**Measure 1: Translational betweenness centrality**

This is a measure that can be used to compare nodes within a network, or networks with each other. Translational betweenness centrality measures how often a node in the network is in the shortest path between basic-clinical node pairs. It measures a node’s control over the communication across the basic-clinical divide. Translational betweenness centrality is defined as:

Equation Translational betweenness centrality



where B is the set of basic science nodes, C is the set of clinical science nodes, gbi,cj is the number of geodesic (shortest) paths between bi and cj, and gbi,k, cj, is the number of the geodesic paths between bi and cj in which k is a node.

I identify two ways this measure could be used. Though, it could be used for more. First, it could be use to determine which nodes in the network control communication flow to the greatest extent. If these people could be identified, their relationships could be leveraged to increase translational research. CTSAs could try to work closely with them to get insights and improve team building. Second, this score could be used determine the proportion of the network accountable for most of the information flow. If a node were to have a high enough translational betweenness centrality, its deletion from the network would cause the nework to fail into clusters with little communication along the basic-clinical divide.. To this end community detection could be performed on the network. One could then start deleting nodes with high translational betweenness centrality, and determine how many nodes need to be deleted to turn most of the network into unconnected communities of either mostly basic scientists or mostly clinical scientists. If one of the purposes of translational initiatives is to increase collaboration across the basic-clinical divide, a network which relies on a few nodes for communication flow could be problematic. What if those people were to leave? How often will nodes outside their discipline get a voice in cross-collaborative endeavors?

The translational betweenness centrality could also be used to create a network measure to compare networks with each other to determine the extent to which communication flow is defuse across the nodes in the network. Translational betweenness centrality could be averages across the nodes in the network to achieve this.

**Measure 2: Translational Network Capacity Score:**

The Translational network capacity score is a diversity score that measures for evenness. For each node it measures the proportion of its connections that are basic, and the proportion that are clinical. It determines the evenness between those categories. It can be used to compare networks for translational capacity.

Equation Translation Network Capcity



Where N is the number of nodes in the network, pi,c is the proportion of node i’s connections who are clinicians, and pi,b is the proportion of node i’s connections who are basic scientists. The more even the proportions the closer  is to 1. This can be used to compare networks. Networks where nodes have, on average, more even proportions of basic and clinical scientists, the closer the global score from equation 2 will be to 1. In contrast, networks where nodes have, on average, less even proportions of basic and clinical scientists, the closer the global score from equation 2 will be to 0.