# *Behavior Over Time (BOT) Graph*

Behavior-over-time (BOT) graphs help us recognize correlations between variables. It is what the name says: a graph of the behavior of select variables over a specific time. You select the variable, and you choose the time frame for your graph. It is important to keep in mind the difference between correlation and causation. For example, there is a correlation between ice cream consumption and sunburn, but we would not say that eating ice cream causes sunburn or that sunburn causes us to consume ice cream. So, although there may be a correlation, causation hasn't been determined. (In this case, there is a missing variable: days over 90 degrees Fahrenheit).

Social psychologist David Myers clarifies the difference between correlation and control. "It's easy to see a correlation where none exists. When we expect to find significant relationships, we easily associate random events, perceiving an illusory correlation."[i] And, "if we believe correlation exists, we are more likely to notice and recall confirming instances."[ii] We must be careful in assuming correlations exist between variables. Our assumptions about correlation may have contributed to the problem.

On the other hand, we can second-guess whether variables are correlated ad infinitum. The benefit of this multi-tool approach to systems thinking is that we have multiple opportunities to evaluate these correlations. As we work through the system tools, we may gain increased clarity about variable relationships. Perhaps there was an unseen intermediate variable that was identified to make sense of the correlation. Or, maybe the variables presented an illusory correlation that disappeared on a more in-depth evaluation. The point: Be careful about making assumptions about relationships between variables. Assumptions contribute to fuzzy thinking.

The most significant benefit of the BOT graph is getting an initial visual representation of correlations between variables. The old saying about a picture being worth a thousand words is true in this case. Just plotting the variables over time can help you see correlations you may have missed previously. Seeing correlations is one of the reasons that BOT graphs are such helpful thinking tools. Although you can use quantitative data in a BOT graph, it is not necessary. Qualitative data, your impression of behaviors and trends, is just as valuable. Social systems deal more with qualitative data than quantitative data, and this is especially true of churches.

Churches are built around values, beliefs, convictions, and non-quantifiable variables that can be represented well in a BOT graph.

Consider the variables identified in the iceberg diagram (Figure 2.1): little sleep, poor diet, work stress, and colds. These are the variables that we will examine in the BOT graph to get an idea of correlation. Experience and common sense tell us that they are related somehow, but what is the nature of the correlation? The BOT graph is an X-Y graph with the selected variable on the Y (vertical) axis and time on the X (horizontal) axis.

**Variables:** Selecting variables for the BOT graph depends on your assessment of the problem. What variables seem to be involved? It is important to make sure you stay focused on the immediate variables. Don't try to consider every possible factor, only those that seem to be most directly involved. You can always expand the graph to include more variables later if you find that others are impacting the problem. Start small, then expand the bounds of the problem as you see necessary correlations. For example, the colds problem from Figure 2.1 identifies sleep, stress, and diet as the primary variables. Is it possible that work schedule and daylight savings time could influence the problem? Well, yes. But they are not closely related enough to consider in the first draft of the BOT graph. Work with the most closely related variables and then expand the graph if you discover that other variables should be included.

**Constructing a BOT graph**: List the immediate variables on the Y-axis. There is no necessary order to the variable, except to consider that if a variable seems to be increasing and another decreasing, to represent them on the graph, they should be placed appropriately, increasing variables toward the bottom and decreasing variables toward the top of the graph. That way, your graph will provide the most visual help in identifying correlations.

Figure 2.2 is a completed BOT Graph of the "colds" variables. The visual representation of the variables provides insight into the nature of the relationship between them. The presenting problem, increased colds, shows that there is a "perfect storm" of variables, all related in some way. But how are they related? What variables are most important to act on? What would be the most effective systemic intervention? The causal loop diagram will help answer these questions.
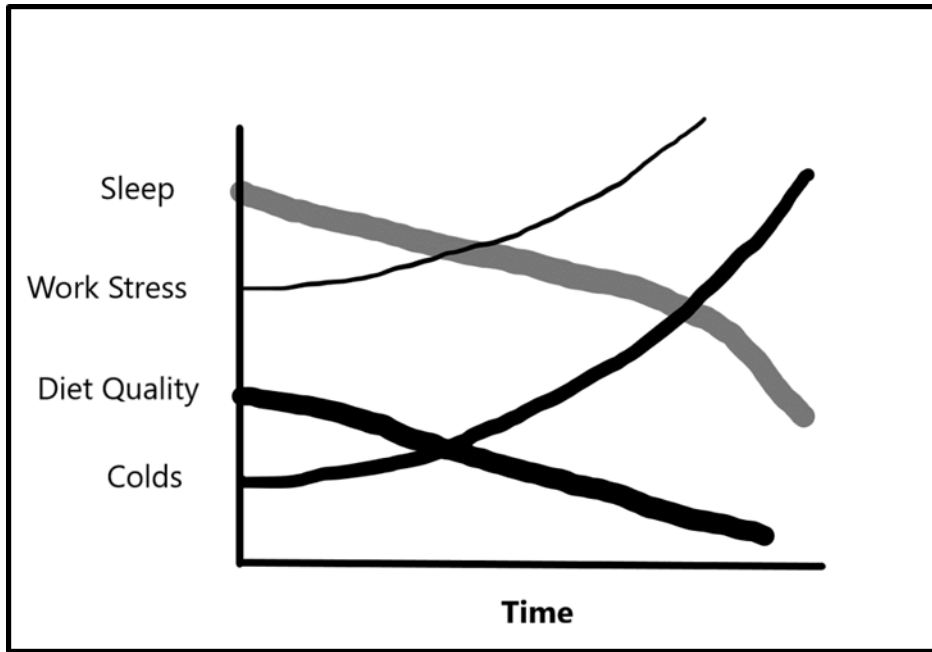
*Figure 2.2 Behavior-Over-Time Graph of "Colds" Variables*. *Source*: J. Messer, 2020.

[i] David G. Myers, *Exploring Social Psychology* (6th ed.), (New York: McGraw-Hill, 2012), 86.
[ii] Myers, *Social Psychology*, 87.