Comments Regarding Missing Data in Longitudinal Studies (LOOKING AHEAD!!!)

- Missing Data in Longitudinal Studies:
  - Intended measurements are not taken, lost, or unavailable.

- Patterns of missing data in longitudinal studies:
  - Dropouts: Subjects stop participating in the study during follow-up period and never come back
    - E.g. Poor treatment outcomes, death, cure, loss of interest, moving away
  - Intermittent Missing: Subjects have missing values in the middle of a study, e.g. miss an appointment but come back later

- Missing data may cause bias: It is important to understand the reasons for missing data;

Missingness Mechanisms

Patterns of Missing Data

Arbitrary

- missing data can occur anywhere
- ordering of variables is unimportant

Covariate Pattern	Y1	Y2	Y3
1	X	X	X
2	X	X	.
3	X	.	X
4	X	.	.
5	.	X	X
6	.	X	.
7	.	.	X
8	.	.	.

Monotone

- ordering of variables is important
- assume a set of variables Y1, Y2, …Yn
- if Yi is missing, then so are Yi+1,…, Yn

Covariate Pattern	Y1	Y2	Y3
1	X	X	X
2	X	X	.
3	X	.	.

- Missing Completely at Random (MCAR): Missingness does not depend on outcomes and covariates
  - Missing scheduled visit due to bad weather
- Missing at Random (MAR): Missingness only depends on observed outcomes and covariates
  - Older people have higher chance of dropping out
- Nonignorable (informative) Missing (NMAR): Missingness depends on unobserved outcomes or unobserved covariates
  - Patients drop out due to poor outcomes

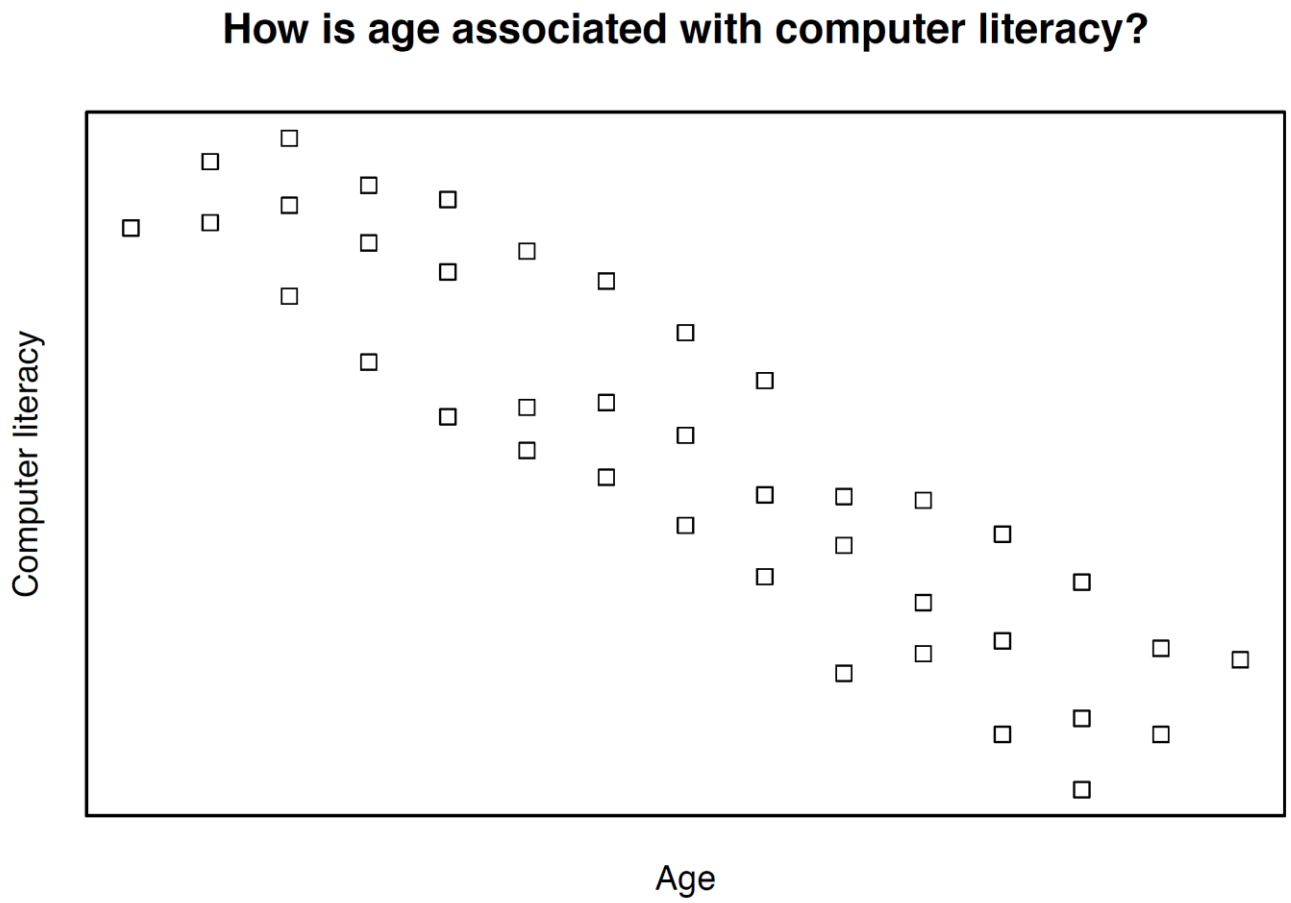
More on why we do Longitudinal Studies

Computer Literacy Example

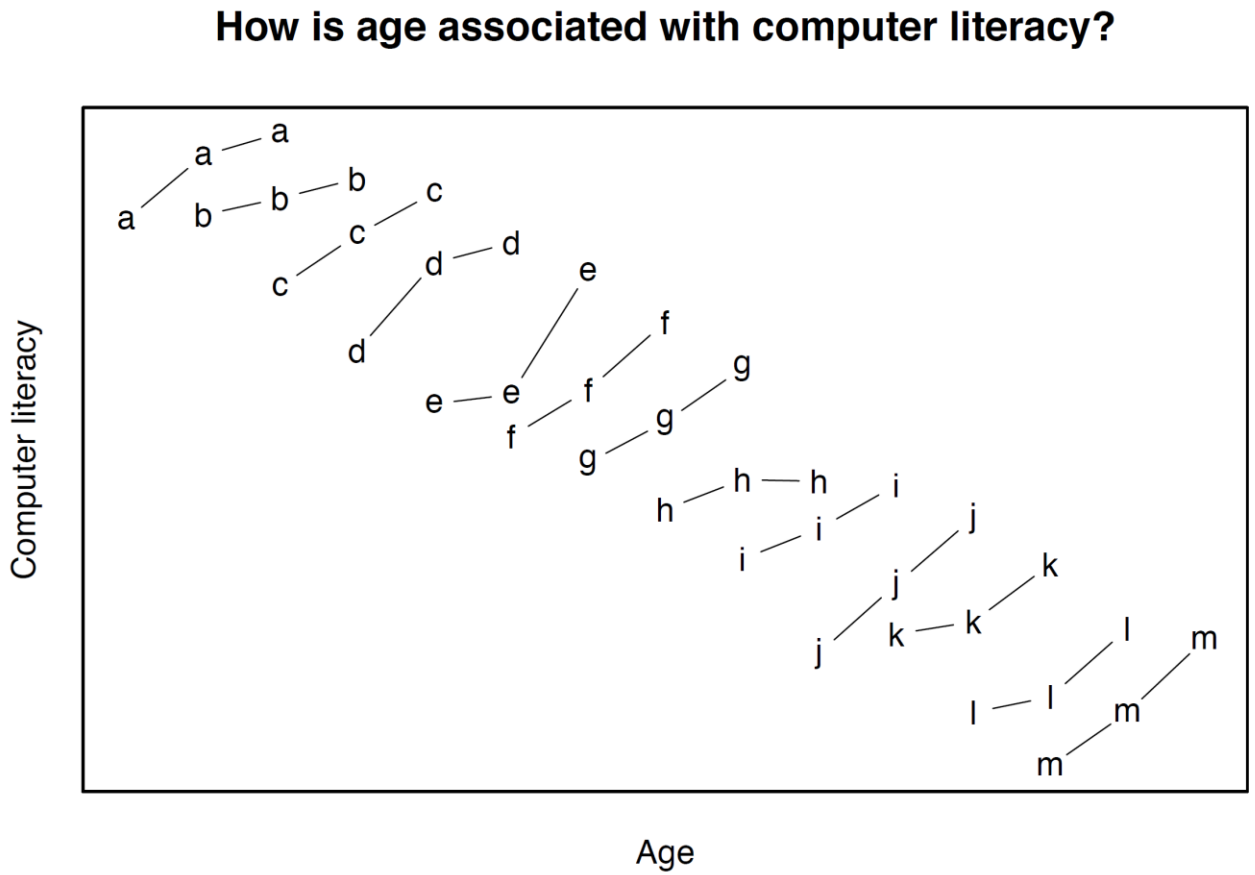
A hypothetical study made up by Adam Szpiro:

- Objective: assess association between age and computer literacy
- Study:
  - 13 Subjects enrolled in 3 year observational study
  - Computer literacy (somehow) assessed at baseline and annual follow-up visits

Study Results



Study Results With subject Labels



Interpretations

1. Computer literacy improves as one gets older
2. Older people have lower literacy

- Essentially: Cohort effect
  - Differences between people due to cohort (in this case birth year)