

## ≡ 10. How Much is Too Much?

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By now, you've seen a lot of ways of expanding the number of variables that can be depicted in a single visualization. The basic positional axes can handle two variables: one on the horizontal and one on the vertical. You can facet by both columns and rows to add up to two variables. Encodings in shape, size, and color could add as many as three more. However, you should try and resist the temptation to overuse your newfound power, and to instead practice some restraint in the number of variables that you include in any one plot.

When you have only two variables plotted, A and B, you have only one relationship to understand. Add in a third variable C, and you have three pairwise relationships: A vs. B, A vs. C, and B vs. C. You also need to consider one interaction effect between all three variables: Does the value of C affect the relationship between A and B? With a fourth variable, you have six possible pairwise relationships and four different three-variable interaction effects. This exponential explosion of possible relationships with the number of variables means that there is a potential for cognitive overload if the data isn't conveyed clearly.

This is why it is so important to approach data exploration systematically, rather than just throw as many variables together as possible immediately. When you move from univariate visualizations to bivariate visualizations, you augment your previous understanding of individual distributions by seeing how they relate to one another. If you look at pairwise visualizations before putting together a trivariate plot, then you will have a clear view to how the interaction, if present, changes your previous understanding of the marginal pairwise relationship.

When you move on to explanatory data visualizations, try to limit the number of variables that are introduced at the same time and make sure that the encoding choices convey the main findings to your reader in the clearest way possible. While it's good to keep a soft limit of about three or four variables in a single visualization, you can exceed this if the trends are clear or you introduce features to your reader in a systematic way.

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