1 Graphs

We start in thinking about graphing change over time with a scatterplot. 1 2

A natural next step is to connect the dots of a scatterplot with straight line segments to form a line plot. 3

Instead of simply connecting the observations, one may estimate an individual linear trajectory. In multilevel modeling these line plots showing individual estimated linear trajectories are sometimes called spaghetti plots.

Alternatively, rather than connecting observations with straight lines, or estimating an overall straight line trajectory for each individual, it may be useful to “smooth” the trajectories by drawing curved lines between individual observations.

One needs to be careful, however, as the smoothed trajectories may give the impression of having more data points than one actually has.
AN INCREASINGLY POPULAR OPTION is a slope graph.\(^4\)

2 The Data Used In This Example Are Simulated.

Many datasets, but not all, are originally created in the wide format—as shown below—where every row of data is an individual, and an individual only has a single row. Ideally, every row in wide data is uniquely identified by an individual id number.

<table>
<thead>
<tr>
<th>id</th>
<th>outcome.1</th>
<th>outcome.2</th>
<th>outcome.3</th>
<th>outcome.4</th>
<th>outcome.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>5</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Generally, for graphing change over time, it is most appropriate to have data that are in a long format, as shown in the margin. In long data every row represents a particular measurement occasion for a particular individual. Each individual in the data set thus has multiple rows. Ideally, every row in data in the long format is uniquely identified by the combination of an id number and a study wave.

Data can be reshaped from wide to long format, and vice versa. Two straightforward options are the reshape command, as available in both Stata and R.

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\(^4\) In order to be clear and effective, a slope graph may often only show the outcome at the beginning point, and at the end point. A slope graph may be less satisfactory when there are multiple timepoints.

The small multiple idea works with a slope-graph as well.

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Graphics made with ggplot2 created by Hadley Wickham.

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