LONGITUDINAL DATA

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What is longitudinal data?

It refers to data which is collected over a period of time from the same subjects.

Why is longitudinal data dependent?

1. Repeated Measures:
2. Time-Related Effects:
3. Individual variability:

Linear Regression Model

VS

Linear Mixed Model

DATA SIMULATION

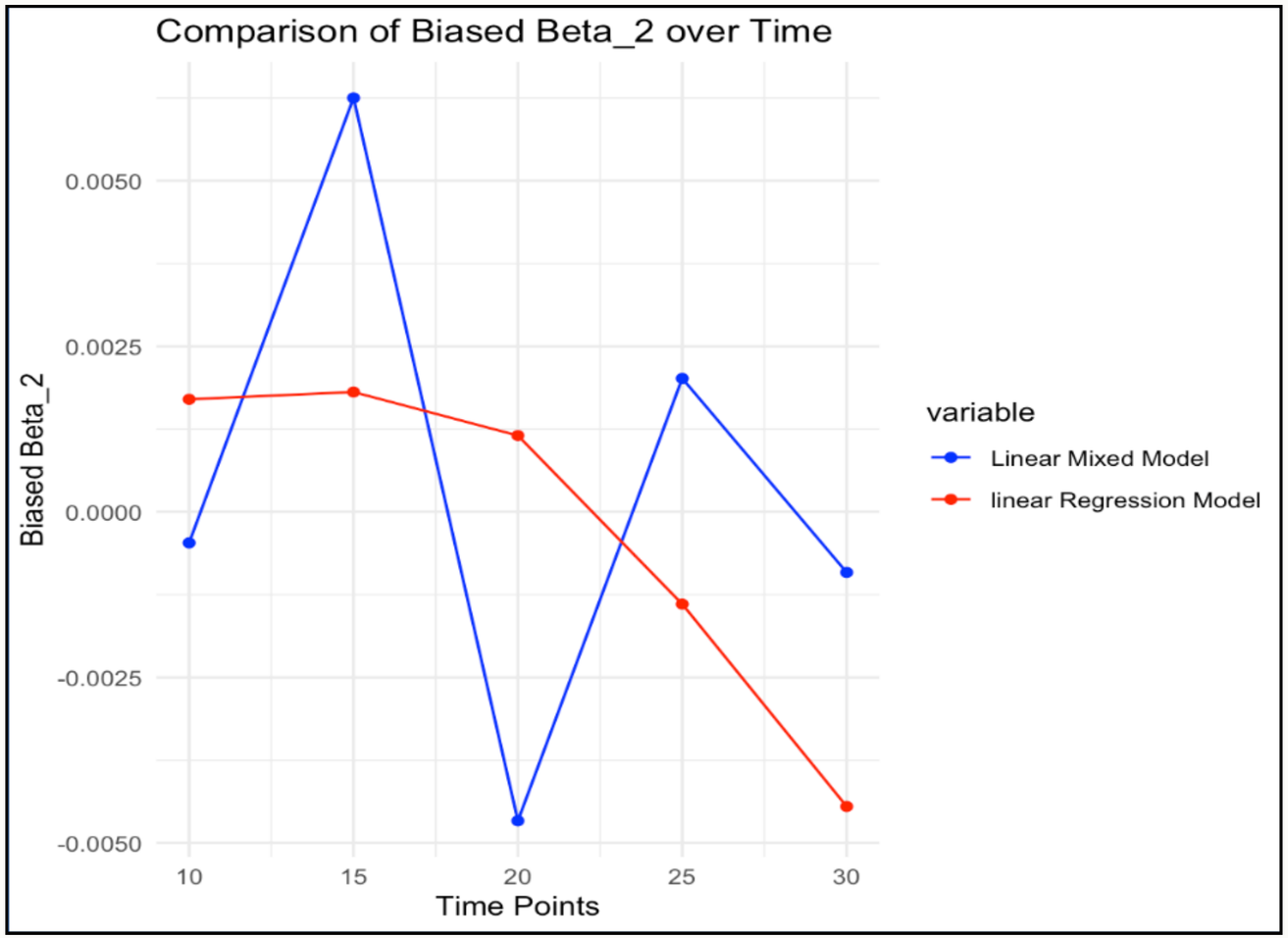
```r
# Define parameters
n_subjects <- 100
n_time_points <- 30
beta_0 <- 3
beta_2 <- 0.5
sigma_0 <- 0.5
sigma_1 <- 0.4
rho <- 0.2
```

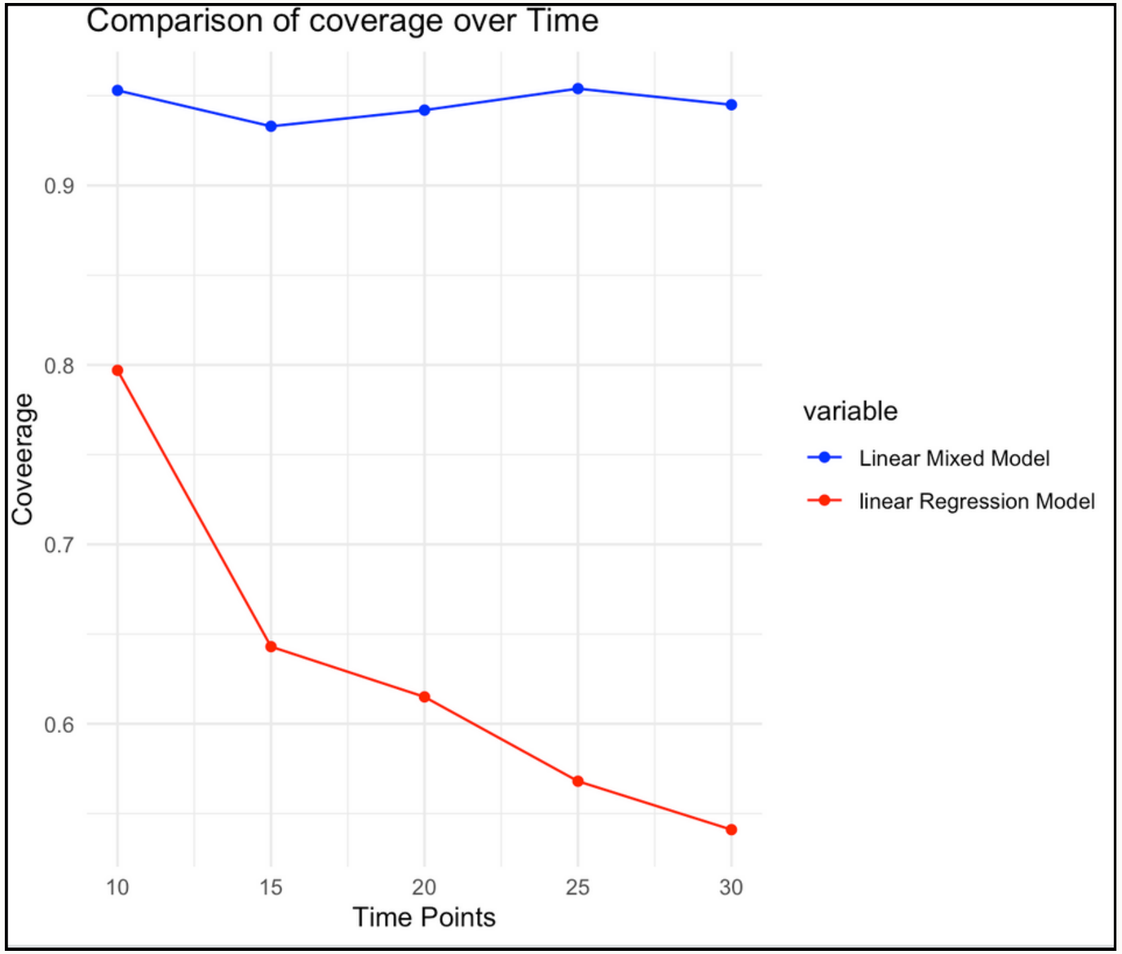
Generate data

$$Y_{it} = \beta_0 + \beta_1 X + \beta_2 t + b_{0i} + b_{1i} t + \epsilon_{it}$$

Biased beta_2 & Coverage

Data Simulation





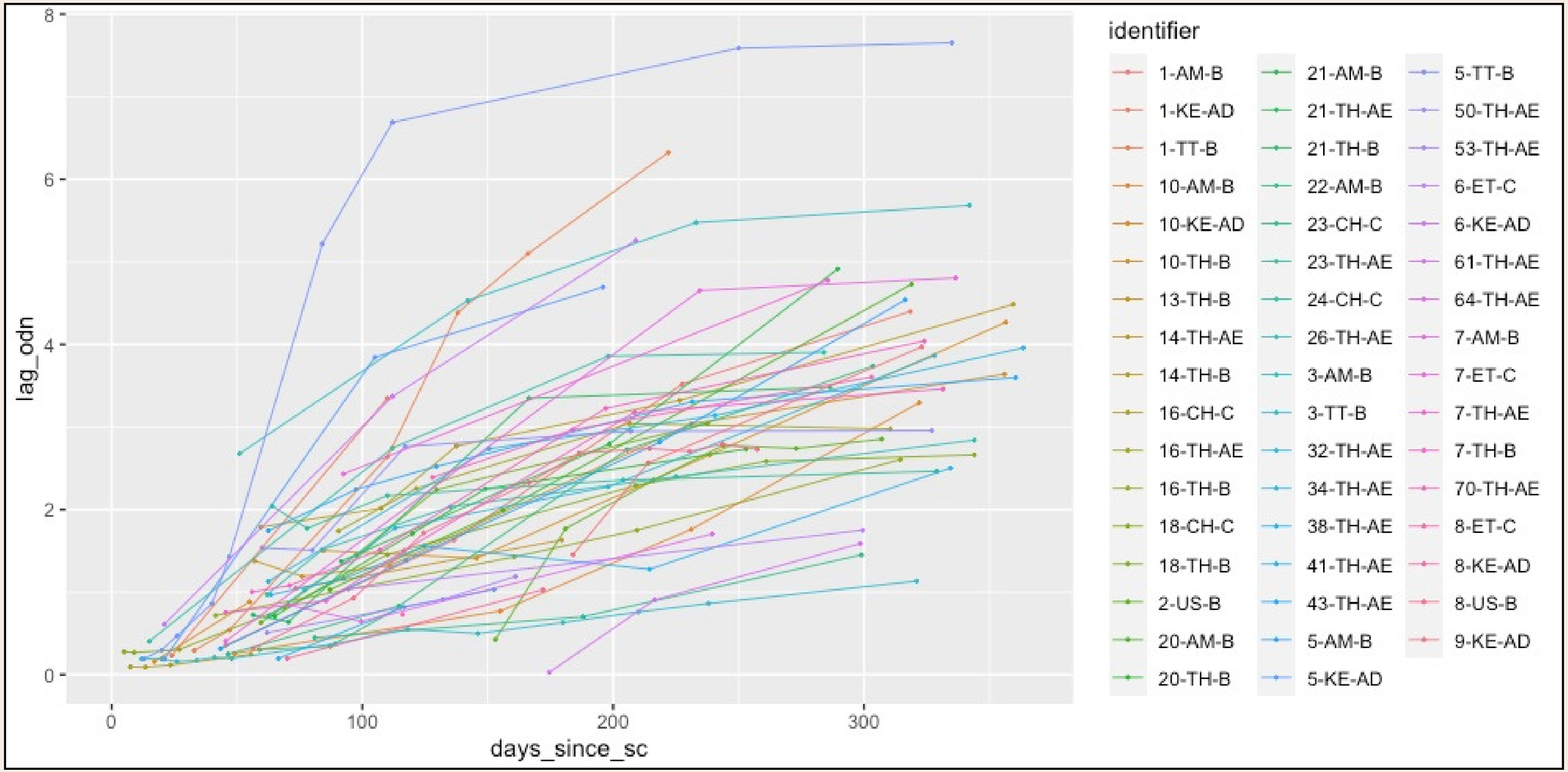
HIV Research

How HIV incidence changed over time?

- One specific use of understanding how LAg Avidity changes over time is in estimating HIV incidence (the rate at which people contract HIV) in a population.

- LAg Avidity: a measure of the binding strength of a certain set of antibodies against HIV.

GRAPH



days_since_sc: Days since HIV seroconversion, as estimated by the midpoint between the last negative and first positive test

lag_odn: LAg Avidity, the biomarker of interest

FINDINGS

$$LAgODn = \beta_0 + \beta_1 Days + b_0 + \epsilon$$

- The estimated coefficient for days_since_sc is approximately 0.0102.
  - With 100 days increase, the lag Avidity increases 1.02 on average.
- Confidence Interval
  - Lower bound: 0.009712427
  - Upper bound: 0.01072529

We want to fit a model with the random slope b1, but we run the computational issues, because of the data.

Thank you!!!!