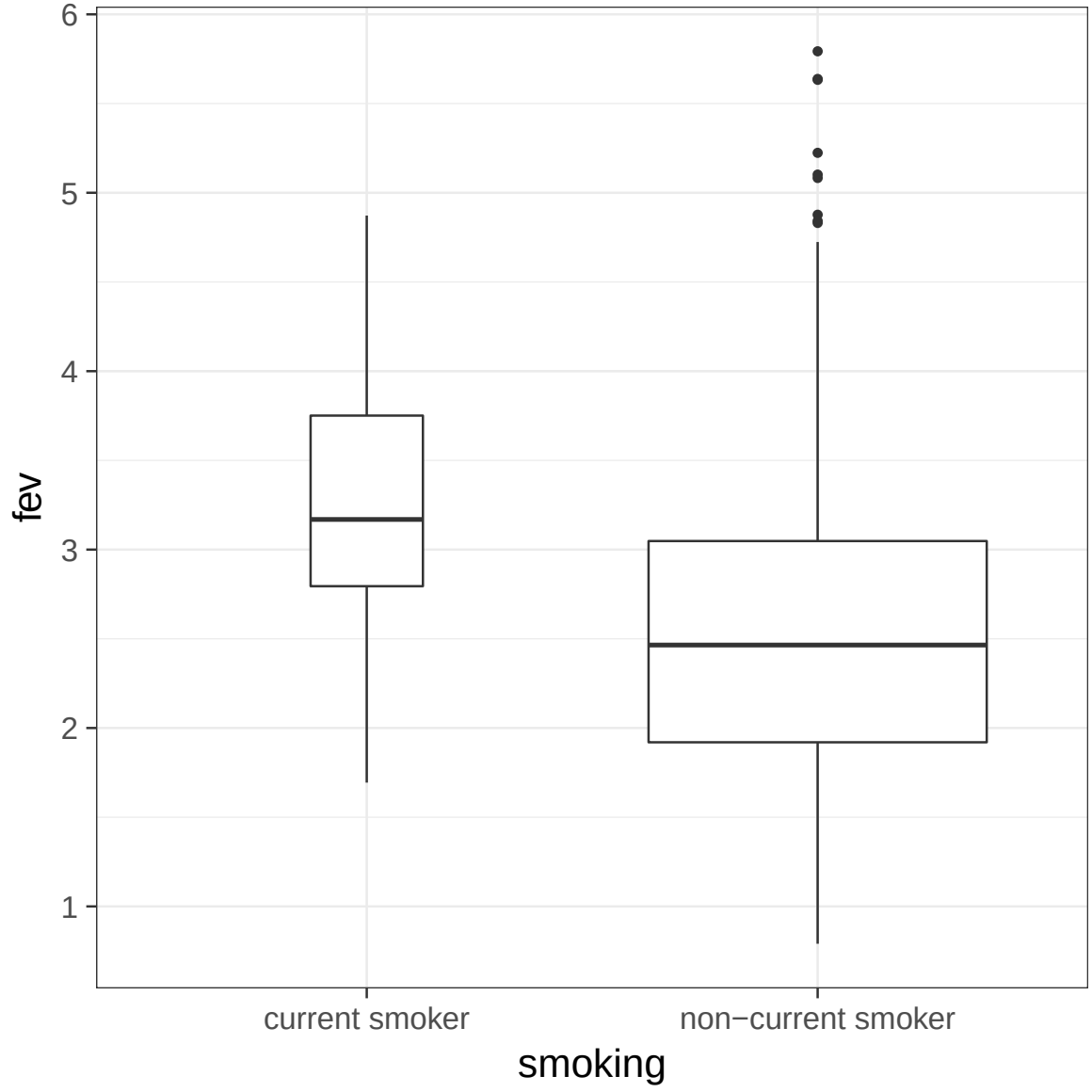
Graphics for inference

- What is my model telling me?
- How can I tell other people?

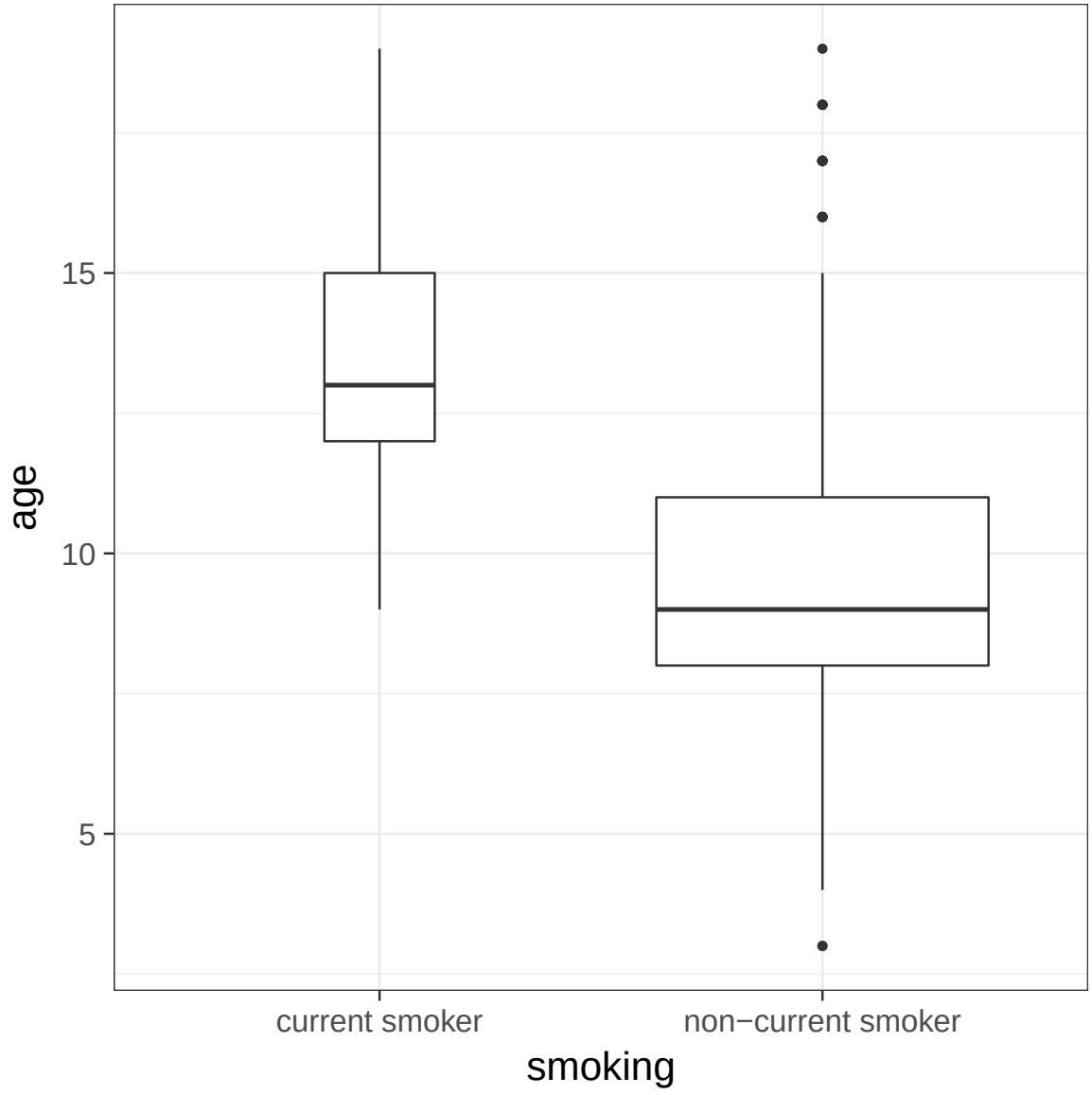
Principles

- Graphs tell stories better than tables do
  - Use graphs to illustrate comparisons
  - Be careful about *units*
- Distinguish between (scientific) variables and (statistical) parameters
- Keep P values in their place
- Show data if it doesn't interfere

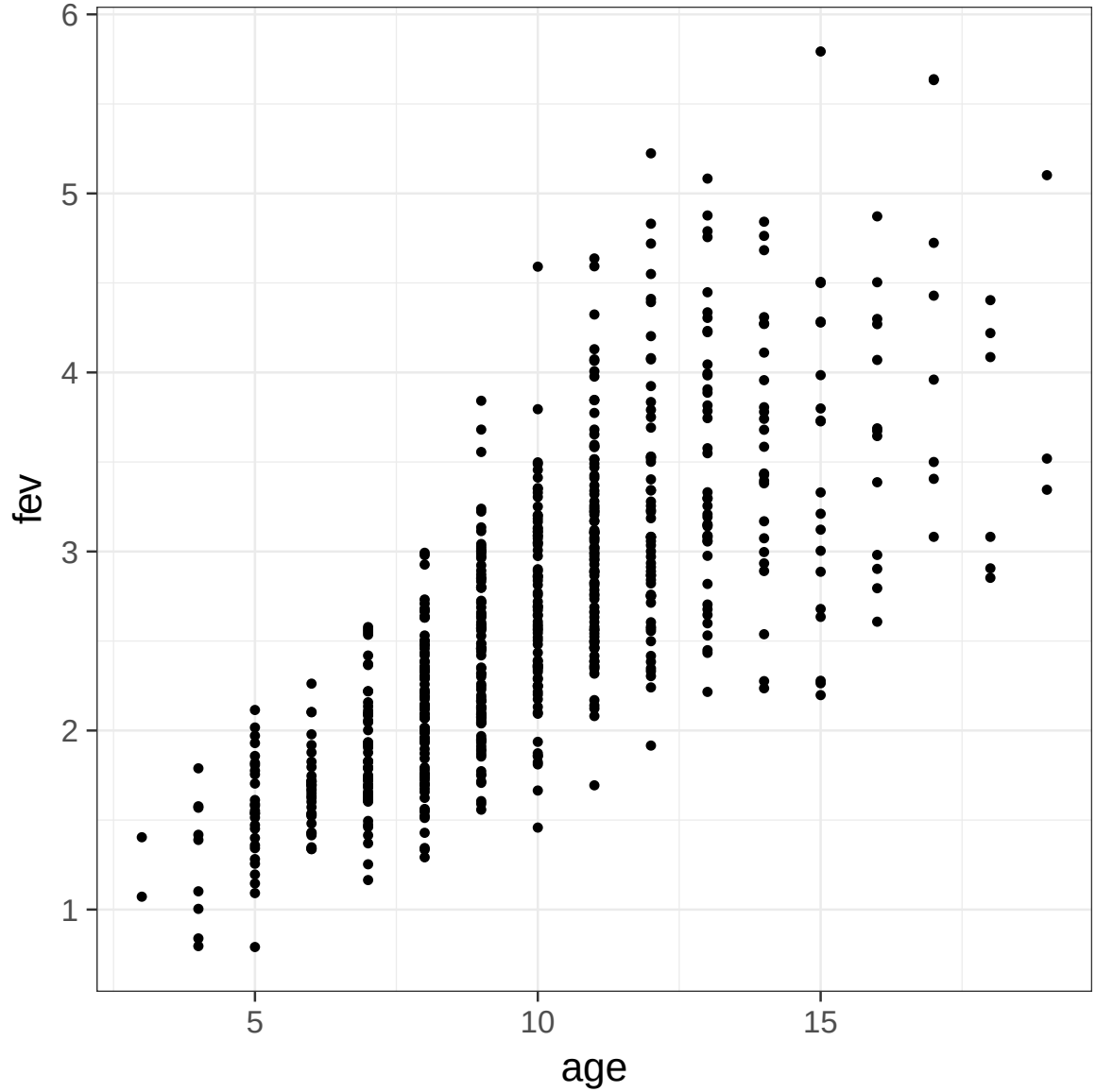
Smoking data

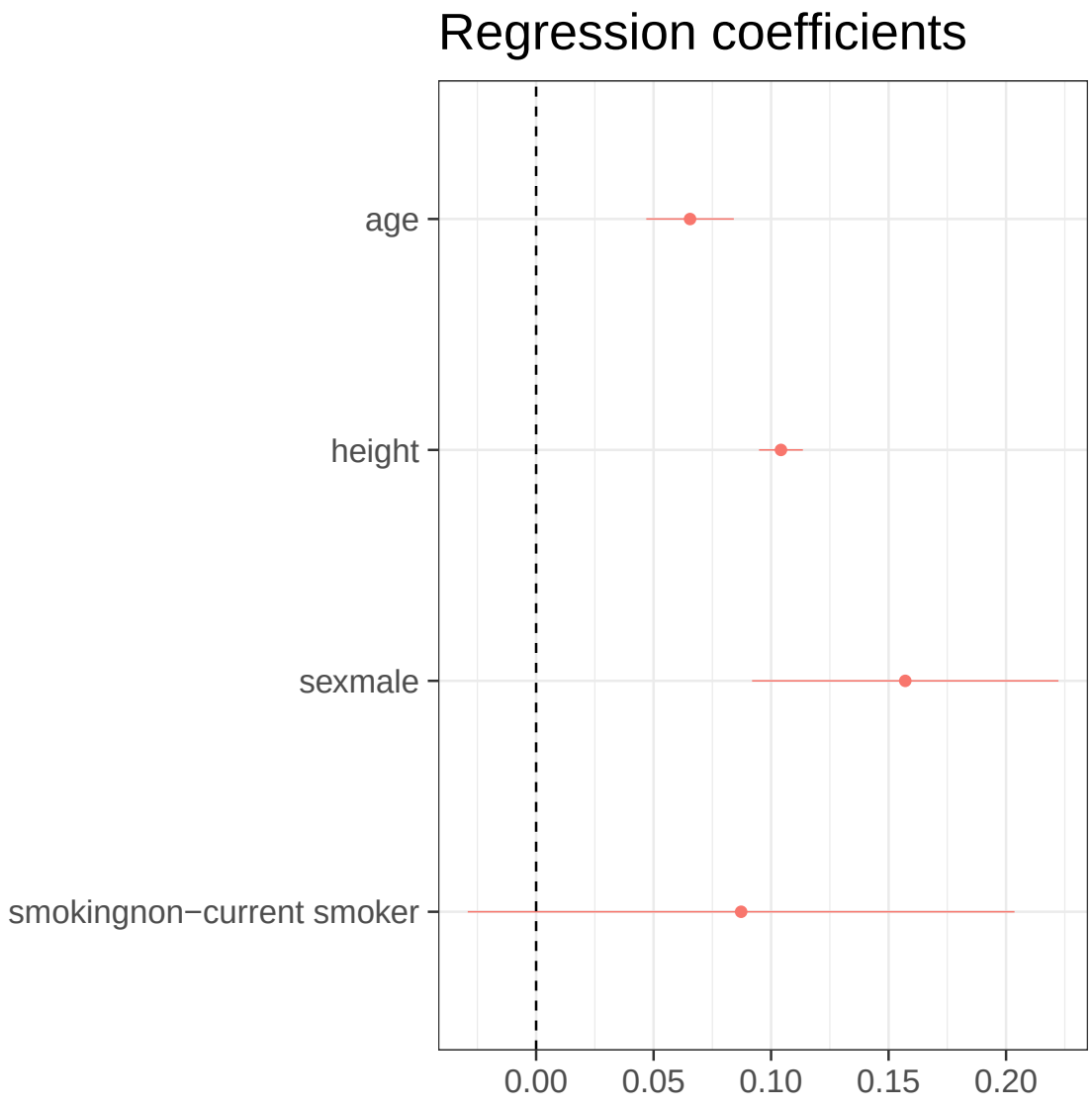


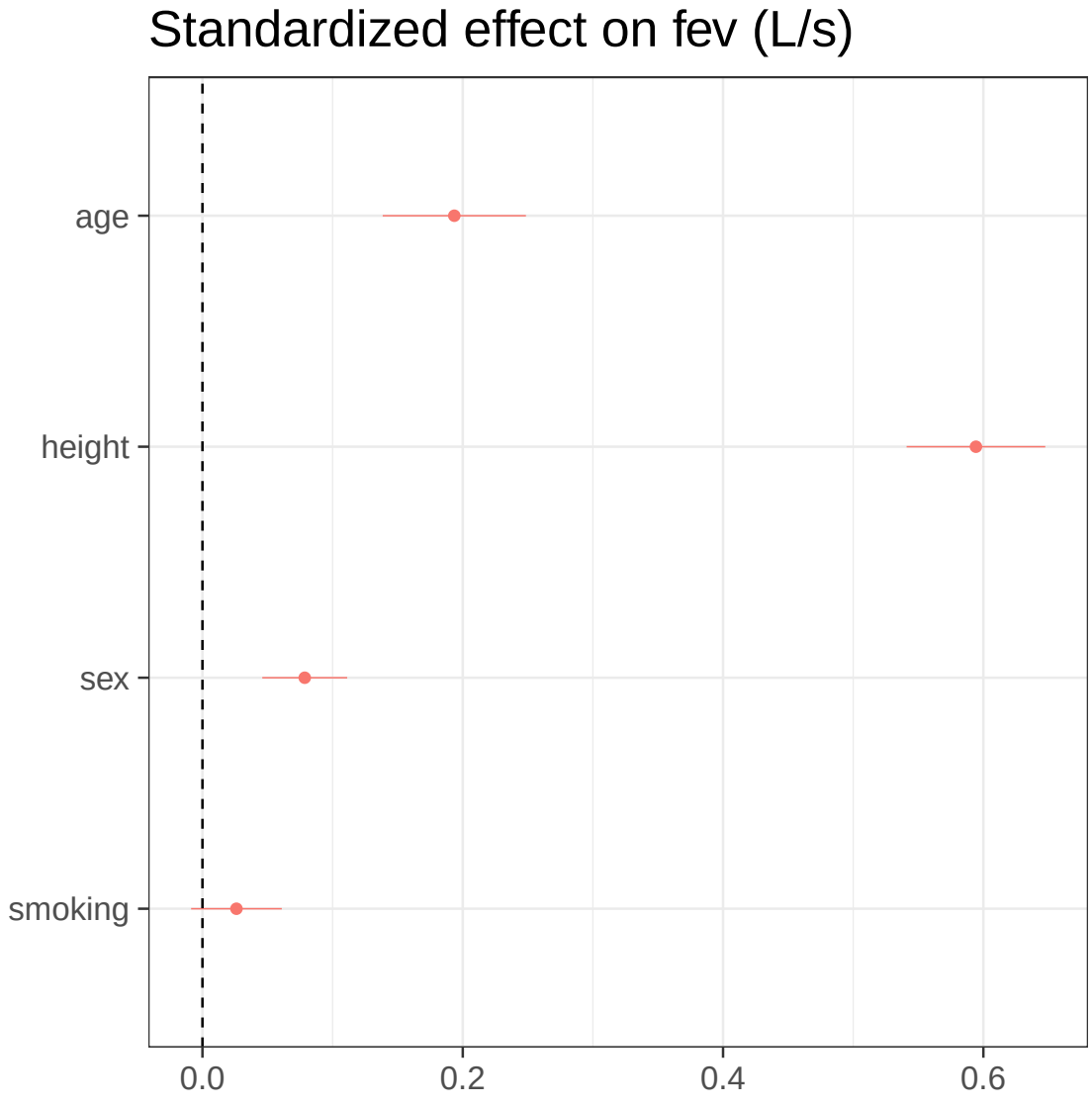
Smoking data

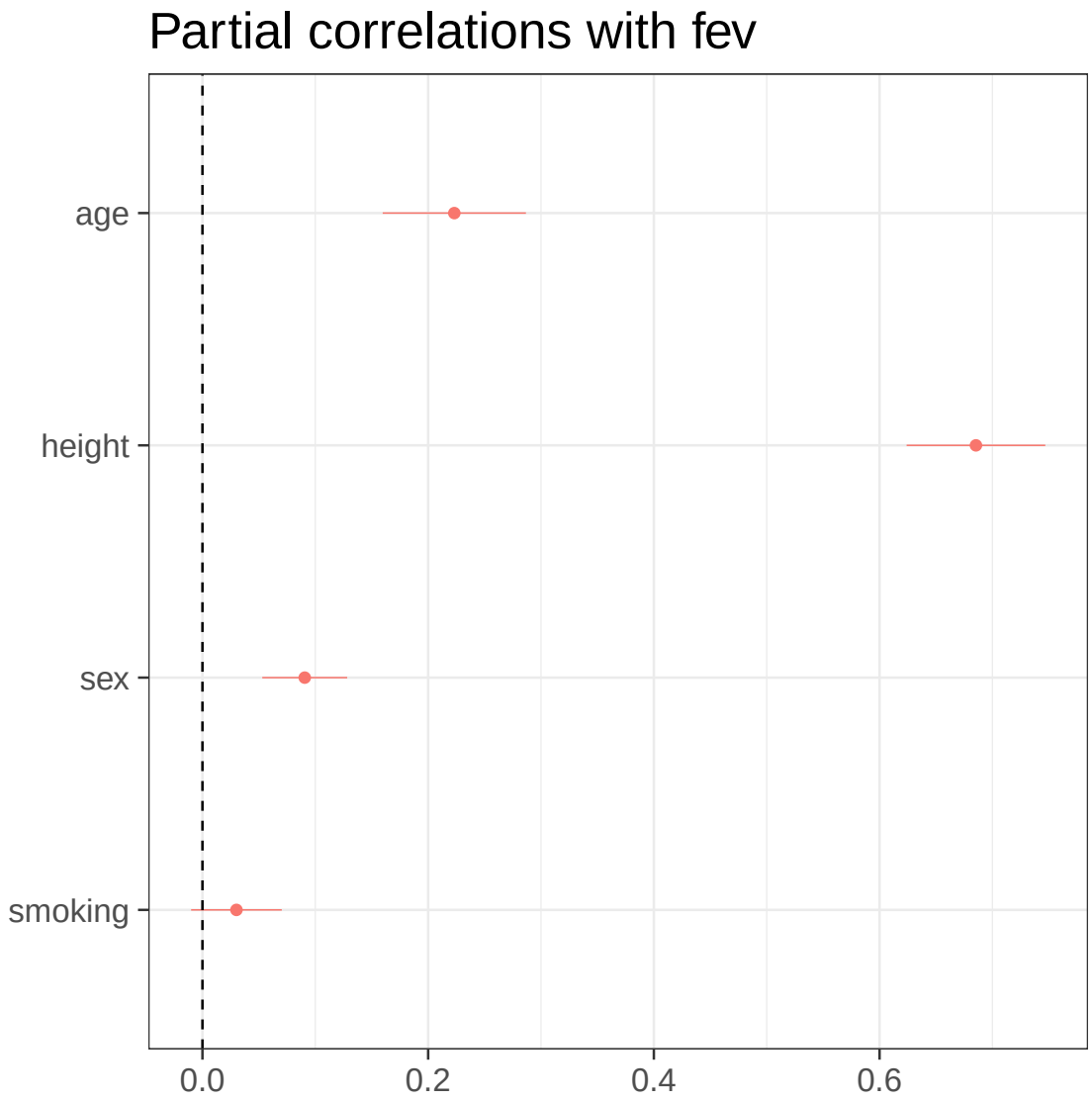


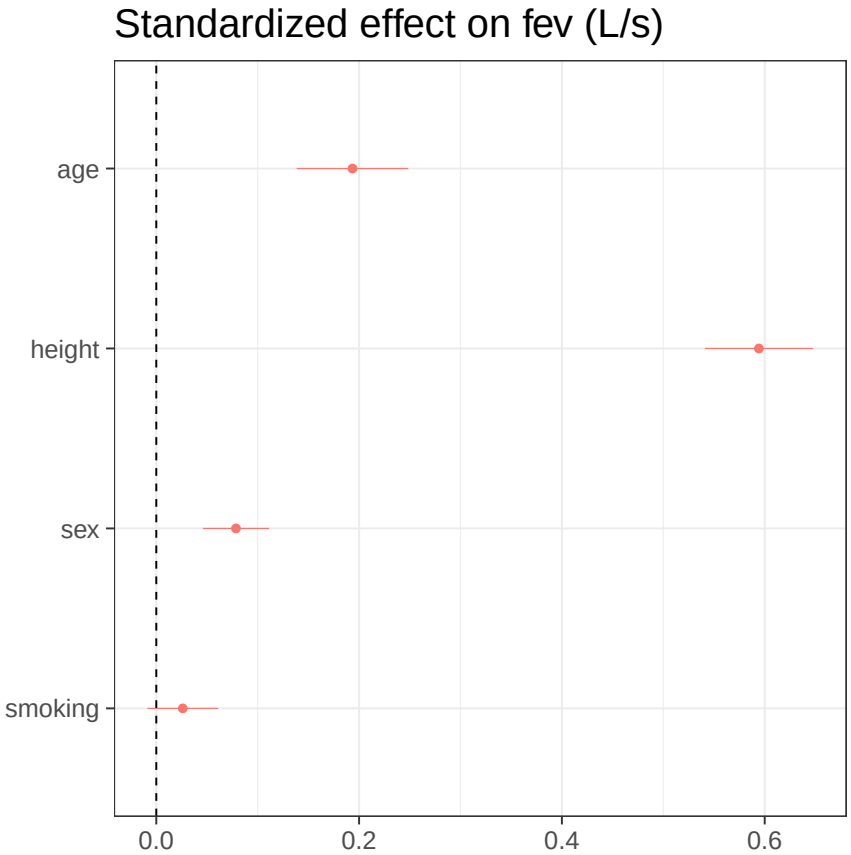
Smoking data




Regression coefficients
age
height
sexmale
smokingnon−current smoker
0.00
0.05
0.10
0.15
0.20


Standardized effect on fev (L/s)
age
height
sex
smoking
0.0
0.2
0.4
0.6


Partial correlations with fev
age
height
sex
smoking
0.0
0.2
0.4
0.6

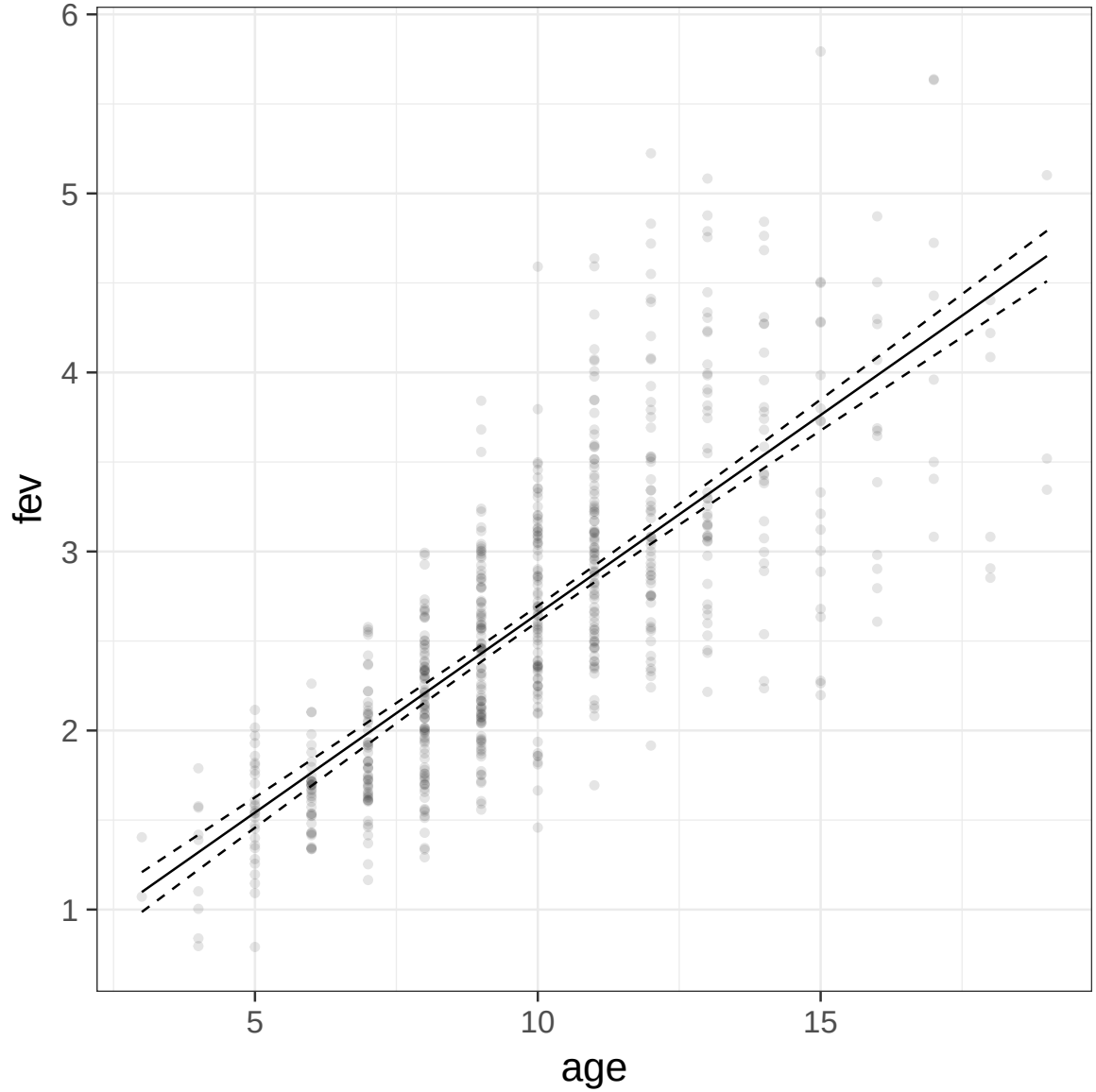


- Would P values add anything here?

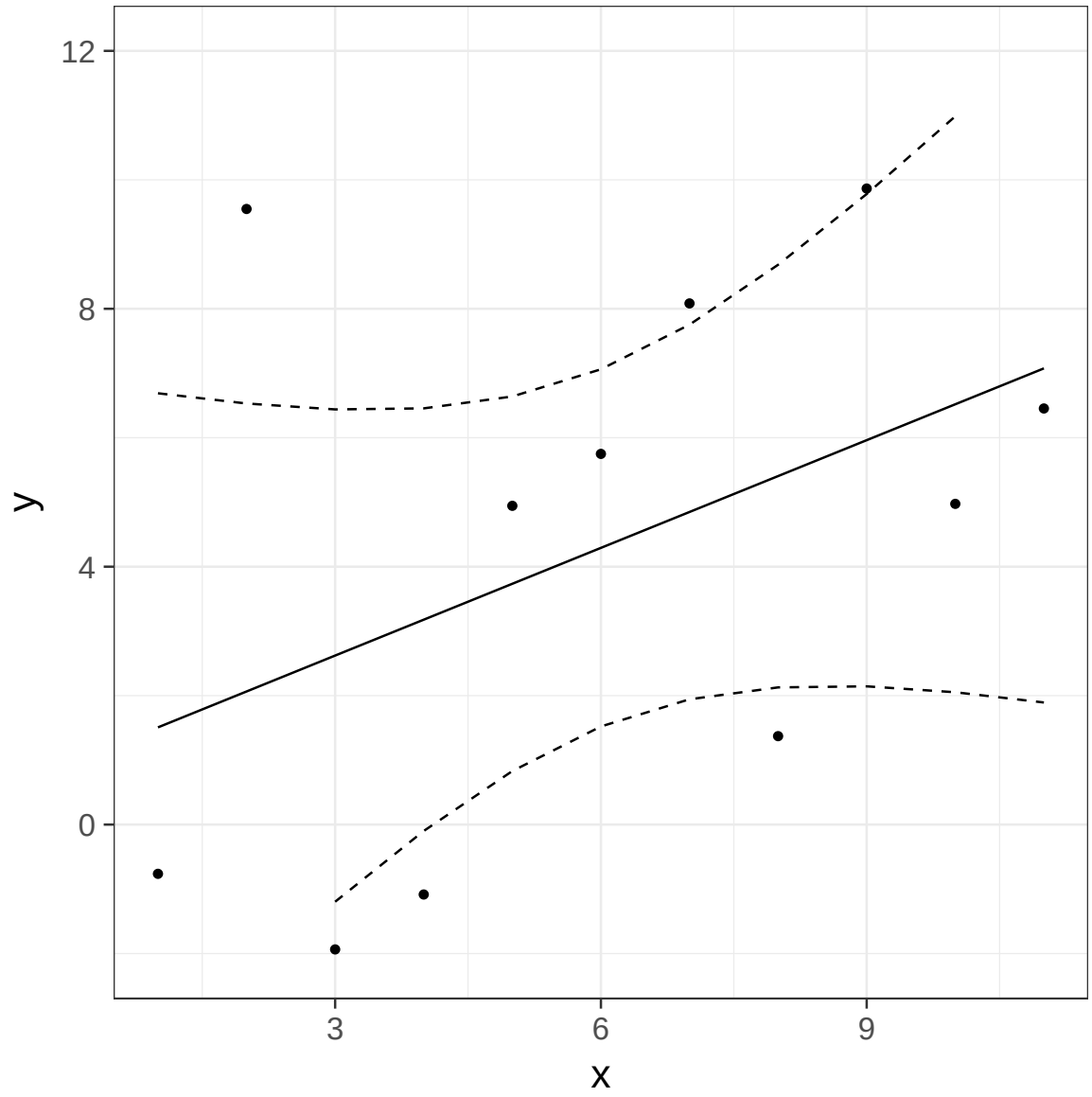
Comparing effects on different response variables

- Put response variables on same scale:
  - Standardize
  - Logs
  - Proportions

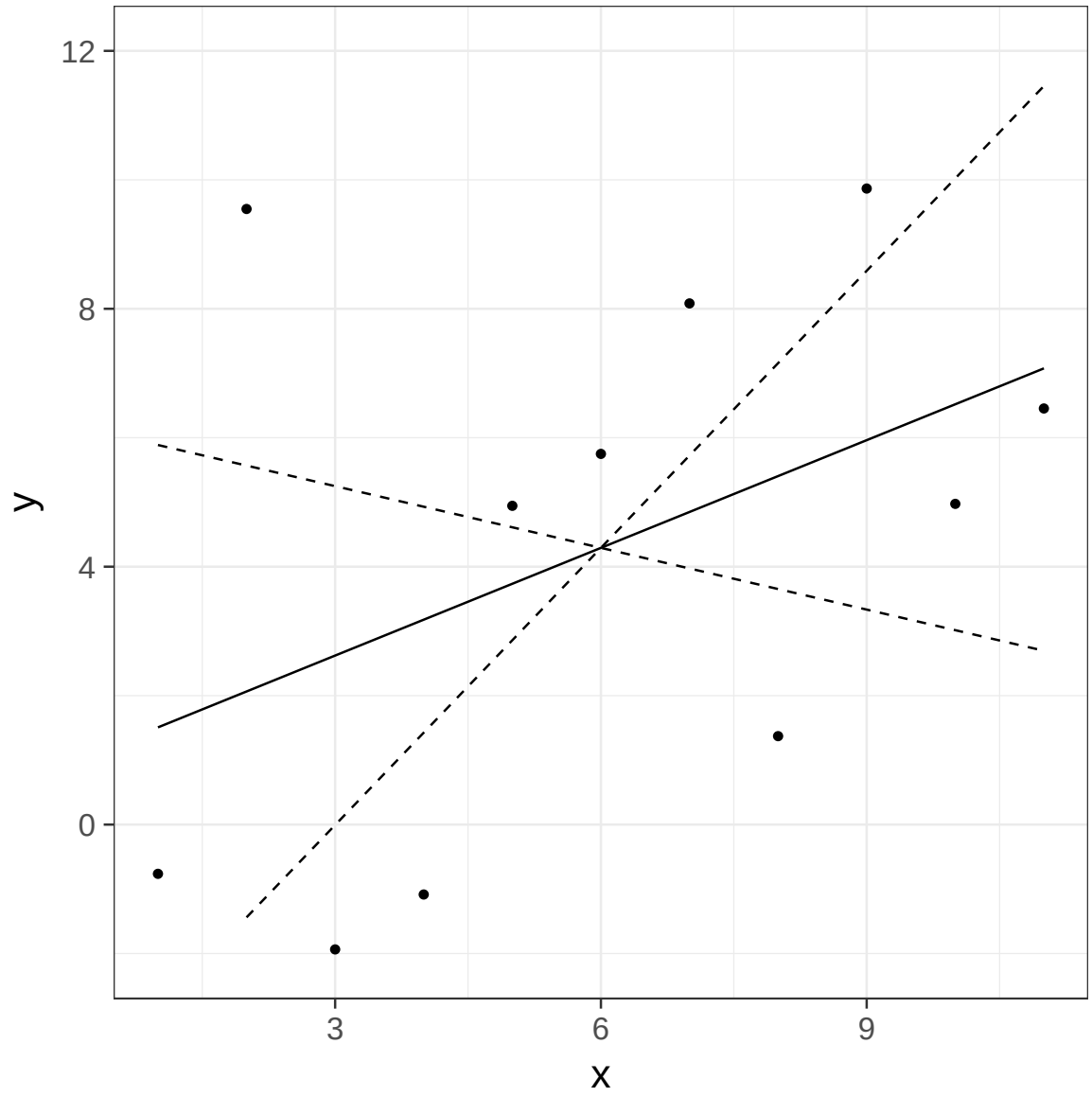
Shape of response



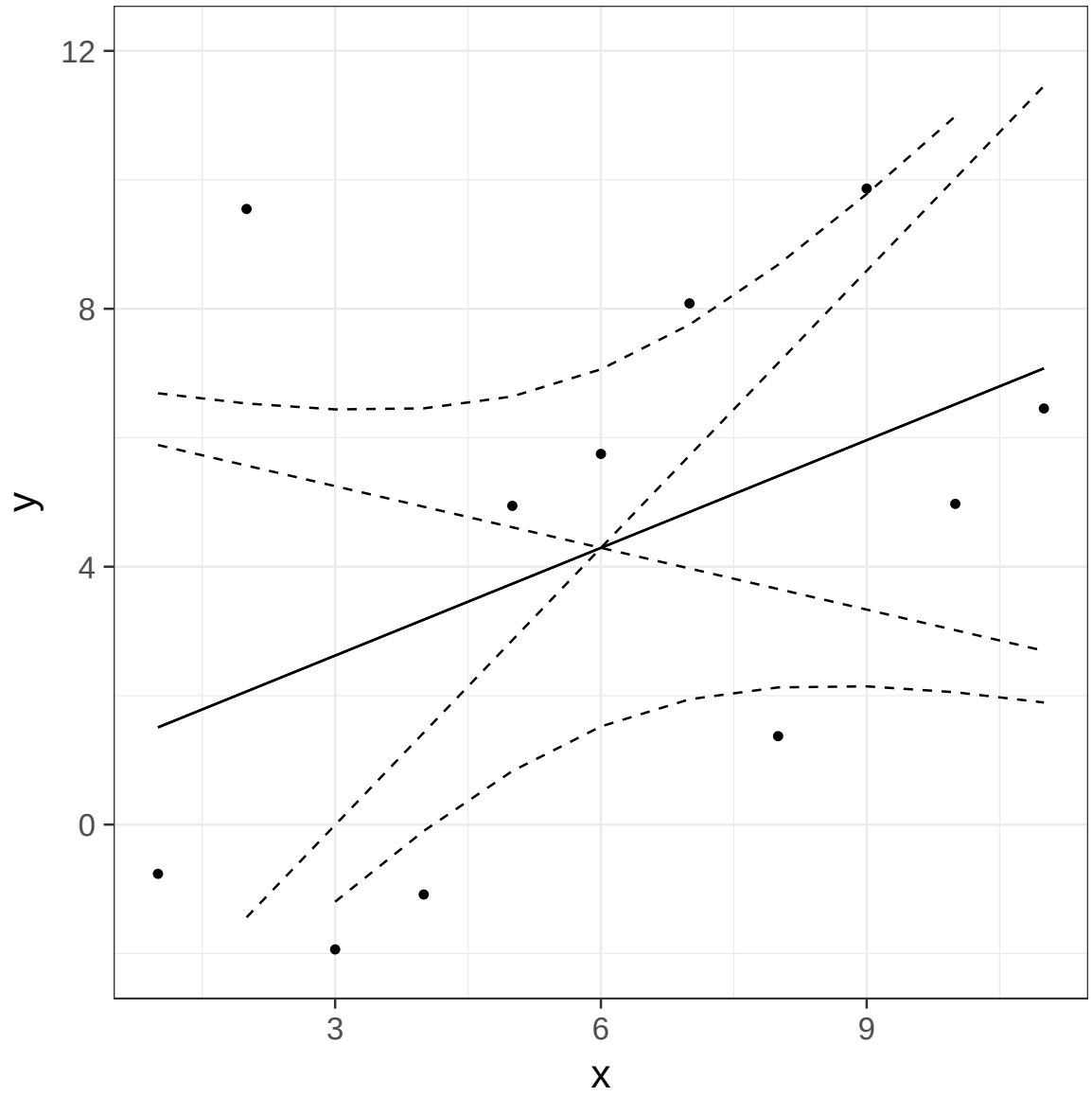
Standard prediction plot



Marginal prediction plot



Combined

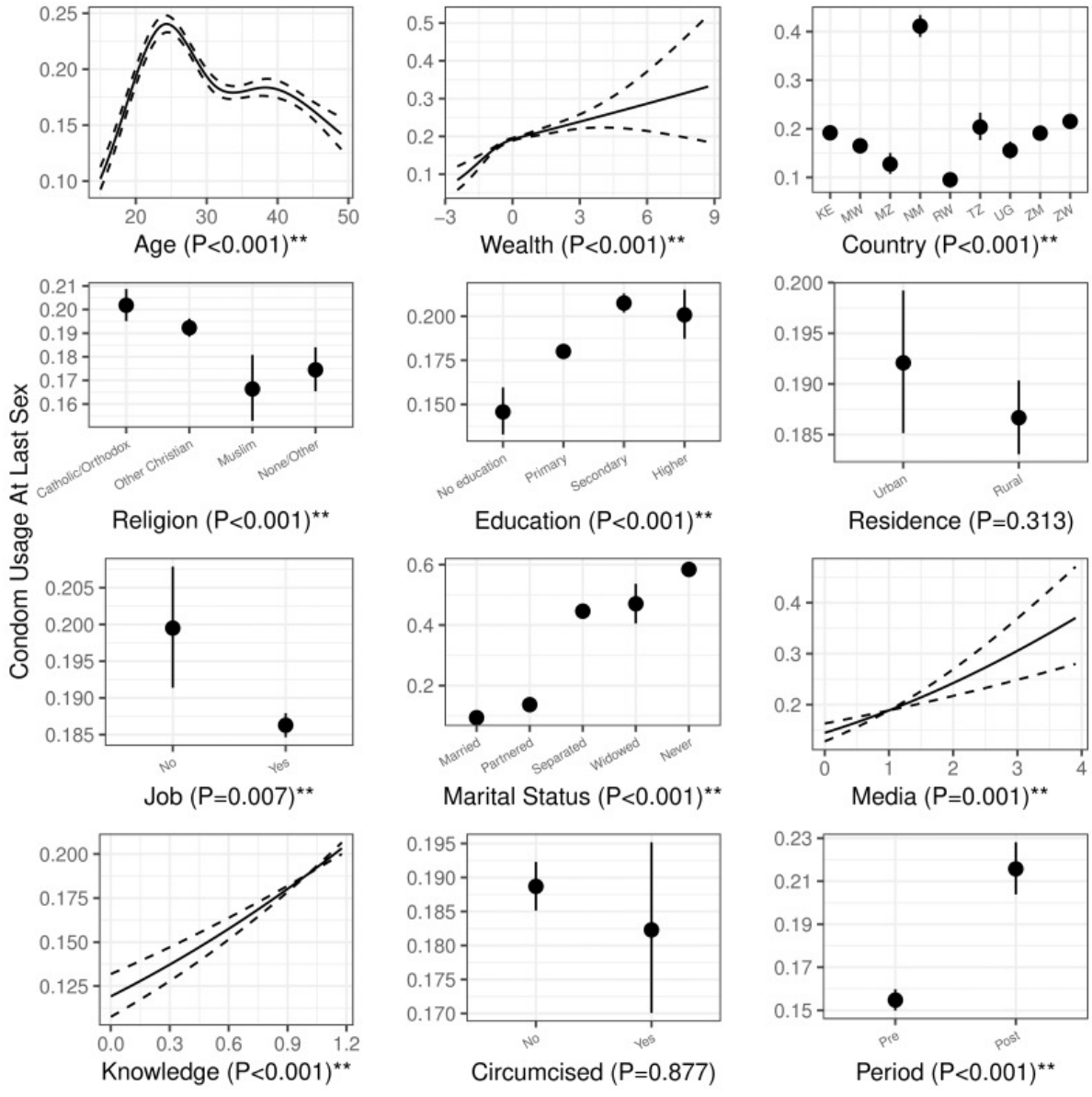


Variables vs. parameters

- A coefficient plot is most useful when each *variable* corresponds to a single statistical *parameter*
  - Binary predictor
  - Linear predictor
- More detailed shape information should be preferred when there is more than one parameter for a single logical variable
  - More than two categories
  - Splines and polynomials

No standard approach

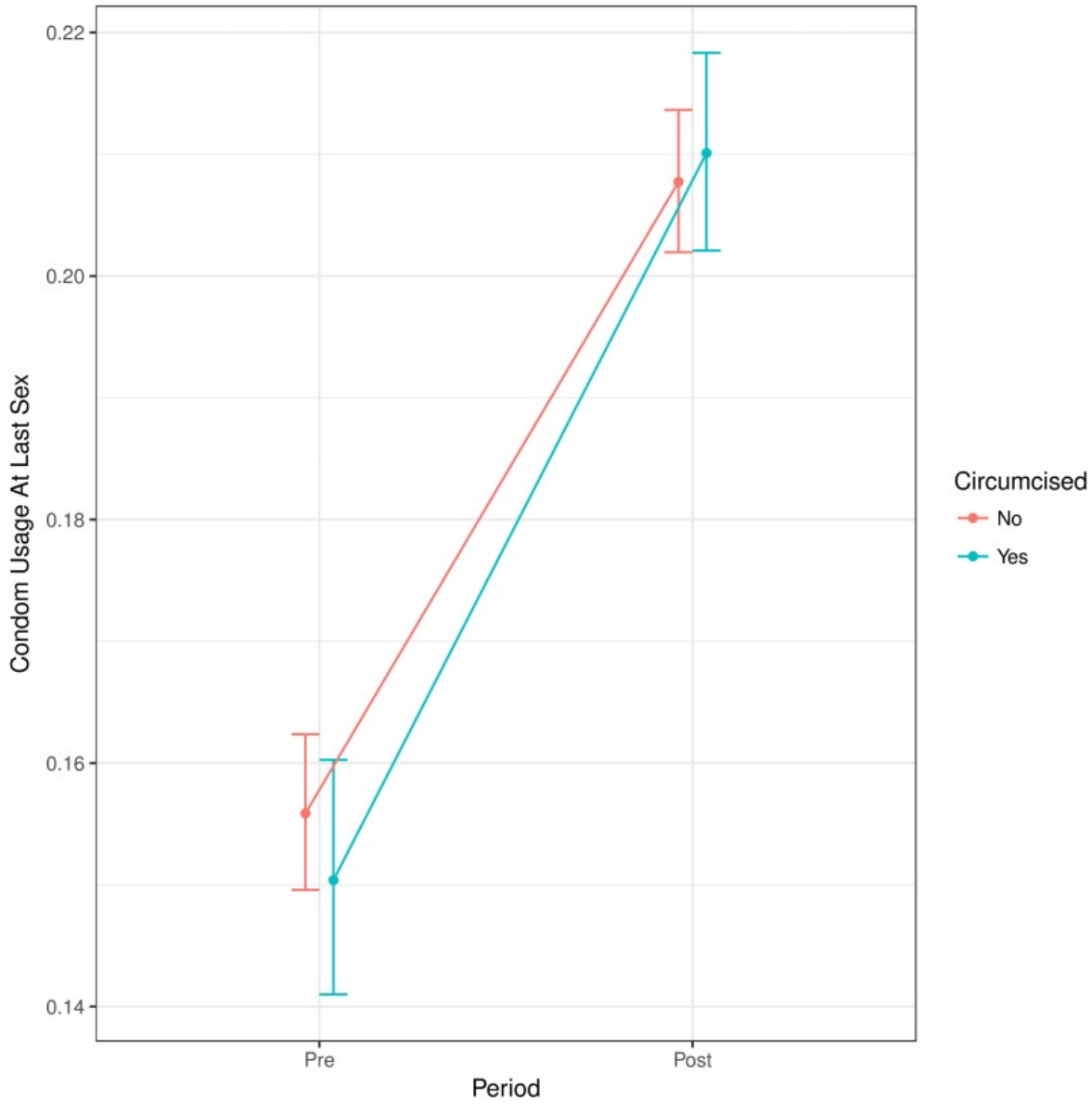
- There are many different ways to try to capture marginal effects of a single variable
  - Particularly if it's associated with more than one parameter
- JD likes to calculate from the model "center"
  - This is the average value from each predictor column of the model matrix
  - Relatively stable
  - A bit divorced from physical reality


Condom Usage At Last Sex
Age (P<0.001)**
Wealth (P<0.001)**
Country (P<0.001)**
KE MW MZ NM RW TZ UG ZM ZW
Religion (P<0.001)**
Catholic/Orthodox
Other Christian
Muslim
None/Other
Education (P<0.001)**
No education
Primary
Secondary
Higher
Residence (P=0.313)
Urban
Rural
Job (P=0.007)**
No
Yes
Marital Status (P<0.001)**
Married
Partnered
Separated
Widowed
Never
Media (P=0.001)**
Knowledge (P<0.001)**
Circumcised (P=0.877)
Period (P<0.001)**
Pre
Post

P values

- We use variable-level P values as a standard for whether the *overall* pattern associated with a given variable is significant
  - This is not super-easy to interpret
  - But it is also not super-easy to think of a better alternative

Interactions



Scales and transformations

- Your model will often involve an original scale (where the data are collected) and a link scale (where the linear predictor lives)
- Which scale should you use for:
  - Calculations?
  - Displaying numbers to users?
  - Graphing?