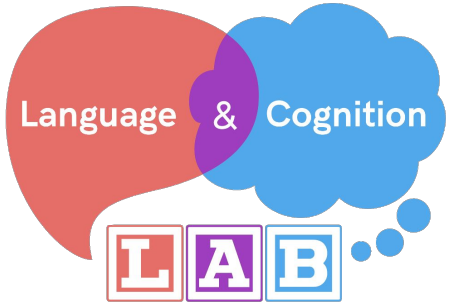
# Using Wordbank for Language Development Research

Alvin Tan & Michael C. Frank





board games

meta-analysis

big team science

cross-situational word learning

open science

grounded language

language models

pragmatics

lexical acquisition

social cognition

children's books

???

???

**You (probably)**

bluegrass

# Roadmap

- Introduction
  - CDIs
  - Wordbank
  - What can we learn?
- Practical session
  - `tidyverse` refresher
  - `wordbankr`
  - Case study: Vocabulary and grammar
- What have we learnt? (Research talk – Mike)

# What tools do you use to measure language development?

<poll for R familiarity>

<poll for Wordbank familiarity>

<poll for tools used to measure language development>

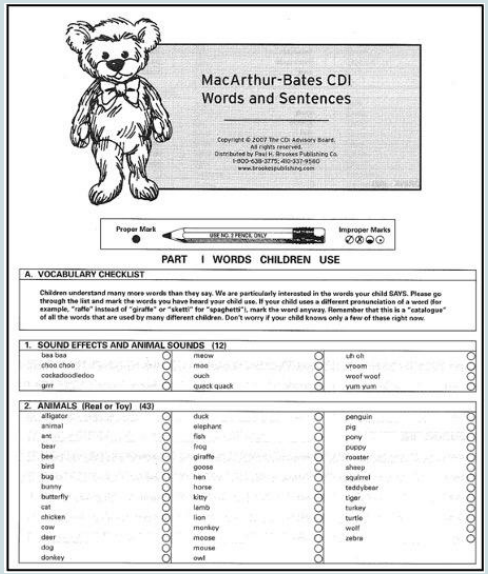
# Measuring language development


Direct production measurement
(LENA Team, 2020)


Picture-based vocabulary tests
(Dunn, 2018; Brownell, 2010)

Looking while listening
(Fernald et al., 2008; Byers-Heinlein, 2018)

# Measuring language development




**Communicative Development Inventories (CDIs)**

Caregiver-report checklists measuring early lexical comprehension and production (and gesture use, emerging morphology and syntax…)

Direct

ng
, 2018)

(Dunn, 2018; Brownell, 2010)

# CDIs

- Words & Gestures (8–18mo; receptive and expressive vocabulary)
- Words & Sentences (16–30mo; expressive vocabulary)

*English (American) WS*

| 1. ***Sound Effects and Animal Sounds*** (12) | | | |
|---|---|---|---|
| baa baa ○ | grrr ○ | ouch ○ | vroom ○ |
| choo choo ○ | meow ○ | quack quack ○ | woof woof ○ |
| cockadoodledoo ○ | moo ○ | uh oh ○ | yum yum ○ |

| 2. ***Animals (Real or Toy)*** (43) | | | |
|---|---|---|---|
| alligator ○ | cow ○ | horse ○ | puppy ○ |
| animal ○ | deer ○ | kitty ○ | rooster ○ |
| ant ○ | dog ○ | lamb ○ | sheep ○ |
| bear ○ | donkey ○ | lion ○ | squirrel ○ |
| bee ○ | duck ○ | monkey ○ | teddybear ○ |
| bird ○ | elephant ○ | moose ○ | tiger ○ |

# Why CDIs?

- Comprehensive view of child's abilities
- Less susceptible to child temperament/mood
- Reliable and valid (Jarůšková et al., 2023)

- Inexpensive and easy to administer
- Adaptations in >120 languages/dialects
- Online implementation in Web-CDI (DeMayo et al., 2021)

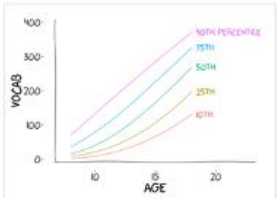
[wordbank.stanford.edu](wordbank.stanford.edu)

2022

# Wordbank

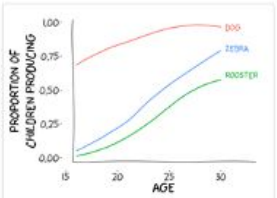
An open database of children's vocabulary development

Wordbank contains data from 79,027 children and 93,258 CDI administrations, across 40 languages and 76 instruments:


## Vocabulary Norms

Explore vocabulary size growth curves for various languages and demographic groups.




## Item Trajectories

Explore trajectories of individual words, word categories, and grammar items.

2019

tains data from 75,144 children
CDI administrations, across
ages and 56 instruments:

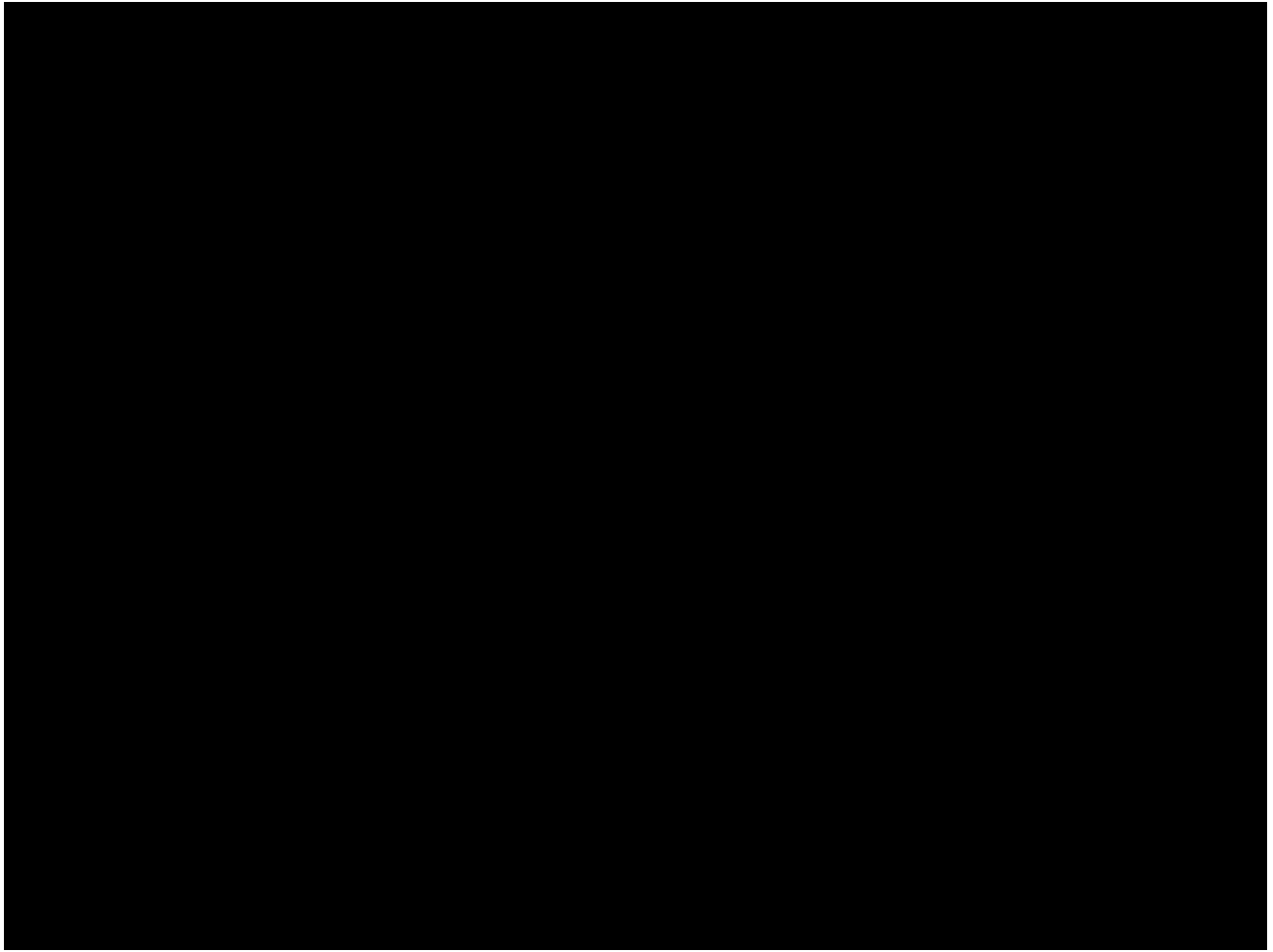

2015

l administrations,
3 instruments:

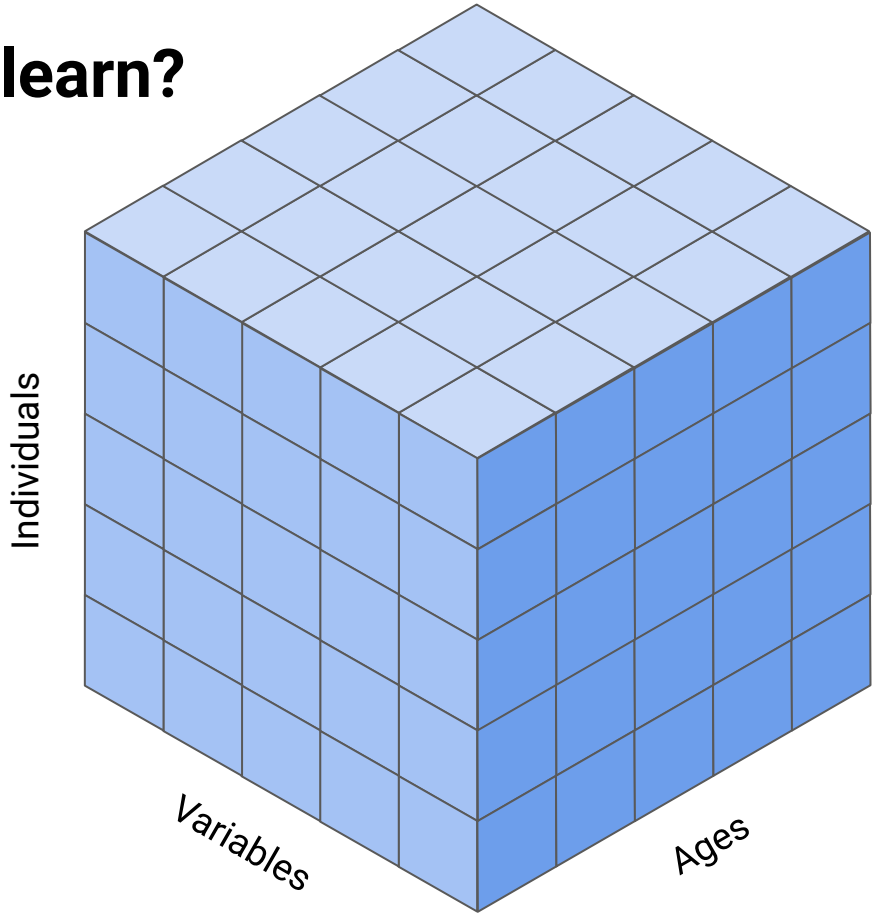
anish

English

[Frank et al. (2017)](Frank et al. (2017))

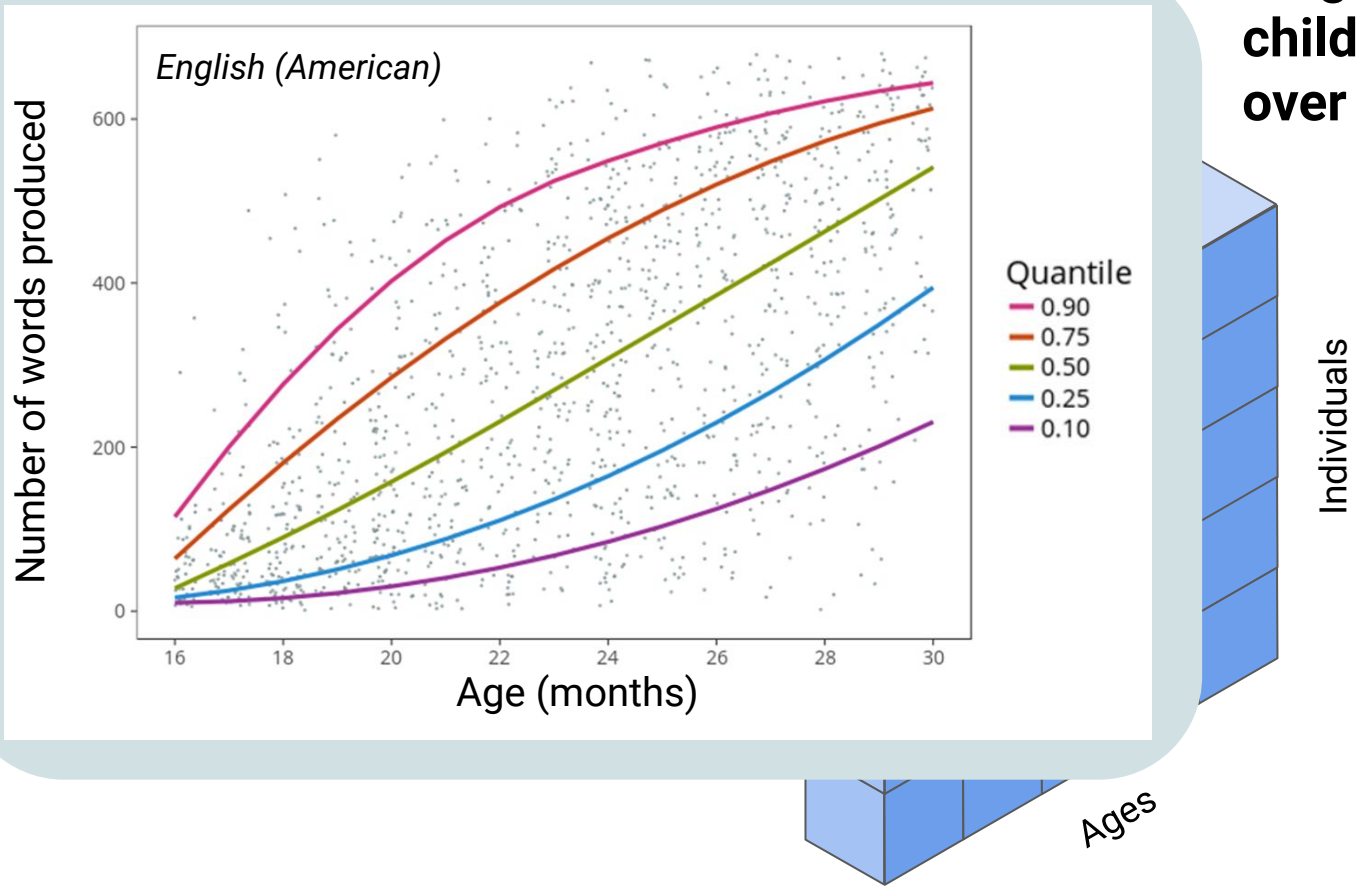


# What can we learn?




Cattell (1966)

# Large variability in children's vocabularies over development



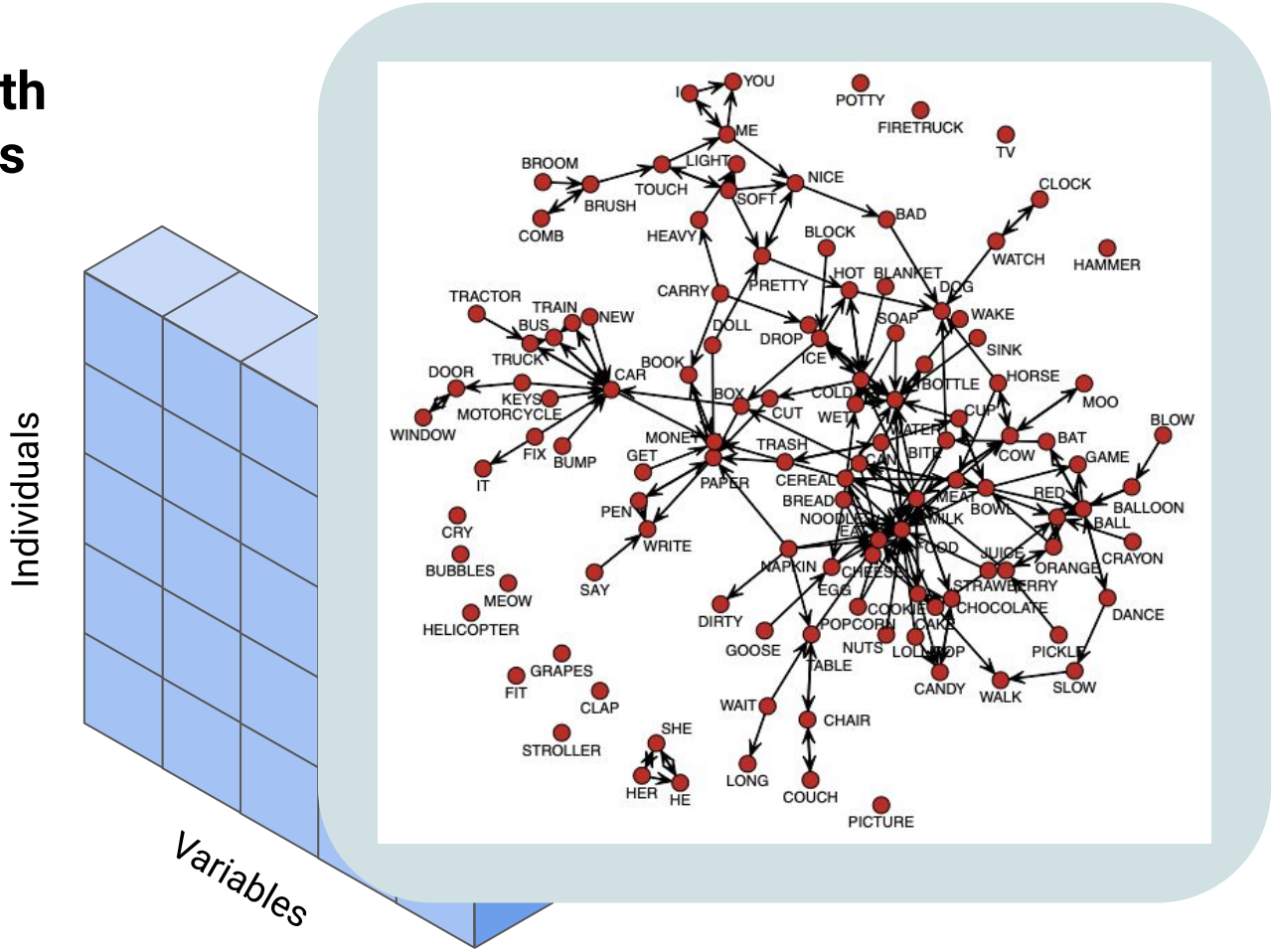

Frank et al. (2021)

| | Croatian | Danish | English (American) | Italian | Korean | Norwegian | Russian | Spanish (Mexican) | Swedish | Turkish |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **grandma** | **peekaboo** | sister | **peekaboo** | **child's name** | **daddy** | **grandma** | milk | **child's name** | **mommy** |
| 2 | **mommy** | pattycake | brother | **daddy** | again | **peekaboo** | **daddy** | **bye** | **mommy** | **daddy** |
| 3 | **daddy** | **child's name** | **daddy** | **mommy** | money | **mommy** | grandpa | **yum yum** | **daddy** | **yum yum** |
| 4 | **bye** | **daddy** | **mommy** | baby food | aunt | **no** | **yum yum** | **daddy** | **peekaboo** | water |
| 5 | **child's name** | **mommy** | **child's name** | **child's name** | cracker | **child's name** | need | **mommy** | **bye** | outing |
| 6 | grandpa | **no** | bottle | **hi** | play | **hi** | can | water | bath | **child's name** |
| 7 | woof woof | **yum yum** | **peekaboo** | **grandma** | **peekaboo** | **bye** | weee | **no** | **hi** | baby food |
| 8 | cat | **hi** | **no** | water | **grandma** | pattycake | thump | ouch | **no** | up |
| 9 | vroom | **bye** | **bye** | **no** | with | **yum yum** | hide and seek | ball | lamp | clap |
| 10 | **yum yum** | ouch | bath | woof woof | food | good night | meow | tickle | look | ball |

# Consistency in early vocabulary across languages

Frank et al. (2021)

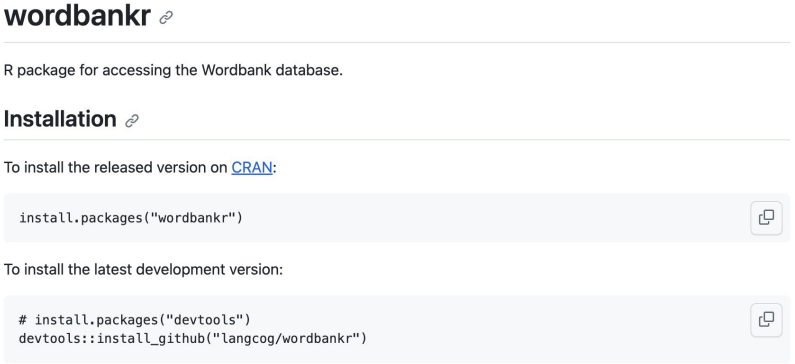
# Preference for acquiring words with more potential links to their lexicons



# Accessing Wordbank data

- Downloading…

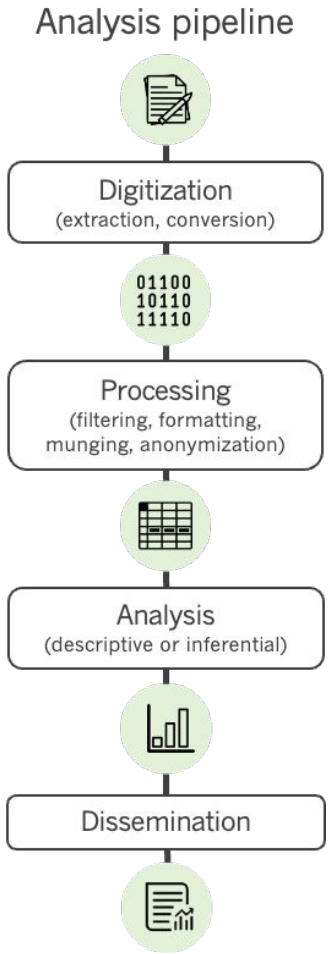

- …or using `wordbankr`
  - Reproducible workflow
  - Version control
  - Flexible updating




Braginsky et al. (2023)

# Reproducibility: What

| | | Data | |
|---|---|---|---|
| | | Same | Different |
| Code | Same | **Reproducible** | Replicable |
| | Different | Robust | Generalisable |



# Reproducibility: Why

| | | Data: Same | Data: Different |
|---|---|---|---|
| Code | Same | **Reproducible** | Replicable |
| | Different | Robust | Generalisable |

Provenance, transparency, & verification

Error detection & mitigation

Efficiency

# Reproducibility: How

Reproducible reports: R Markdown (.Rmd) / Quarto (.qmd) documents

- Embed all your processing and analysis code in your report
- Avoid updating / copy-paste errors
- Save pain when changing formats
- Interpretable and transparent
- Quick and ✨pretty✨


# Practical session

- Go to https://posit.cloud and register (if you haven't)
- Create a "New RStudio project"
- Download the Rmd file for the practical <here>, and upload it into your project (the "Upload" button is in the bottom right panel)