The Role of Modeling in Proposed Organ Allocation Policy Changes

David C. Mulligan, MD, FACS, FAST, FAASLD
President, Organ Procurement and Transplantation Network (OPTN)
United Network for Organ Sharing (UNOS)
Professor of Transplantation and Immunology
Yale University

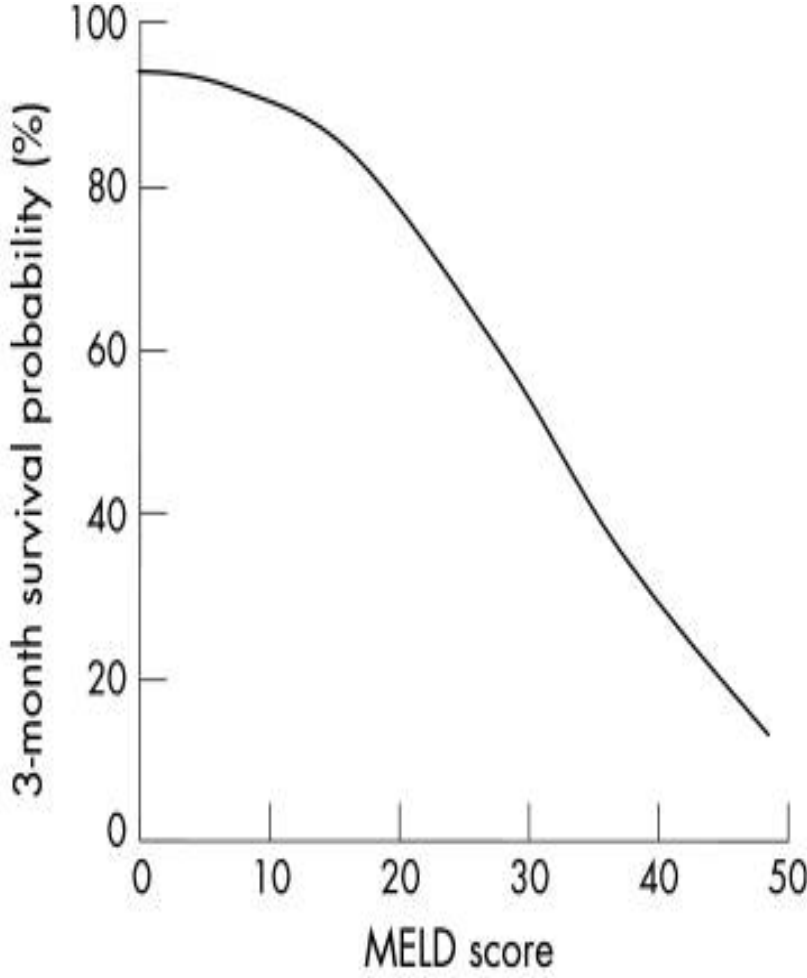
UNOS UNITED NETWORK FOR ORGAN SHARING

Yale SCHOOL OF MEDICINE

MELD

Model for **E**nd Stage **L**iver **D**isease

- Developed by Kamath, Kim, and colleagues at Mayo Clinic Rochester to assess mortality risk in patients with liver disease undergoing TIPS shunting
- Modified for liver transplantation and applied as a national allocation system in February 2002
- This system prioritizes candidates based on the risk c death while awaiting liver transplantation
- The HIGHER the MELD score the sicker the person and the higher the probability of death

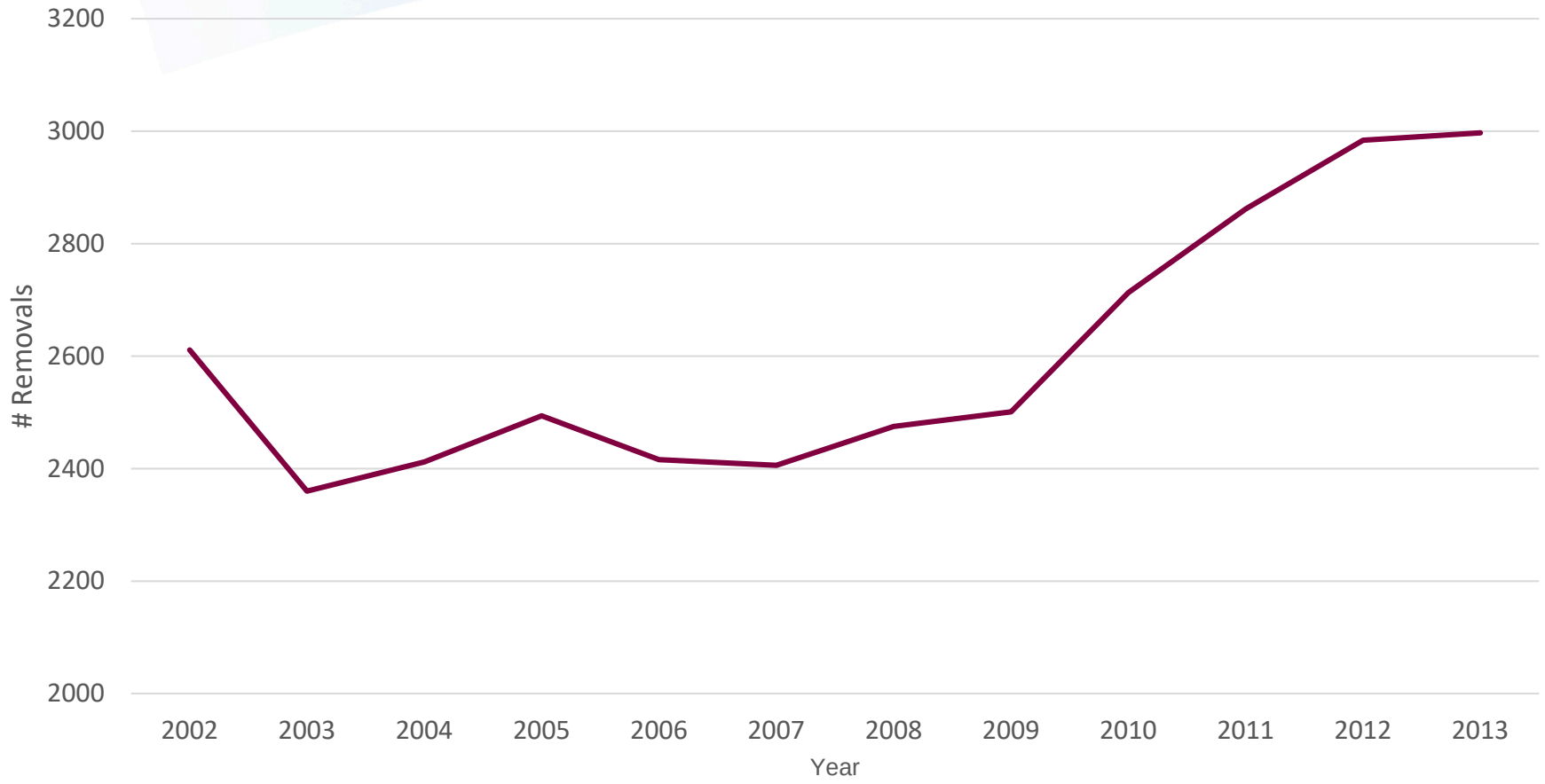


The Current Distribution System

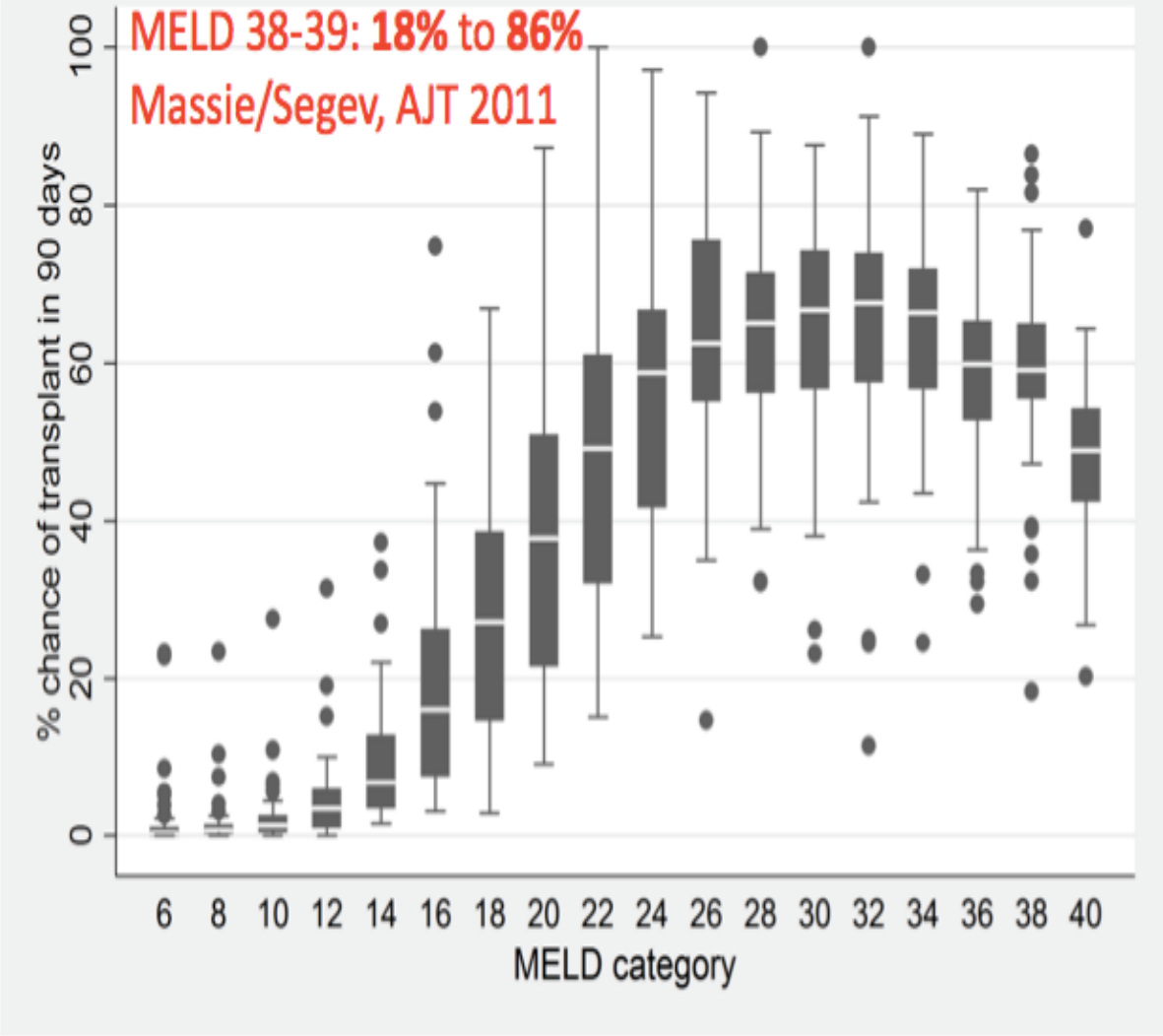
Based historically on the geographic relationship between the hospital where the organ is recovered and the transplant hospital where the candidate is listed.

Similar to kidney and pancreas allocation, the current liver distribution system uses a “local, regional, national” algorithm.

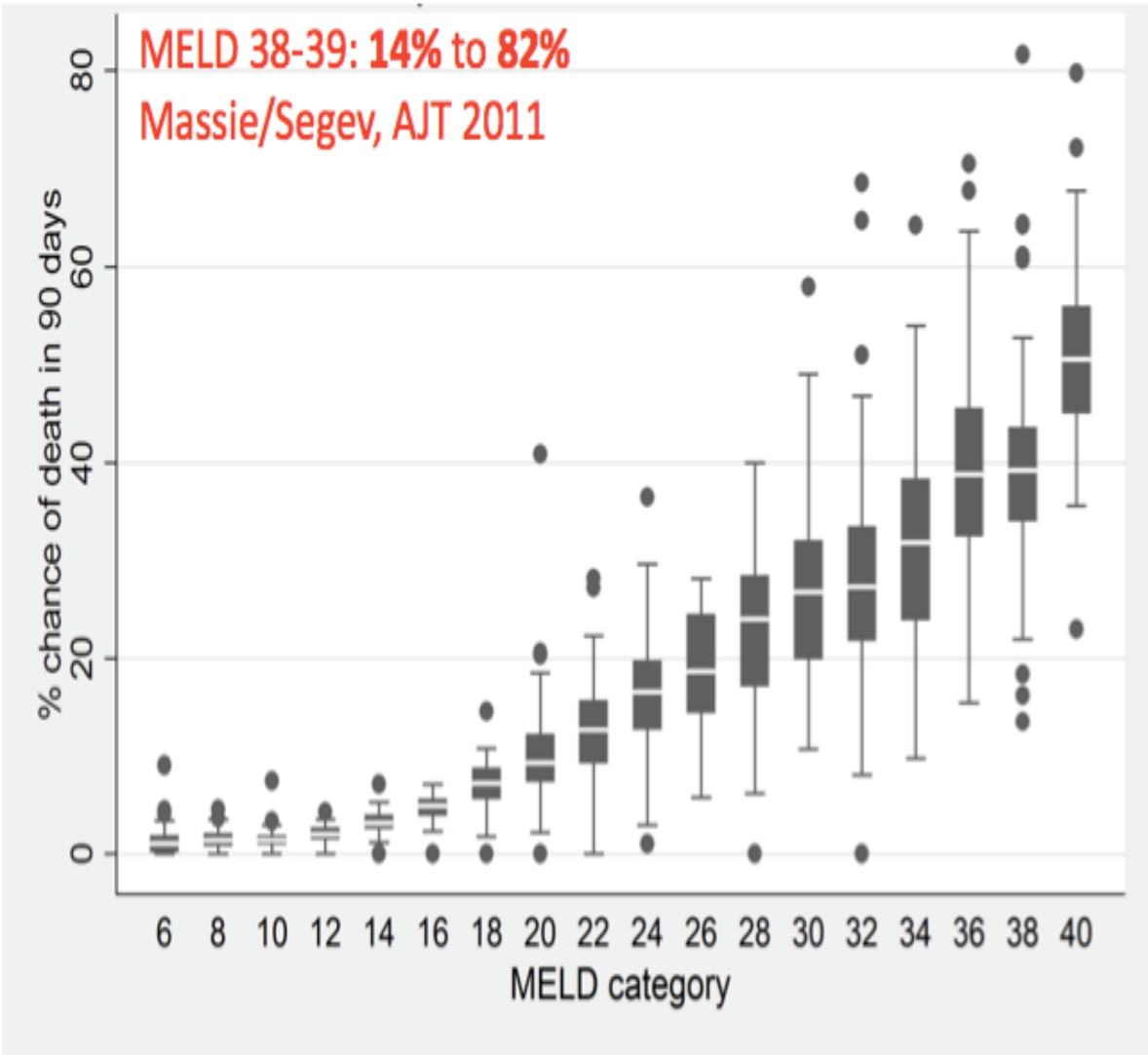
Removals From the Liver Waiting List for Died or Too Sick, 2002-2013



Motivation: Transplant Rates, by OPO

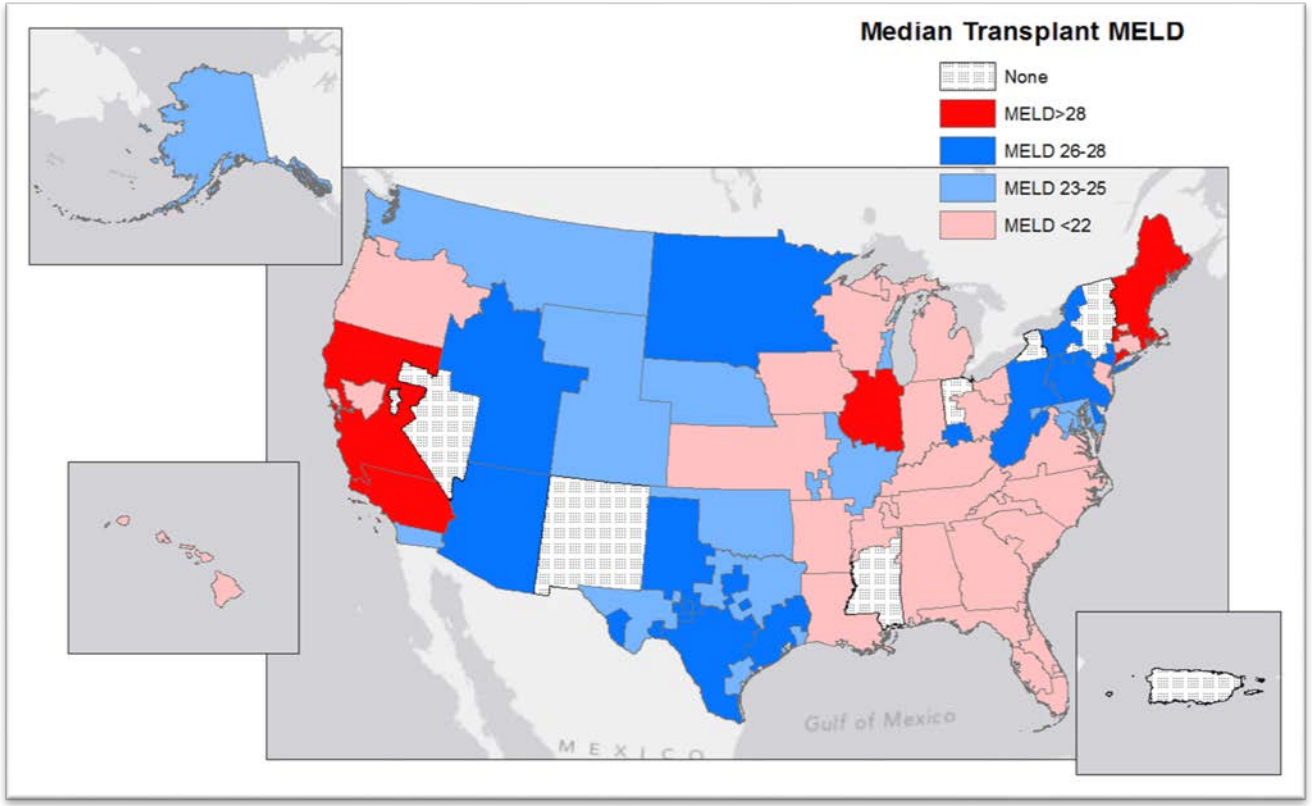


Motivation: Death Rates, by OPO



Challenges Liver Candidates Face

- Despite improvements in liver allocation and distribution, waitlist mortality remains high for patients with higher MELD scores
- Significant disparity exists between OPOs and regions with regard to median MELD at transplant and waitlist mortality
- **How can we direct livers to those people most in need?**



Organ availability

- The liver allocation system prioritizes candidates by Status 1 and then in decreasing order of MELD/PELD
- Transport time limitations and geographic boundaries prevent some organs from reaching the highest-priority candidates
- If each liver were teleported instantaneously to the highest-priority candidate anywhere in the country, that allocation system would be one where geography has no influence
- Paradoxically, full regional sharing actually worsened disparity

Balancing supply and demand

- Geographic disparities in organ availability are caused by uneven distribution of liver disease, listings, and eligible deaths
- Eligible deaths vary 4-fold among DSAs
- Listings for liver transplant vary 14-fold among DSAs
  [Gentry et al. Liver sharing and organ procurement organization performance. *Liver Trans* 21(3) 2015]
- Deaths due to liver disease vary 19-fold among DSAs
  [Adler et al. Role of patient factors and practice patterns in determining access to liver waitlist. *Am J Trans* 2015]

OPO performance

- OPO performance metrics vary by less than 2-fold across DSAs
- Geographic disparities are not correlated with organ procurement organization performance
  [Gentry et al. Liver sharing and organ procurement organization performance. *Liver Transplantation* 21(3) 2015]
- If all OPOs had 100% conversion rate, huge differences in supply and demand would remain
- OPO performance improvements can increase transplants but can not resolve geographic imbalance in supply and demand

Options Previously Considered

- Full Regional Sharing
- Concentric Circles
- Extension of Share 15 Regional
- Tiered Regional Sharing
- Net Transplant Benefit

Redistricting as a Potential Solution, 2012

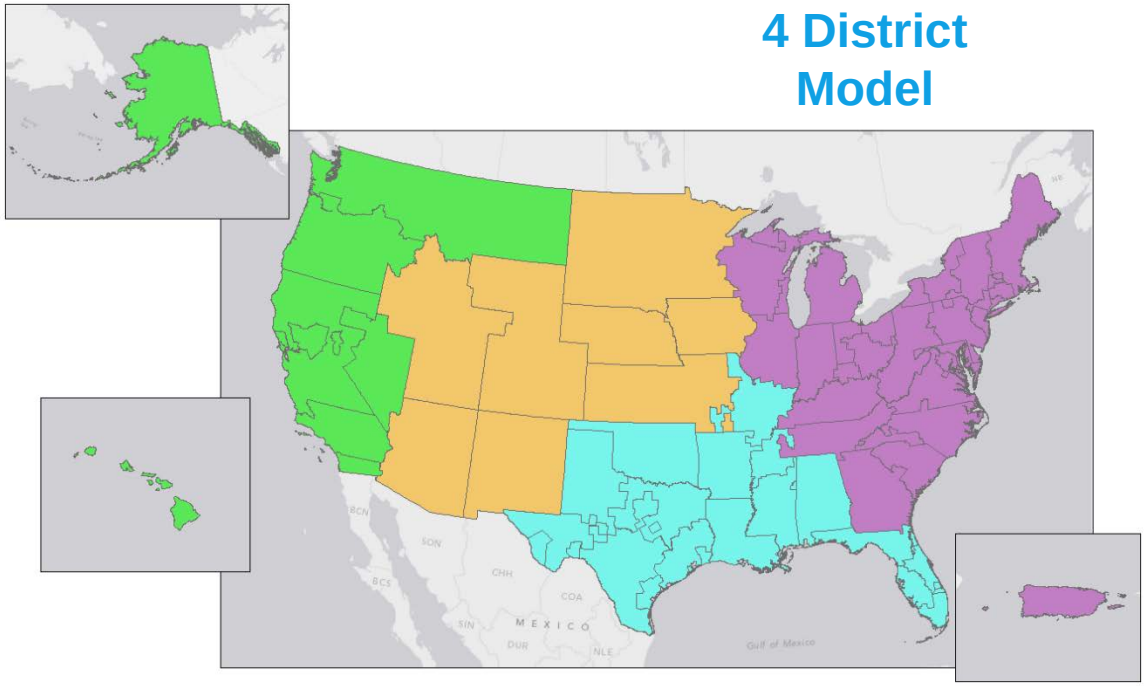
Statistical modeling strongly suggests that using fewer geographical allocation districts would likely result in a reduced variation in the MELD or PELD scores at transplant and reduced waitlist deaths.

The Committee agreed upon the following parameters for these optimized maps:

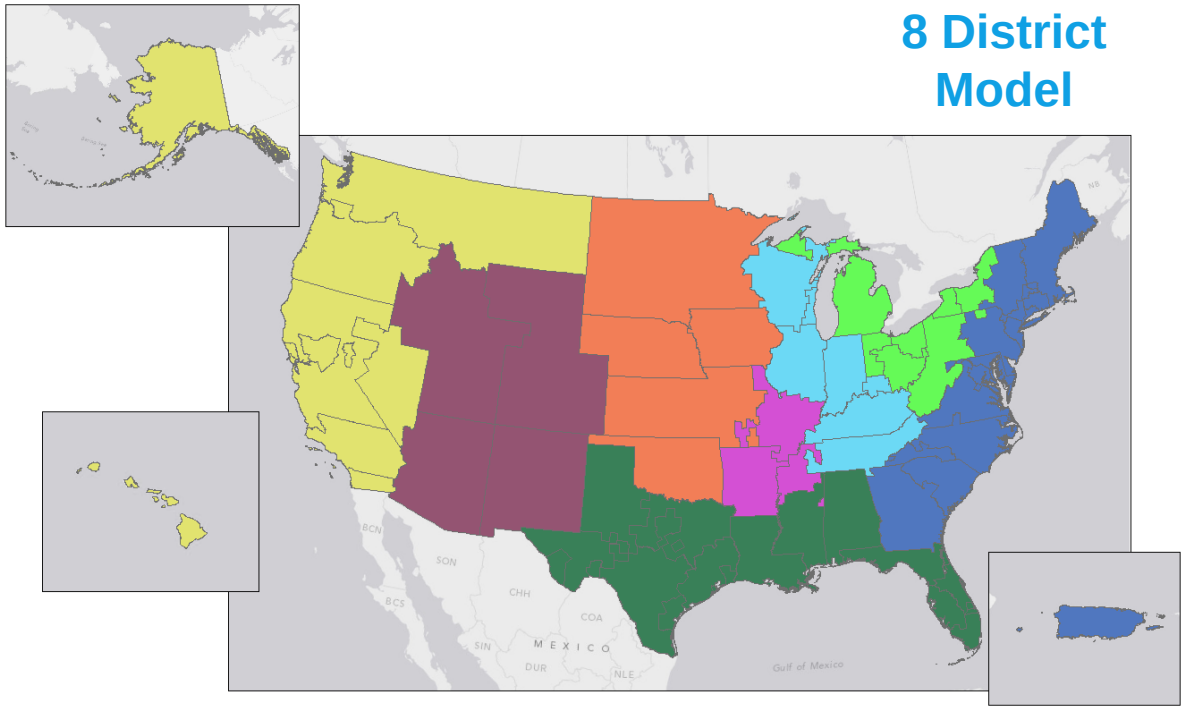
- The number of districts should be at least 4 and no more than 8
- The minimum number of transplant centers per district is 6
- The maximum median travel time between DSAs placed in the same district is 3 hours
- The number of waitlist deaths under redistricting must not be statistically significantly higher than in the current system
- The districts should be contiguous

Redistricting as a Potential Solution

4 District Model

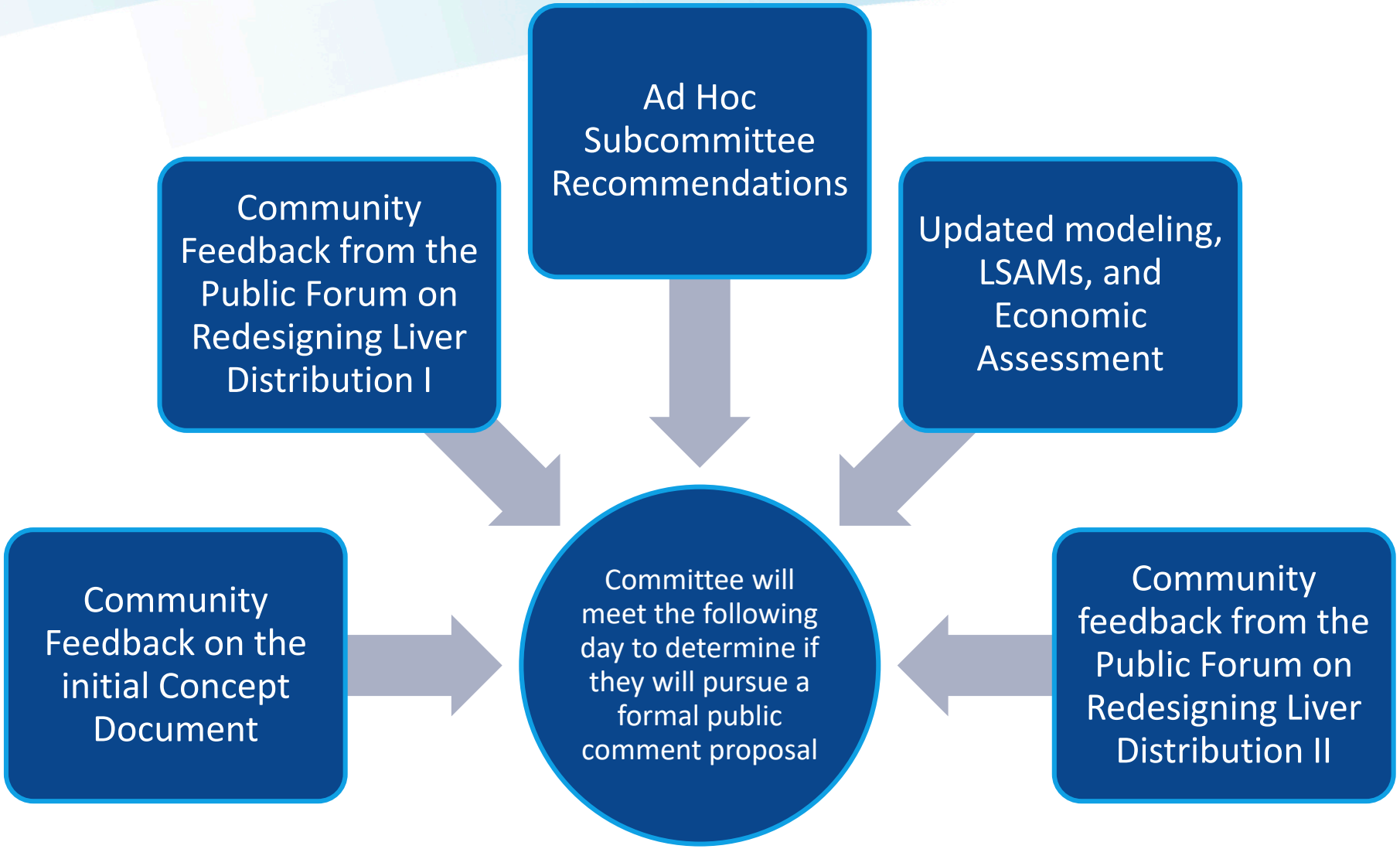


8 District Model



GOAL: To reduce the variation in the median MELD at transplant.

And then?


Ad Hoc Subcommittee Recommendations
Community Feedback from the Public Forum on Redesigning Liver Distribution I
Updated modeling, LSAMs, and Economic Assessment
Community Feedback on the initial Concept Document
Committee will meet the following day to determine if they will pursue a formal public comment proposal
Community feedback from the Public Forum on Redesigning Liver Distribution II

Incorporating the Community into Concept Development

Statement to the community
April 2014

Concept Document and Questionnaire circulated
June-July 2014

Public Forum on Redesigning Liver Distribution
September 2014

Great People, Great ideas, Great Solutions