Last Time

• Choosing colors is difficult
  – Color is a perception, not an actual property
  – Our brain and eyes can easily trick us
  – We have to consider colorblindness
  – Saturated backgrounds are bad
  – Making background and text the same hue is bad
Types of Data

- **Nominal** – Data can be categorized, but those categories don’t have any inherent order.

- **Ordinal** – Data can be categorized and do have an inherent order, but arithmetical comparisons are meaningless.

- **Interval** – Data can be categorized, categories have an inherent order, and arithmetical calculations can be done with addition/subtraction but not multiplication/division because there is no meaningful zero point.

- **Ratio** – Data can be categorized, categories have an inherent order, and all arithmetical calculations can be done (addition, subtraction, multiplication, division) because there is a meaningful zero point.
Color Encoding Styles

• **Qualitative** – Independent colors (different hues) that have no relationship to one another

• **Sequential** – Dependent colors (same hue, different saturation/value) arranged such that the change in color is proportionate to the change in the data in one direction

• **Diverging** – Two dependent colors arranged such that the change in color is proportionate to the change in the data in two directions, spreading from a center point.

www.colorbrewer2.org
## Encoding Types of Data

<table>
<thead>
<tr>
<th>Nominal</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinal</td>
<td>Sequential</td>
</tr>
<tr>
<td>Interval</td>
<td>Diverging</td>
</tr>
<tr>
<td>Ratio</td>
<td></td>
</tr>
</tbody>
</table>
Bad: Qualitative Encoding of Ratio Data
Good: Divergent Encoding of Ratio Data
Good: Nominal Data, Qualitative Colors
Good: Nominal Data, Qualitative Colors
Good: Ratio Data, Divergent Colors
Bad: Interval Data, Qualitative Color
Good: Interval Data, Sequential Colors
Good: Interval Data, Sequential Colors
Bad: Not Colorblind Safe

WHICH STATES ARE MOST AFFORDABLE TO LIVE IN?
Bad: Ratio Data, Qualitative Colors
Good: Ratio Data, Divergent Colors
Just Horribly Bad
Two Activities

1. Go back to Color Brewer, find a color scheme, and recolor one of your labs or code from a class lecture.

2. Go to Google Images, search “scientific data visualization” or something similar, and find a good example and/or a bad example of color encoding.
Any Questions?