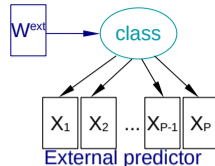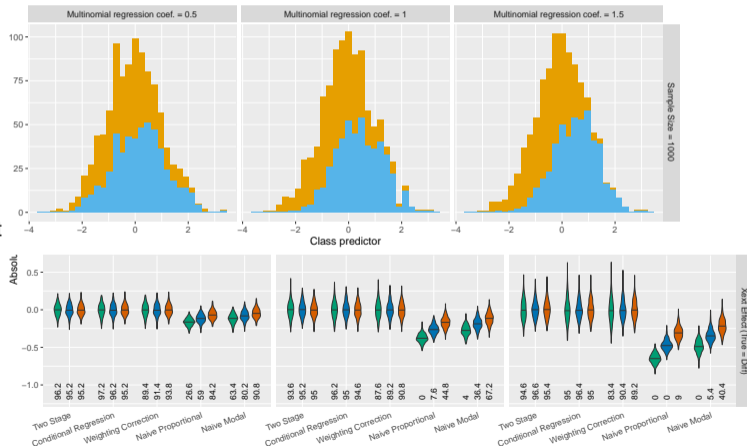# What about some predictors of the latent classes?
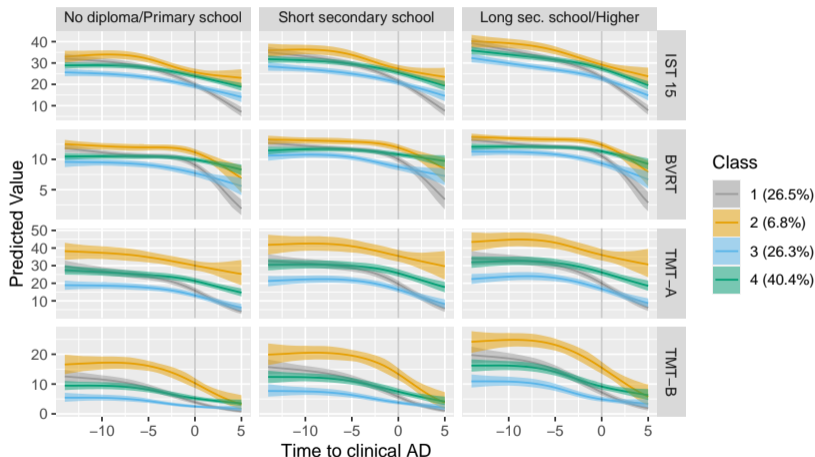

External predictor

1. Simulate a class predictor with 3 different intensities of association (along with the time-varying exposure)

$$\text{logit}(P(c_i = g)) = \gamma_O + \gamma_1 W_i^{\text{ext}}$$

2. Evaluate the bias in the subsequent multinomial model (here with 1000 subjects)

Heterogeneity of executive functioning trajectories in Alzheimer's disease (AD)
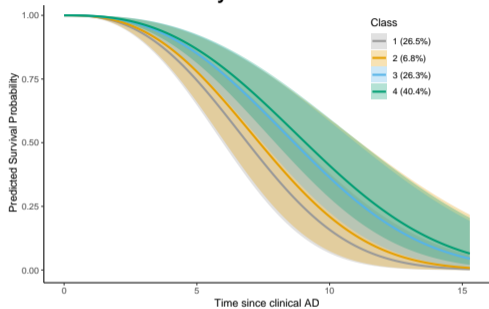

3C study

- ▶ Population-based
- ▶ 649 AD incident cases
- ▶ 4 scores of executive functioning
- ▶ time to clinical AD
- ▶ adjustment for education, center

4 identified latent profiles

profile characteristics?

Posterior association with clinical progression

Survival Probability

26.5% Intermediate EF with generalized substantial decline
6.8% High EF with specific substantial decline
26.3% Low EF with slow decline
40.4% Intermediate EF with slow decline

Trajectory of functional dependency

Trajectory of depressive symptomatology

Posterior association with brain atrophy biomarkers (MRI)

▶ Marker value at the last exam prior to diagnosis, adjusted for MRI timing
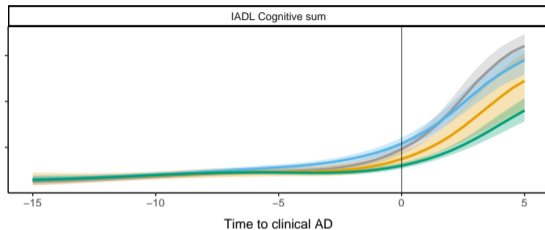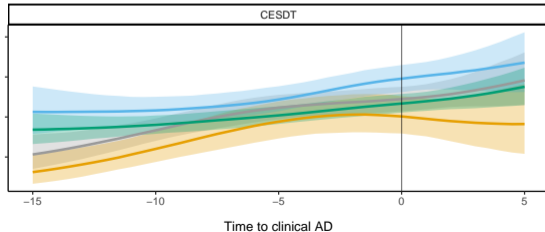
26.5% Intermediate EF with generalized substantial decline

6.8% High EF with specific substantial decline

26.3% Low EF with slow decline

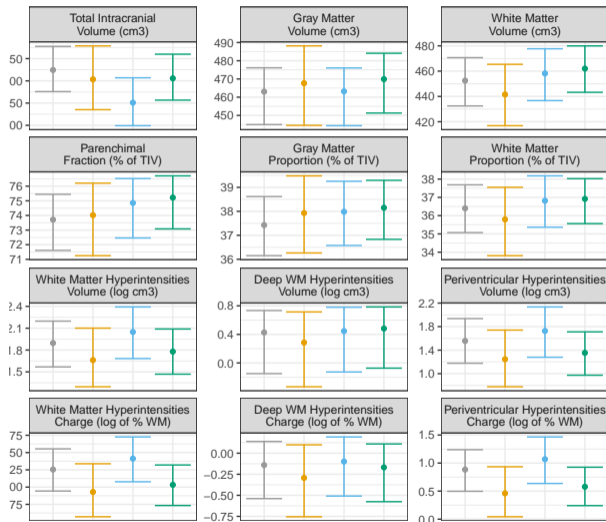40.4% Intermediate EF with slow decline

Concluding remarks

- Latent classes are widely used to summarize multidimensional information:
  - ▸ parcimonious summary
  - ▸ easy and graphical interpretation

- Inherent error of classification generally ignored
  - ▸ induces incorrect interpretations especially when classes are not well separated

- Two effective methods of correction: conditional regression or two-stage
  - ▸ may apply to any type of data
  - ▸ require specific computation of the variance (bootstrap or analytical)
  - ▸ rely on the assumptions of the model used (to be checked as always!)

- Software: Mplus and Latent Gold (correction, conditional)
            R package **lcmm** (conditional, two-stage)

Acknowledgements and references

Topic Group 4
"Measurement error and
Classification"

Project ID3M,
Fondation vaincre
Alzheimer

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