Not Every Graph Is a Good One: Examples of Improvements to Commonly Used Graphs

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Examples: Before and After

Contributors

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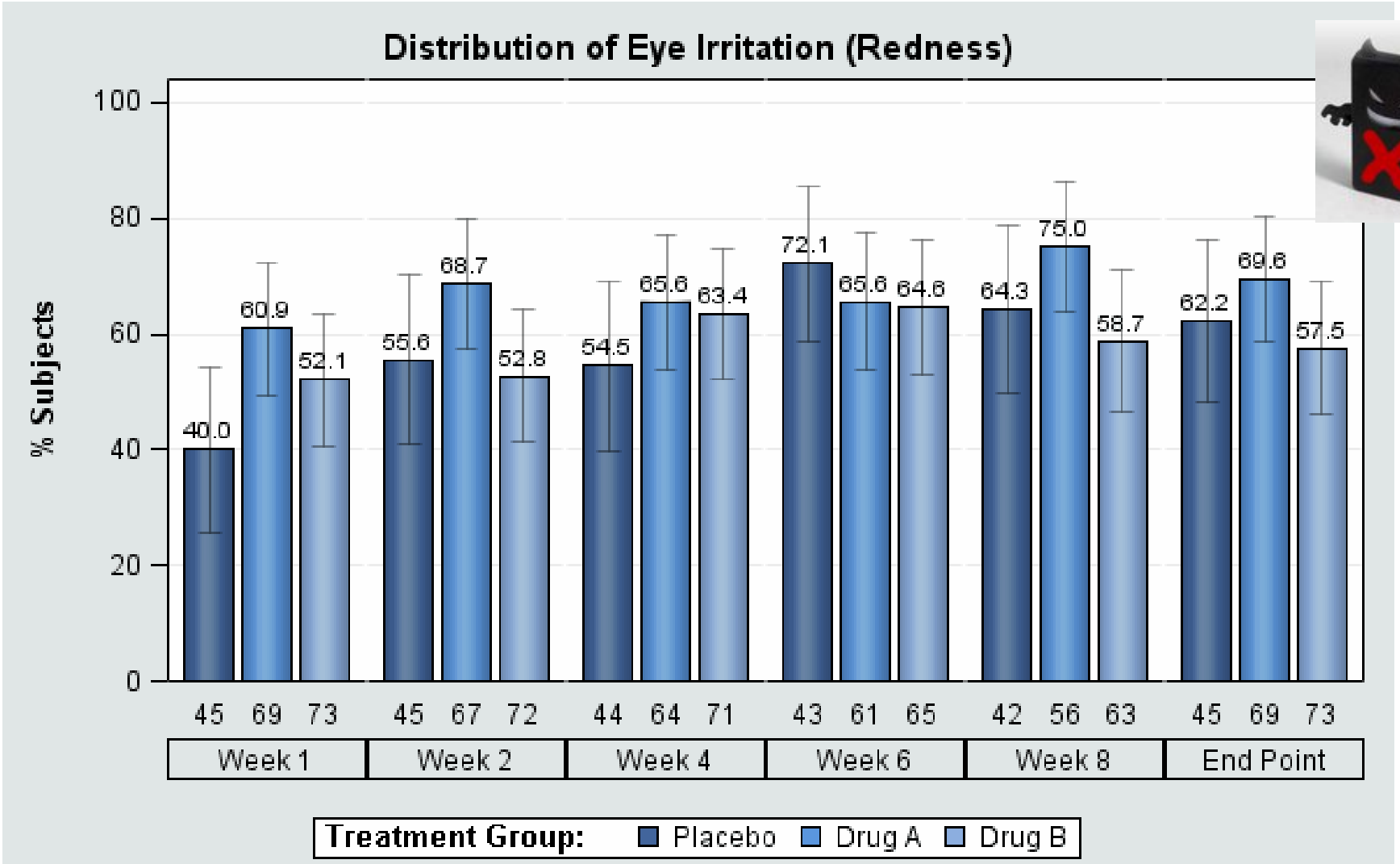
Fabrice Bancken, Novartis

Brenda Crowe, Lilly

Tired of Sitting in Sessions?

- Audience participation section

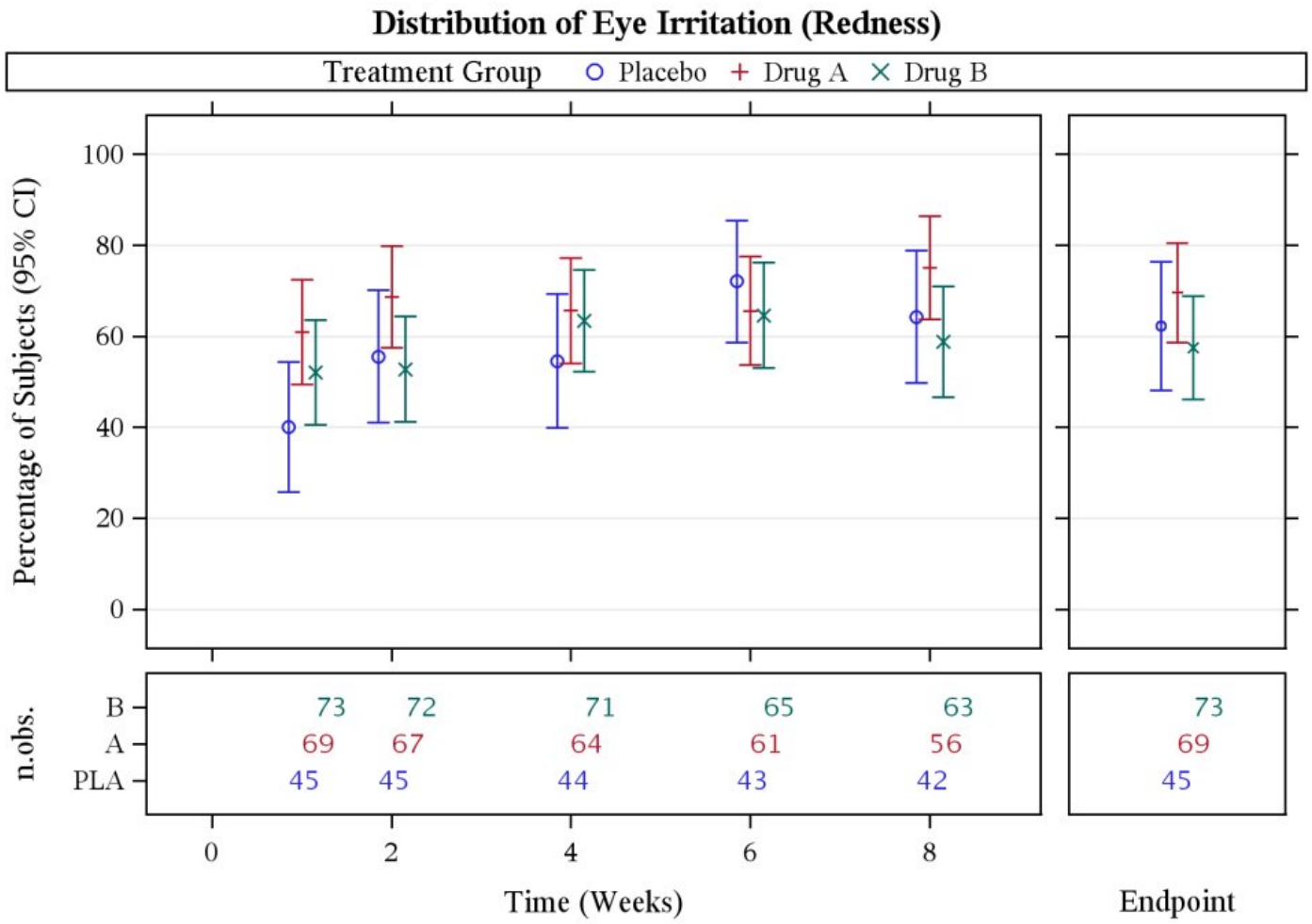
Graph 1a: Bar Chart of Distribution of Eye Irritation



Problems

- Lots of ink doesn't help the message
- Not clear what is the measure of variability
- Using weeks and end point as categorical variables doesn't show the time differences between them.
- Endpoint just another set of bars, not distinguished from 'over time' info

Graph 1b: Dotplot of Distribution of Eye Irritation

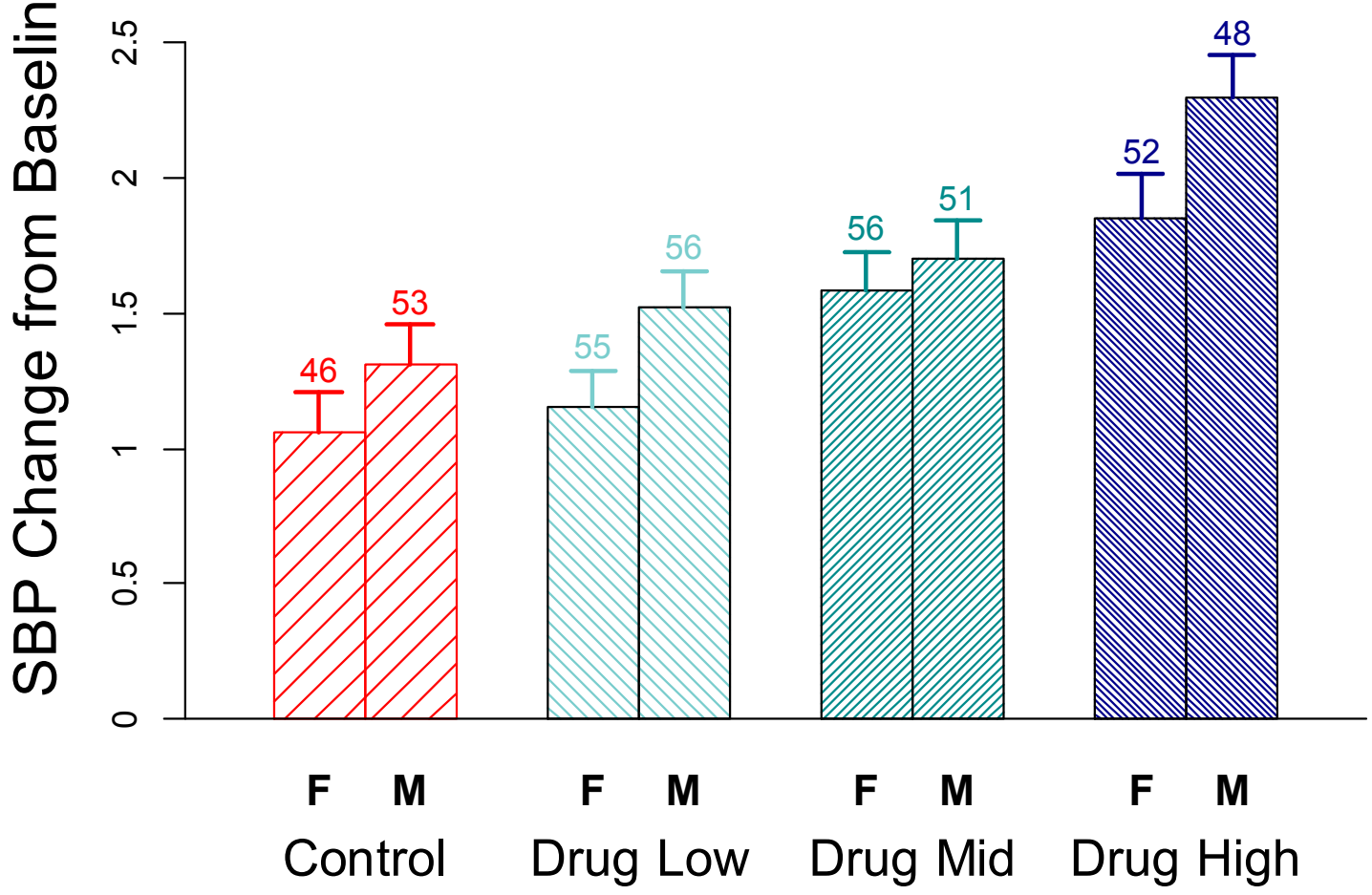


- Main message not obscured by all the ink.
- Weeks 1 and 2 visually closer than weeks 2, 4, 6 and 8.
- Endpoint clearly separated from time in weeks.

Situation 2

- Clinical trial to assess effects of multiple doses (low, mid, high) on systolic blood pressure
- Mean change from baseline was calculated with 95% CI
- Also want to know if effect similar for males and females
- Barplot is commonly used

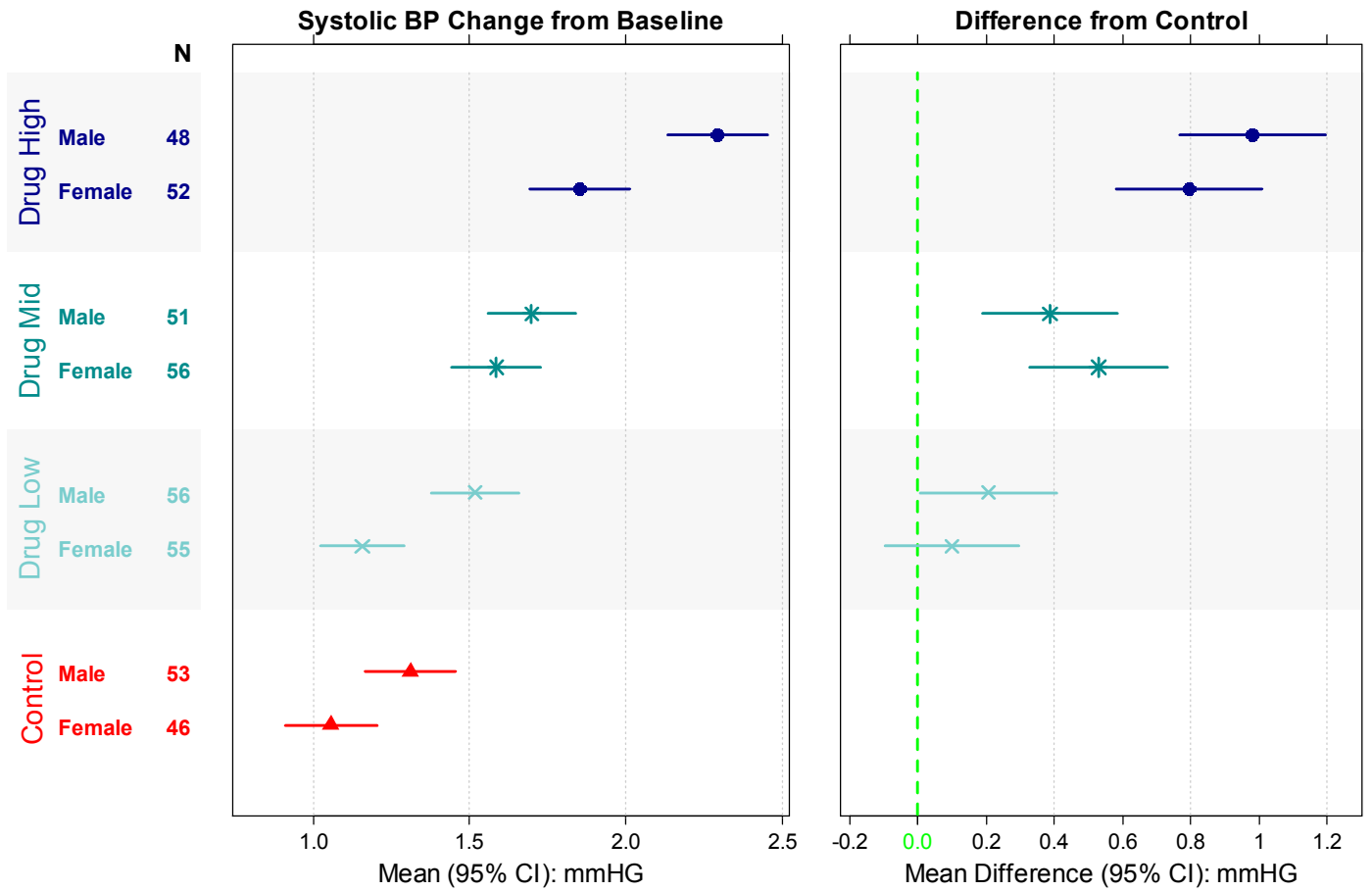
Graph 2a. Barplot of Mean Changes from Baseline.



Problems

- No indication of what top of bar represents (actually it is upper bound of 95% CI)
- Lower bound of CI not shown
- Bar height represents the mean (data-to-ink ratio not maximized)
- Number at top of bar not described
- What is difference between treatments and control?
- Change from baseline to???

Graph 2b. Multi-panel Dotplot of Mean Changes from Baseline in Systolic Blood Pressure



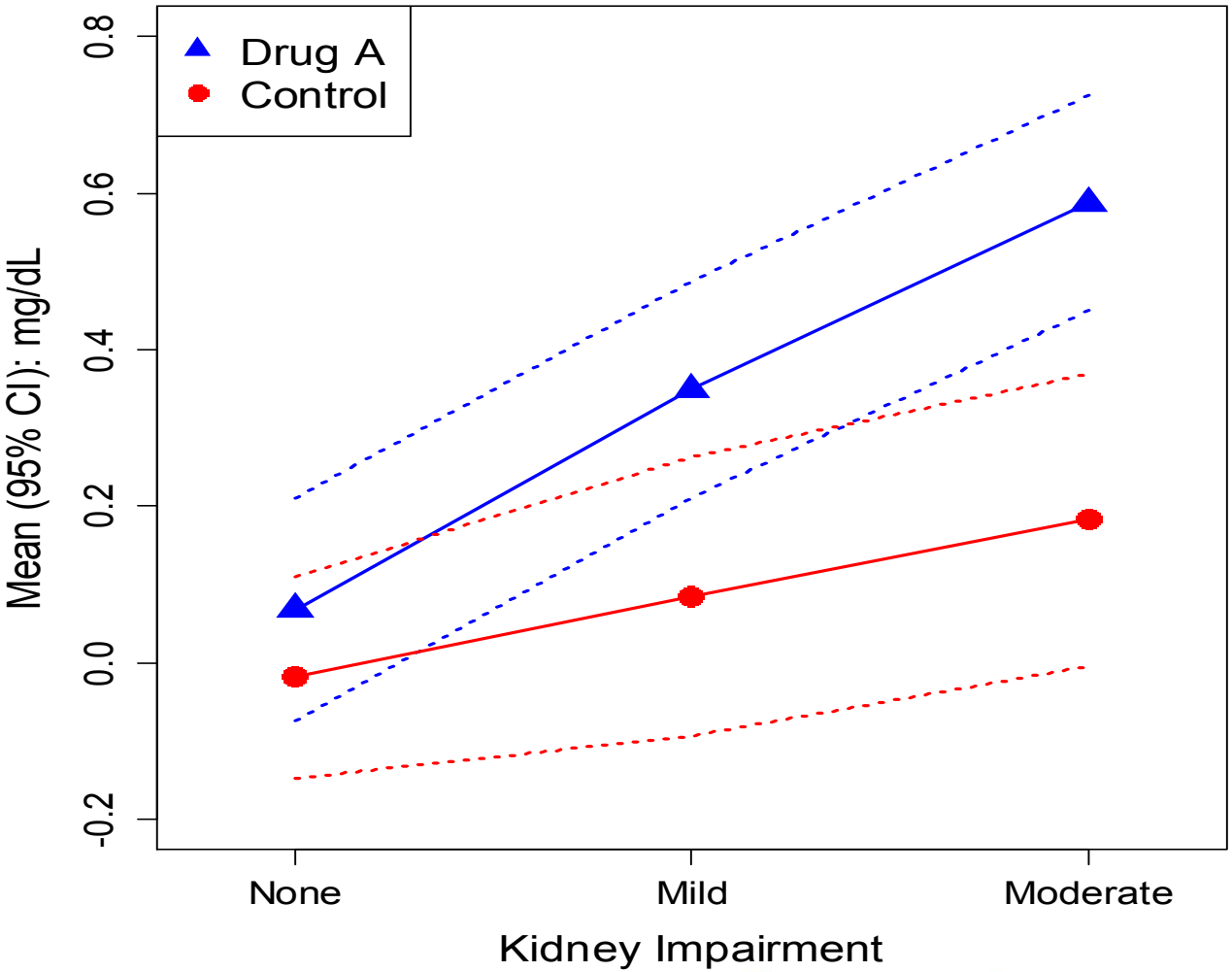
Advantages of Graph 2b

- Single plotting character depicts the mean and 95% CI—much more effective data-to-ink ratio (clearer graph with unobstructed data patterns)
- Difference between the experimental dose and that of the control is easily decoded in the right hand panel
- Easy to see which doses (and gender) have lower bounds greater than 0 (values greater than 0 imply increases in systolic blood pressure relative to control).

Situation 3

- A clinical trial collects lab data to assess effect of Drug A on serum creatinine based on baseline kidney function that was graded as none, mild or moderate.
- Objective is to determine if a treatment effect exists within each subgroup defined by the level of kidney function.

Graph 3a. Line Plot of Changes in Serum Creatinine

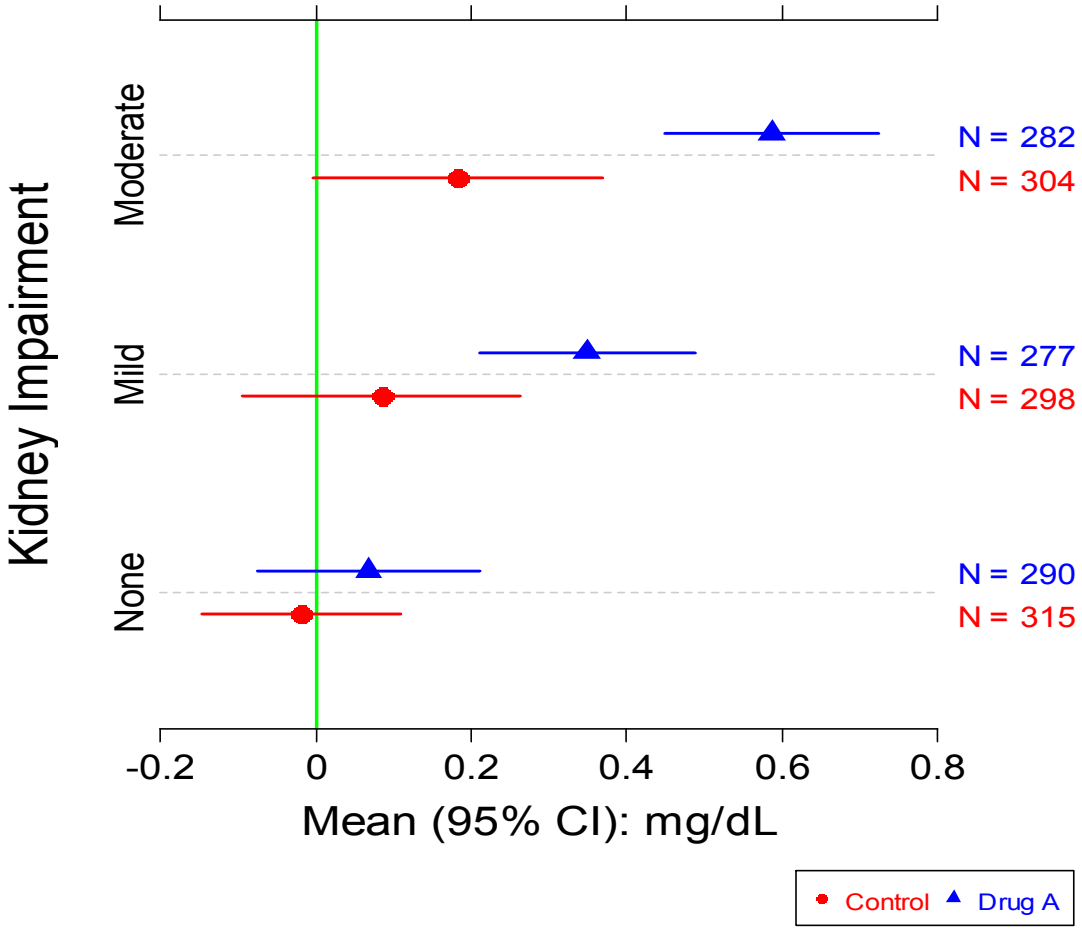


Dotted lines are 95% CIs

Problems with Graph 3a

- Use of lines to connect might suggest continuous x axis
- Use of lines for the CI makes it difficult to compare the upper bound of the control CI with lower bound of Drug A CI
- Graph suggests a comparison of curves across a range of kidney function rather than a comparison within a specific subgroup of kidney function

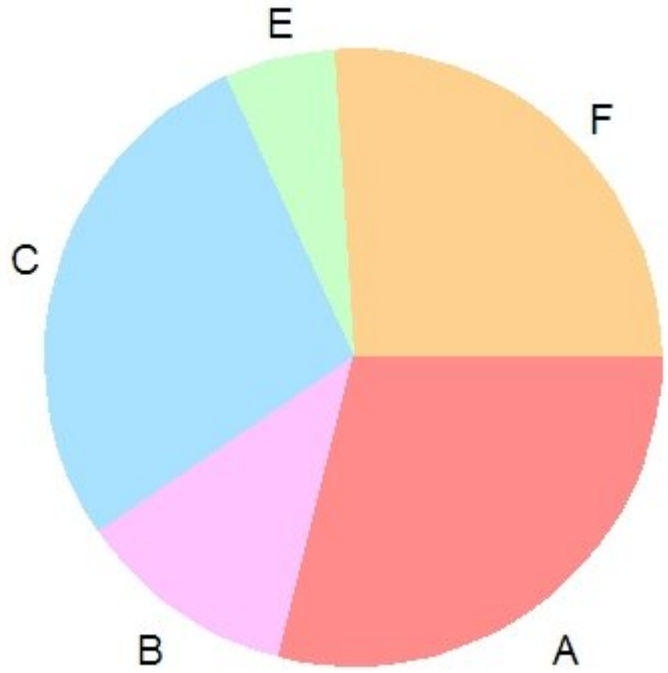
Graph 3b. Annotated Dotplot of Changes in Serum Creatinine



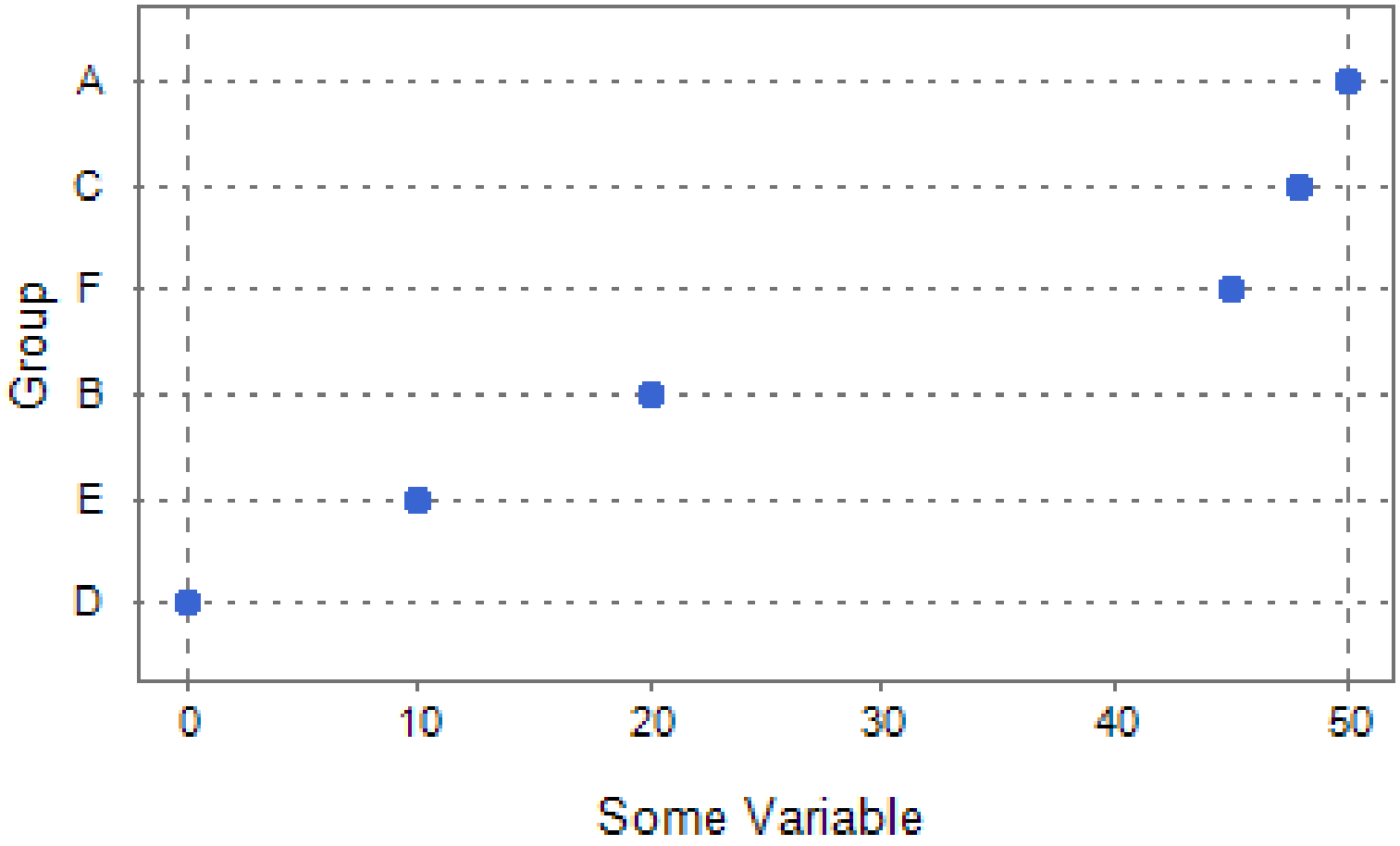
Advantages of Graph 3b

- Kidney function variables are unconnected (hence not implying data continuous)
- More clear that the data are ordinal
- Within a level of the kidney function subgroup, the 95% CIs are in near proximity to each other emphasizing a more direct comparison with subgroup (the primary clinical interest) rather than across subgroups
- Includes sample sizes

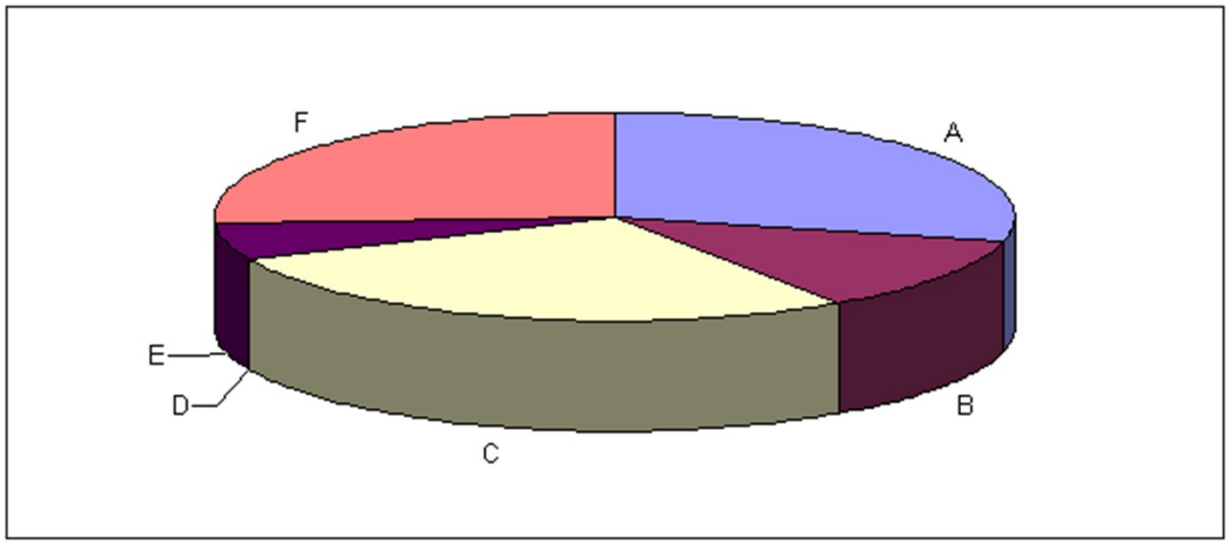
Graph 5a. A Pie Chart Used in an Informal Study to Assess How Well Data Can Be Read From It



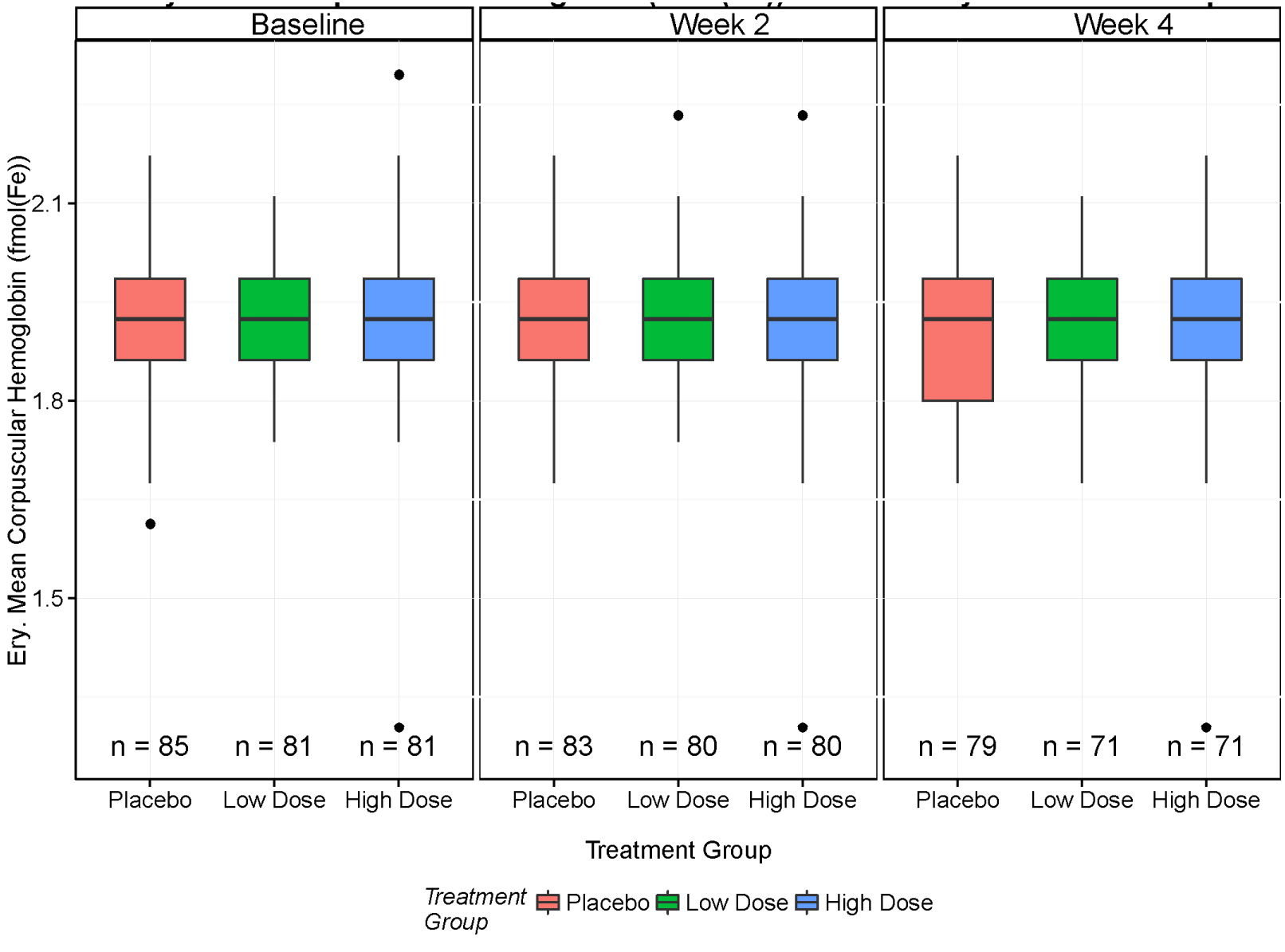
Graph 5b. Dotplot Using the Same Data as Graph 5a



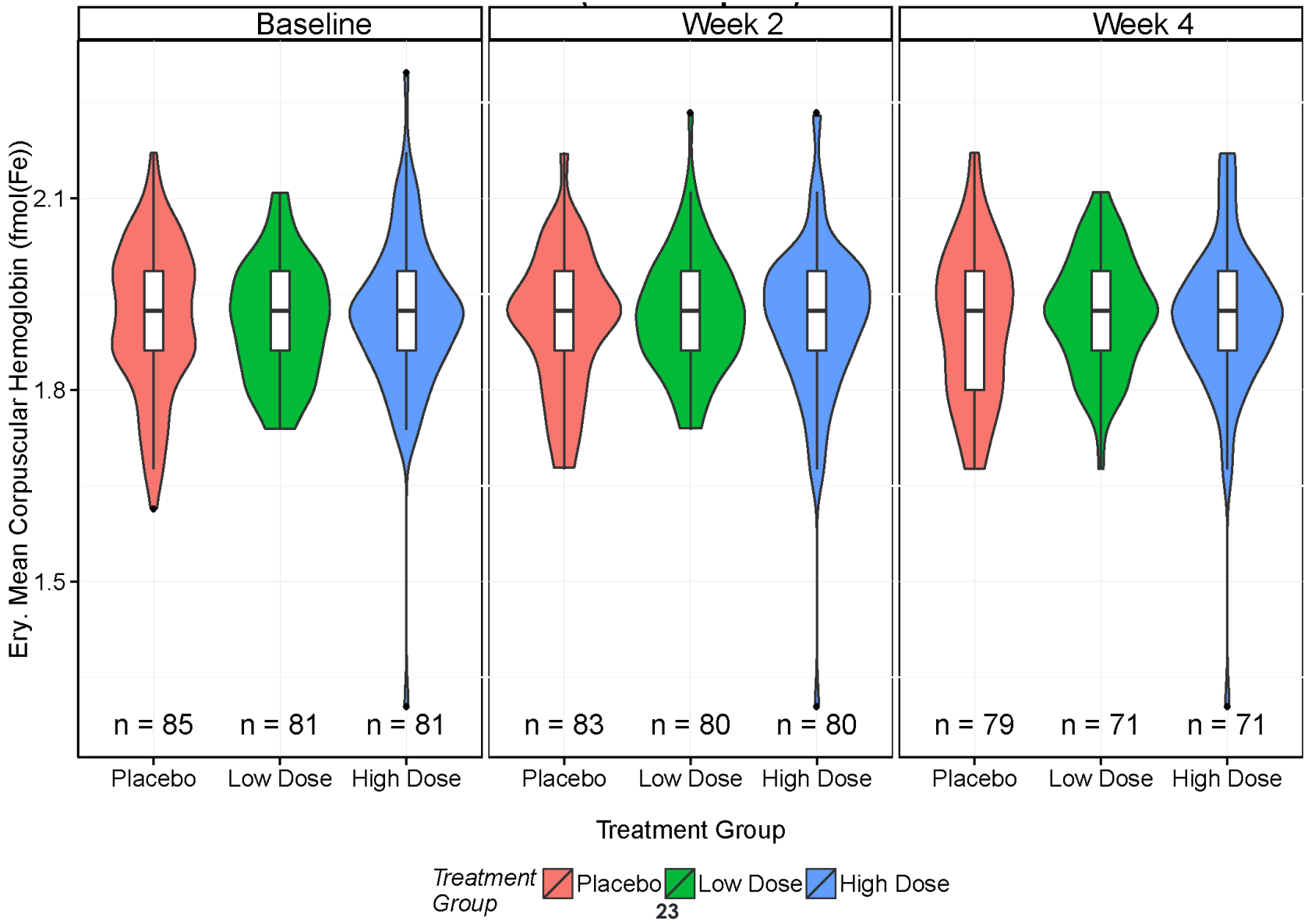
Graph 5c. Pseudo Three-dimensional Pie Chart (using the same data as Graph 5a) *(not recommended).*



Boxplots of Erythrocyte Mean Corpuscular Hemoglobin over Time by Treatment Group



Violin plots (with boxplots) of Erythrocyte Mean Corpuscular Hemoglobin over Time by Treatment Group



References

- Best practices recommendations from the Clinical Trials Safety Graphics Working Group. Available at: https://www.ctspedia.org/do/view/CTSpedia/BestPractices
- Brewer C and Harrower M. Color Brewer advice for maps. Available at: http://colorbrewer2.org/
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- Osborn DP, Levy G, Nazareth I, Petersen I, Islam A, King MB. Relative risk of cardiovascular and cancer mortality in people with severe mental illness from the United Kingdom's General Practice Research Database. *Archives of General Psychiatry* 2007; **64:**242-249.

Acknowledgements

Rebeka Tabbey,
Sr Statistician-Computation
Lilly

Concluding Remarks

- Often simple changes can greatly improve a graph

Potential improvements from using effective graphics

- More transparent results
- Easier to detect safety signals
- Improves the ability to make clinical decisions
- Allows for more productive interactions between sponsors and regulatory bodies
- Improves communication with the public

Thank you

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