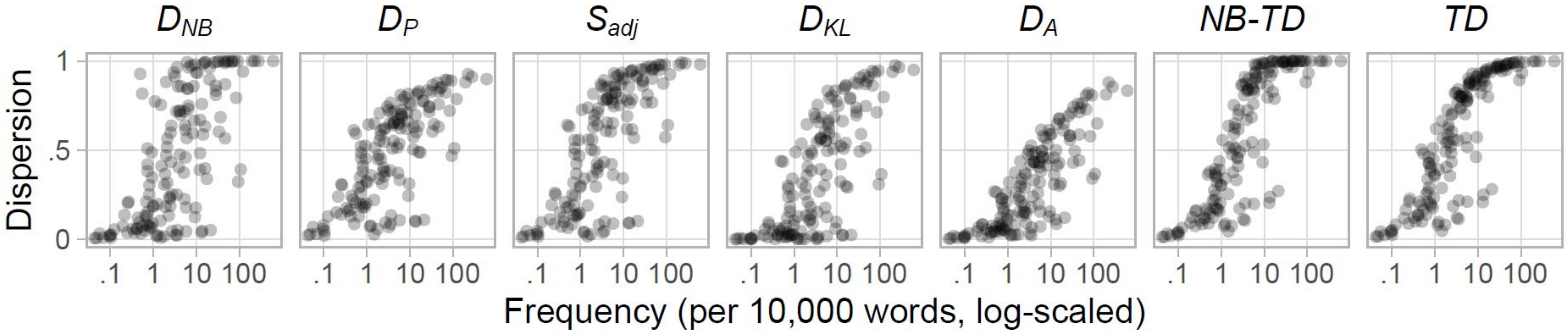


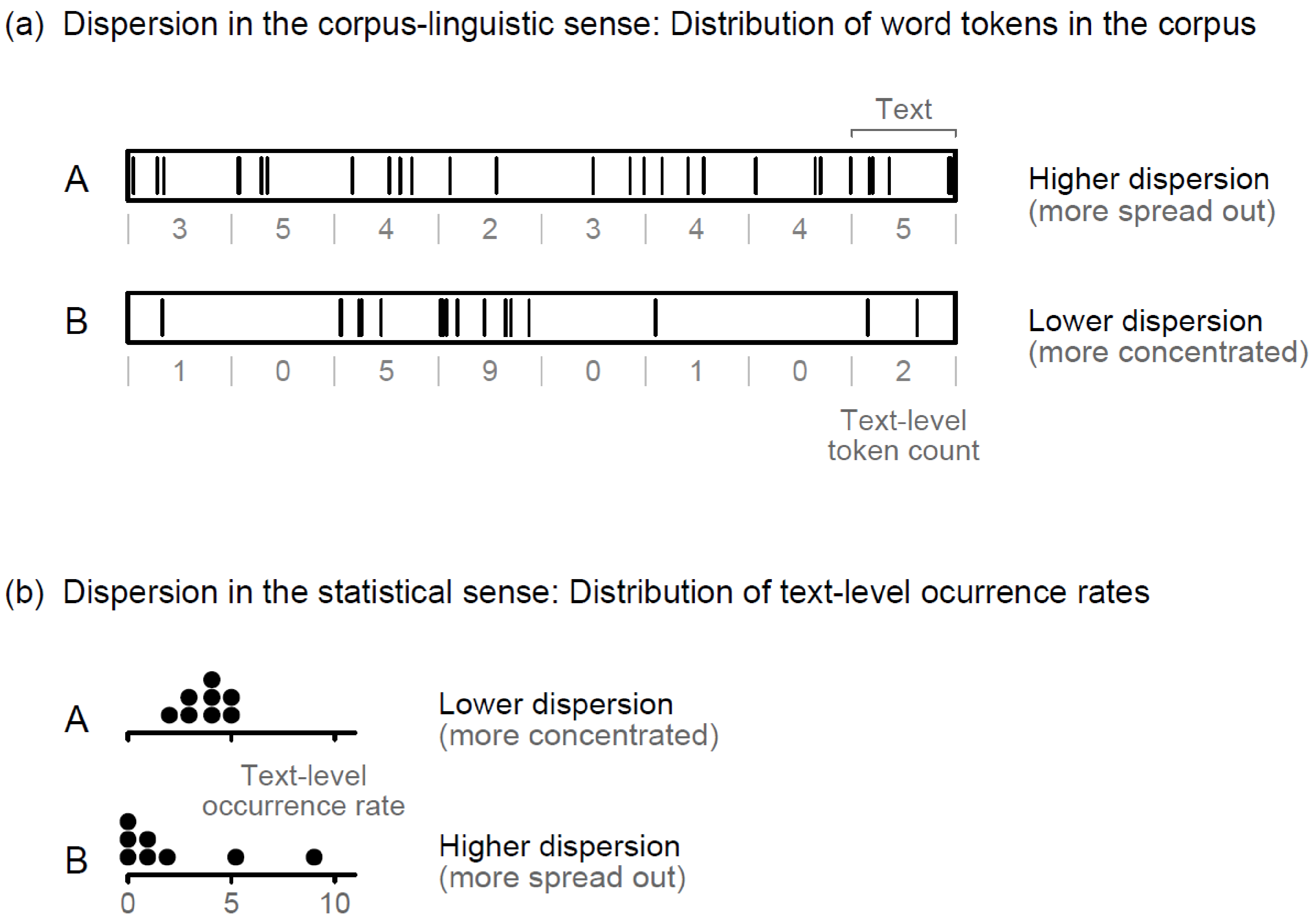

Occurrence rate ACAD
NEWS
Rate ratio
Shape parameter ACAD
NEWS
Scale ratio
0
20
40
60
80
100
Coverage rate



	Mdn	*IQR*	*Range*
NB-TD	.62	.73	[.01;1.0]
TD	.62	.65	[.02;1.0]
S_{adj}	.62	.66	[.01;.99]
D_P	.52	.47	[.02;.93]
D_{NB}	.43	.72	[.01;1.0]
D_{KL}	.33	.61	[.00;.98]
D_A	.29	.41	[.00;.88]


TD
NB-TD
D_A
D_{KL}
S_{adj}
D_P
D_{NB}
.60
.70
.80
.90
1
Correlation with (log) frequency


D_{NB}
D_P
S_{adj}
D_{KL}
D_A
NB-TD
TD
Dispersion
1
.5
0
.1
1
10
100
Frequency (per 10,000 words, log-scaled)



(a) Dispersion in the corpus-linguistic sense: Distribution of word tokens in the corpus

(b) Dispersion in the statistical sense: Distribution of text-level ocurrence rates