In some areas of the U.S., the sickest liver transplant candidates have an 82% chance of dying; in others, a 14% chance of dying, because of extreme disparities in the availability of livers for transplant. Historical precedent dictates organ sharing within a hierarchy of 50 small donor service areas grouped into 11 regions, and these areas have very different ratios of eligible liver donors to liver transplant candidates.

We designed novel regions for liver allocation by partitioning the set of donor service areas according to an integer program redistricting model. Our work directly addressed the paramount clinical and ethical concern about geographic equity in transplantation. We validated our redistricted maps using the clinically detailed Liver Simulated Allocation Model that is the gold standard for testing allocation policy proposals, to compensate for the necessarily simplified and aggregated picture of liver allocation in an integer program.

Trying to implement this solution led to an intense battle over the scarce livers that has had a number of twists and turns, and I will discuss a web of related studies our research group has undertaken to support the movement towards transplant equity.

BIO:
Sommer Gentry is a Professor of Mathematics at the United States Naval Academy, and is also on the faculty of the Johns Hopkins University School of Medicine. She is a senior investigator with the Scientific Registry for Transplant Recipients. She has a B.S. in Mathematical and Computational Science and an M.S. in Operations Research, both from Stanford University, and a Ph.D. in Electrical Engineering and Computer Science from MIT. She designed matching optimization methods used for nationwide kidney paired donation registries in both the United States and Canada, and is now redistricting liver sharing boundaries to help the Organ Procurement and Transplantation Network reduce geographic disparities in transplantation. Her work has attracted the attention of major media outlets including Time Magazine, Reader’s Digest, Science, National Public Radio, and the New York Times. Gentry has received the MAA’s Henry L. Alder award for distinguished teaching by a beginning mathematics faculty member, and was a finalist for the INFORMS Daniel H. Wagner prize for excellence in operations research practice.