Geographic Variation in Liver Supply and Demand

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Background

- Livers are currently allocated by donation service area (DSA) and region.
- There is considerable geographic disparity in the median MELD at transplant by DSA.
- Mathematically optimized 4 and 8 district maps designed to reduce geographic disparity have been previously described (Gentry, *Am J Transplant* 2013).
- Research questions:
 - How are supply and demand distributed across the country?
 - How do different region/district maps group supply and demand?
- Goal: Characterize the balance of supply and demand for deceased donor livers in the current OPTN regions and in conceptualized districts.



Methods – Supply/Demand Ratios

- Analysis based on calendar year 2013 data.
- Multiple measures of organ supply by DSA:
 - Actual liver donors (OPTN)
 - Eligible donors (OPTN)
 - Total deaths (US Census Bureau)
- Multiple measures of demand by DSA
 - Candidates on the liver waiting list with allocation MELD/PELD scores >15
 - Candidates on the liver waiting list with laboratory MELD/PELD scores >24
- Supply measures were divided by demand measures to create 3 supply/demand metrics.



Methods – Maps

- Color scale for each metric based on the range of data across DSAs.
- Interval limits selected so that number of DSAs in each bin approximately equal.
- Data shown for 52 DSAs that had active liver transplants in 2013; others shown in gray.
- Comparisons:
 - By DSA: compare supply/demand metrics to each other and to median M/P at transplant.
 - By DSA, region, and district: compare region and district groupings for individual supply/demand metrics



Supply/Demand Metrics by DSA:Allocation M/P >15





Supply/Demand Metrics by DSA: Laboratory M/P >24





Supply/Demand by DSA, Region, and Districts: Eligible Donors to Allocation M/P > 15



SCIENTIFIC REGISTRY C

Supply/Demand by DSA, Region, and Districts: Total Deaths to Allocation M/P >15



9

SCIENTIFIC REGISTRY C TRANSPLANT RECIPIENT

Supply/Demand by DSA, Region, and Districts: Eligible Donors to Laboratory M/P >24



SCIENTIFIC REGISTRY OF TRANSPLANT RECIPIENTS

Supply/Demand by DSA, Region, and Districts: Total Deaths to Laboratory M/P >24

Range Comparison Across Supply/Demand Metrics

	Eligible Donors to Alloc M/P >15		Total Deaths to Alloc M/P >15		Eligible Donors to Lab M/P >24		Total Deaths to Lab M/P >24	
Grouping	Range	Spread	Range	Spread	Range	Spread	Range	Spread
National	0.41		153.53		0.78		291.12	
11 Regions	0.24-0.62	0.38	103.83-238.63	134.80	0.39-1.5	1.11	189.86-542.13	352.27
8 Districts	0.37-0.51	0.14	128.38-193.97	65.59	0.63-1.03	0.40	212.28-418.68	206.40
4 Districts	0.37-0.43	0.06	128.38-171.29	42.91	0.63-0.85	0.22	212.28-329.13	116.85

The range of supply/demand ratios across the country narrows around the national average when grouping into optimized 8 or 4 district areas.

Discussion

- Supply and demand for deceased donor livers vary widely and independently of each other across the country.
- Geographic patterns of supply and demand were similar across multiple metrics.
- Optimized district boundaries could markedly improve geographic disparity in supply to demand ratios compared with the current 11 regions.

