



18 July 2013

***Knowledge Mapping of Transportation Research Board Committees***

SPEAKERS: Jacob Speigler & Andrew Seredick, Kent State University, School of Library and Information Science



# Organizational Network Analysis & Data Visualization

Jacob Spiegler (presenting)

Andrew Seredick

Sean Gaffney

IAKM Kent State University

INFORMATION ARCHITECTURE AND KNOWLEDGE MANAGEMENT (IAKM)

Kent State University  
P.O. Box 5190  
Kent, OH 44242-0001



# Research Goal and Objective

- This research proposes to apply organizational network analysis to the transportation research community to investigate the efficiency and effectiveness of communication amongst the committees and organizations
- The proposal speaks to the needs of the Transportation Research Board (TRB) to map the transportation research network



# Research Questions Addressed

- How are knowledge and information shared within committees and between committees within groups?
- What does a successful communication network look like and where do they exist within TRB?
- How are knowledge and information shared between groups and how is this information shared back to committee members and friends?

- TRB provided 989 records representing members and their involvement on one or more committee or project
- Within the provided data set, 787 distinct people were identified
- Minimal, data clean up was performed by the KSU team
  - Some anomalies\gaps present but not major enough to impact findings.
  - IE: missing data or incorrect states\addresses, titles, etc.



# Data Overview

## Dimensions

- TRB
  - Committee\Project
  - Section
- TRB Member
  - Role
  - Location (Country, State\Prov, City, Address, Zip)
  - Education Level
  - Age
  - Title
- TRB Member Organization
  - Type
  - Group

## Measures

- # of distinct people\members
- # records
  - TRB Committee\Project assignments
- Average Member Age



# Research Methodology

- Construct Profiles for Individuals and Committees
- Construct Controlled Reference Sources for Profile Attributes
- Create Network Metrics and Construction of Three Networks
  - Organizational Network Analysis of TRB Committee Members
  - Communication Network Map of TRB Committees
  - Knowledge Network Map
- Create Network Analysis



# Tools Used

- Qualtrics (<https://www.qualtrics.com>) –
- Tableau Software (<http://www.tableausoftware.com/>)
- NodeXL (<http://nodexl.codeplex.com>)



- There were constraints that prevented the team from completing the analysis as fully as had been hoped. These included:
  - Pilot test
  - Limited communications survey responses: only 115 responses were received
  - Inability to access Dialog Science Citation Index data to determine citation relationships



# ORGANIZATIONAL NETWORK ANALYSIS

INFORMATION ARCHITECTURE AND KNOWLEDGE MANAGEMENT (IAKM)

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# What is ONA?

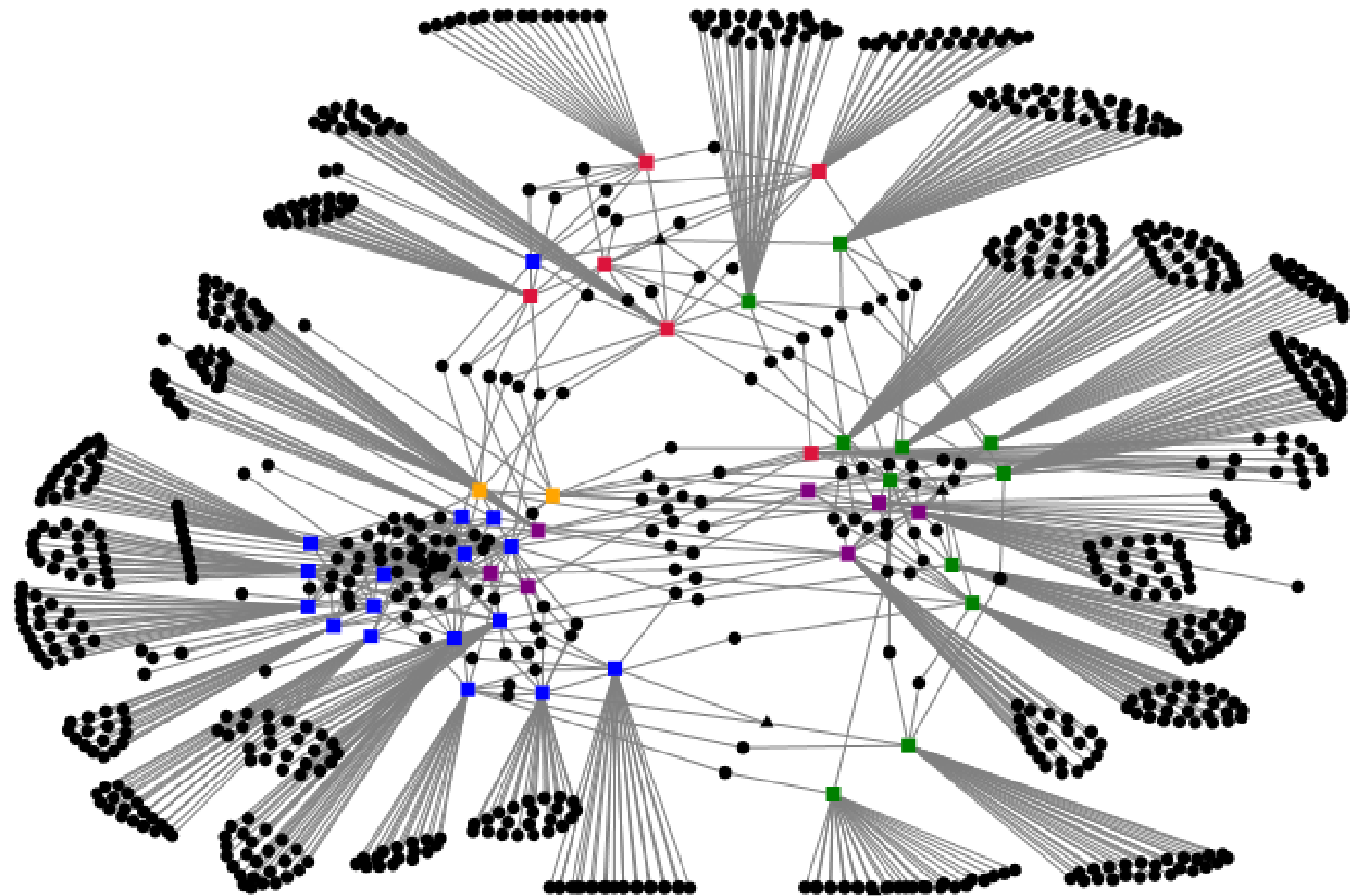
- Organizational network analysis is the exploration and mapping of these networks both formal and informal.
- Knowledge is transferred through communication and networks.



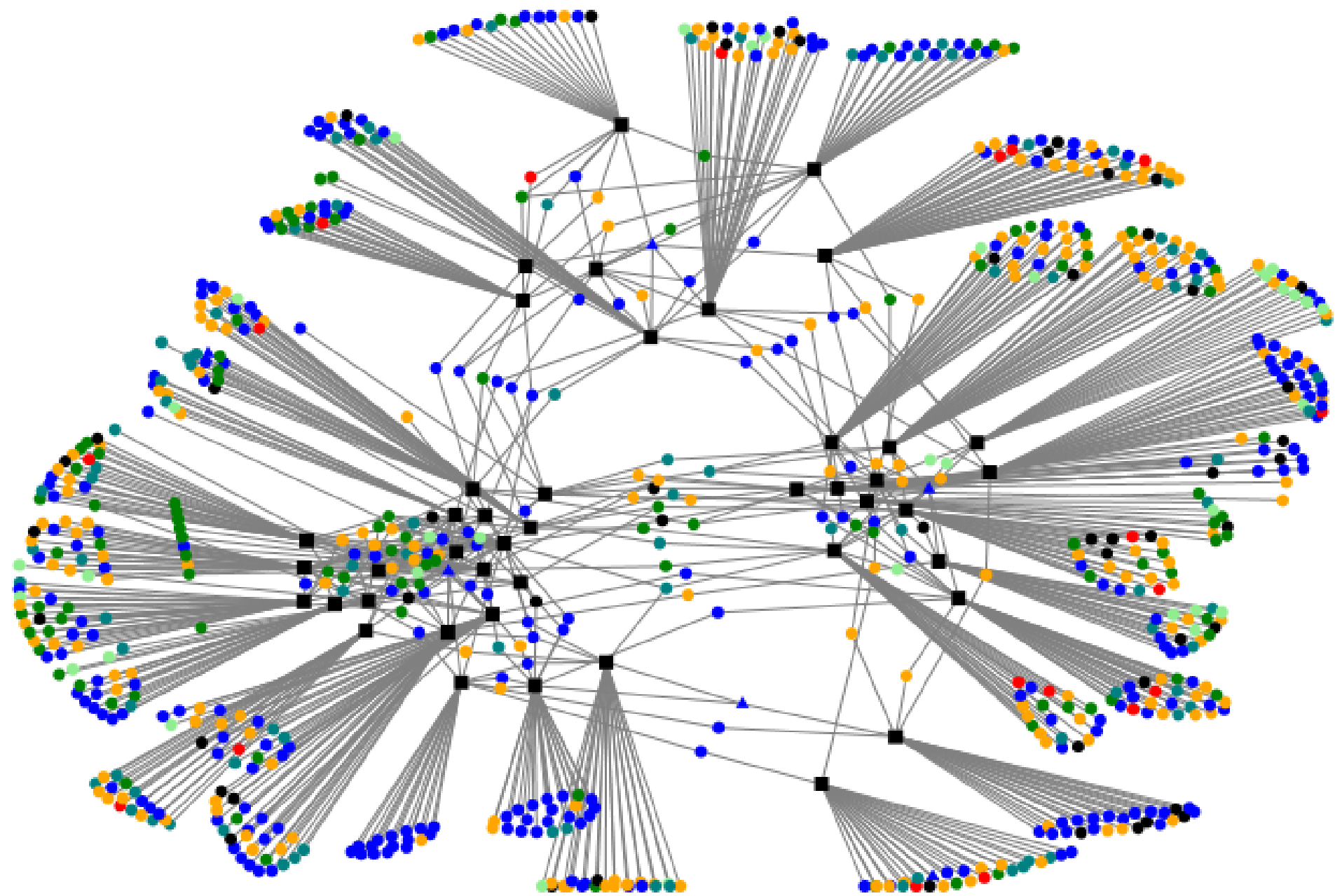
## Value of an ONA

- Strives to make intangibles a bit more tangible.
- Can give us new insights into old data.
- Can reveal future risk factors and current problem areas within the knowledge network.
- Reveals the questions we should be asking.
- Reveals key personnel within the network

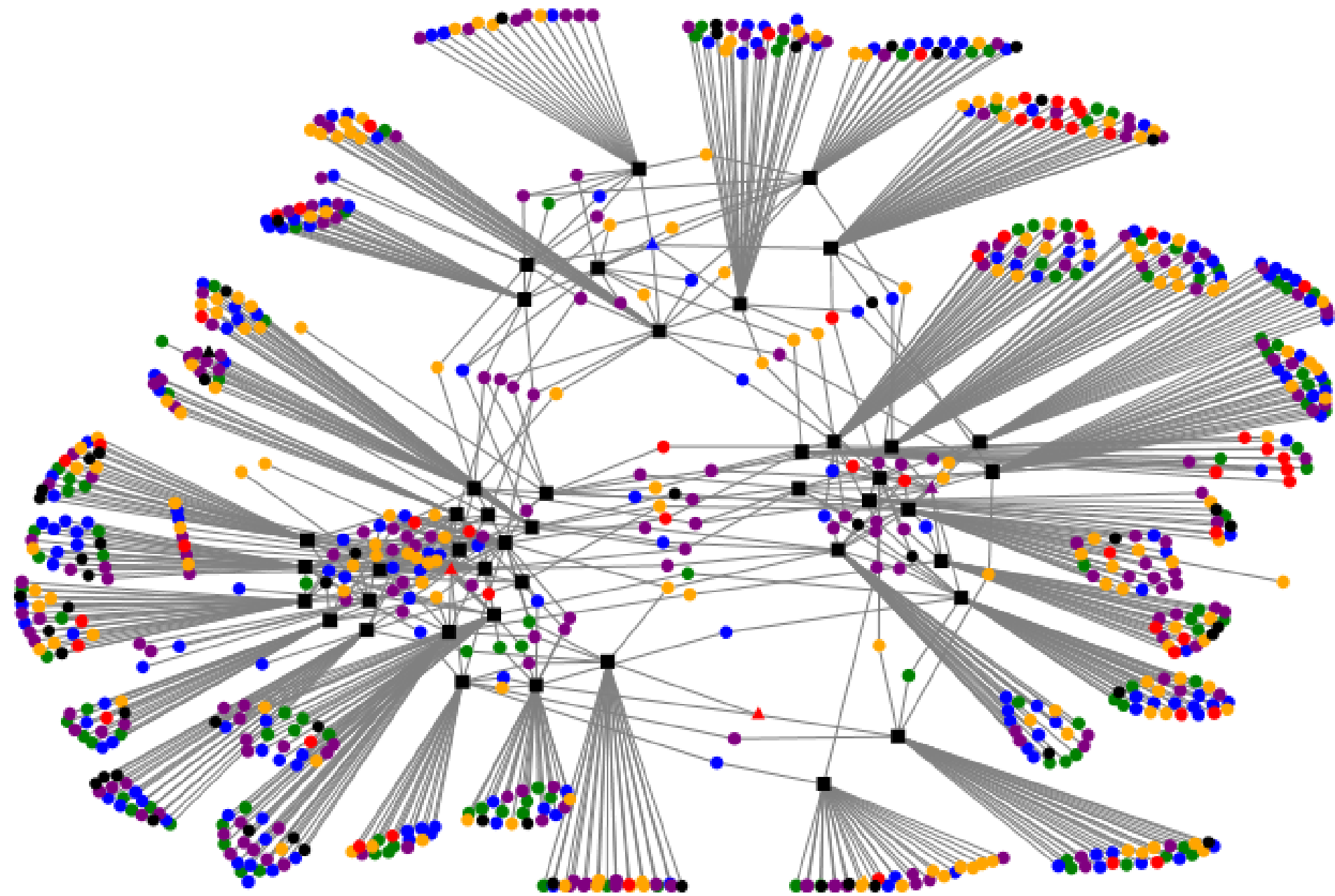
# Section Graph



# Employer Type Graph



# Age Graph





# Communications Survey

- Using Qualtrics software, a survey was designed and administered to determine communication networks within the subset.
- Key questions involved:
  - Who does the member communicate with most often within his or her committee (up to three)?
    - How often?
    - How?
  - Who does the member communicate with most often outside his or her committee (up to three)?
  - How often?
  - How?

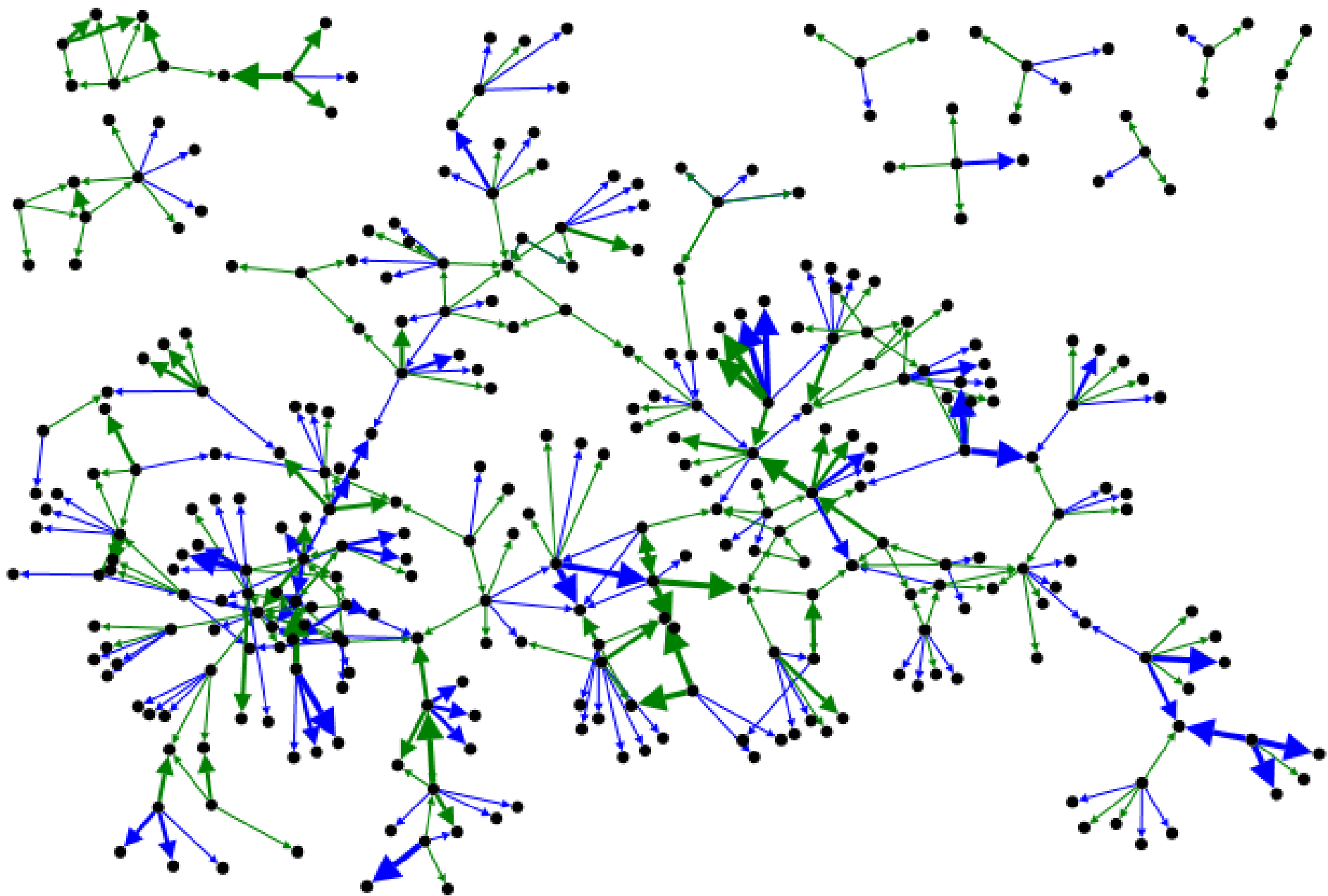




# Communications Survey

- Demographic information was also collected in order to aid in the analysis
  - Name
  - Highest degree earned
  - Institution at which degree was earned
  - Degree subject matter focus
  - Current role
  - Areas of expertise (up to three)
- Survey URL:  
[http://kentstate.qualtrics.com/SE/?SID=SV\\_234vDjo2C\\_ejqAdL](http://kentstate.qualtrics.com/SE/?SID=SV_234vDjo2C_ejqAdL)

# Communication Network Graph





# DATA VISUALIZATION

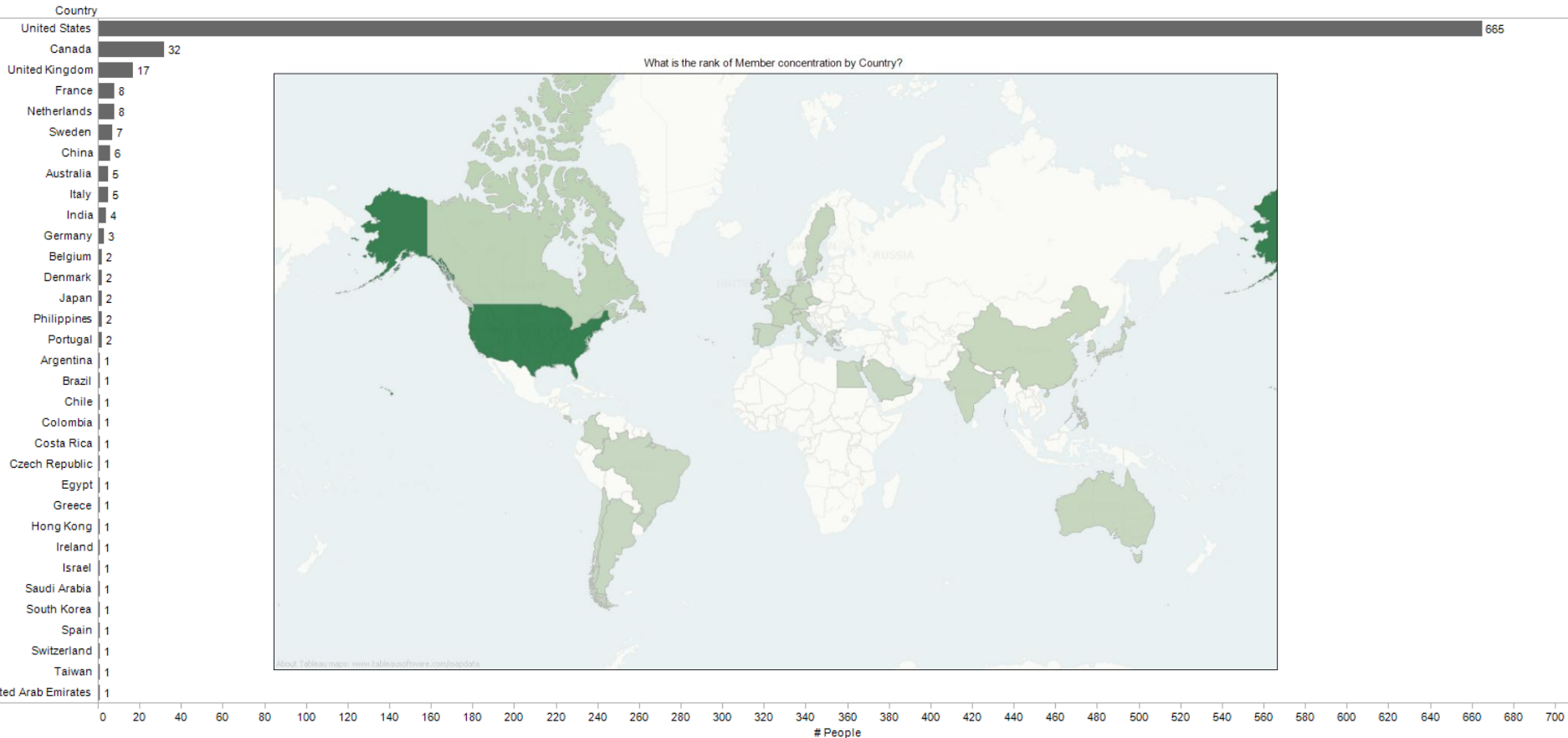
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- What is the potential impact of Travel Restrictions or more remote access to information flow/committee participation
- What is the potential impact of baby boomer retirement/RIFs to TRB committees?
- Who are the key individuals in TRB for a new member to meet when they come onboard?

# Geospatial Analysis – Country Level

What is the rank of Member concentration by Country?

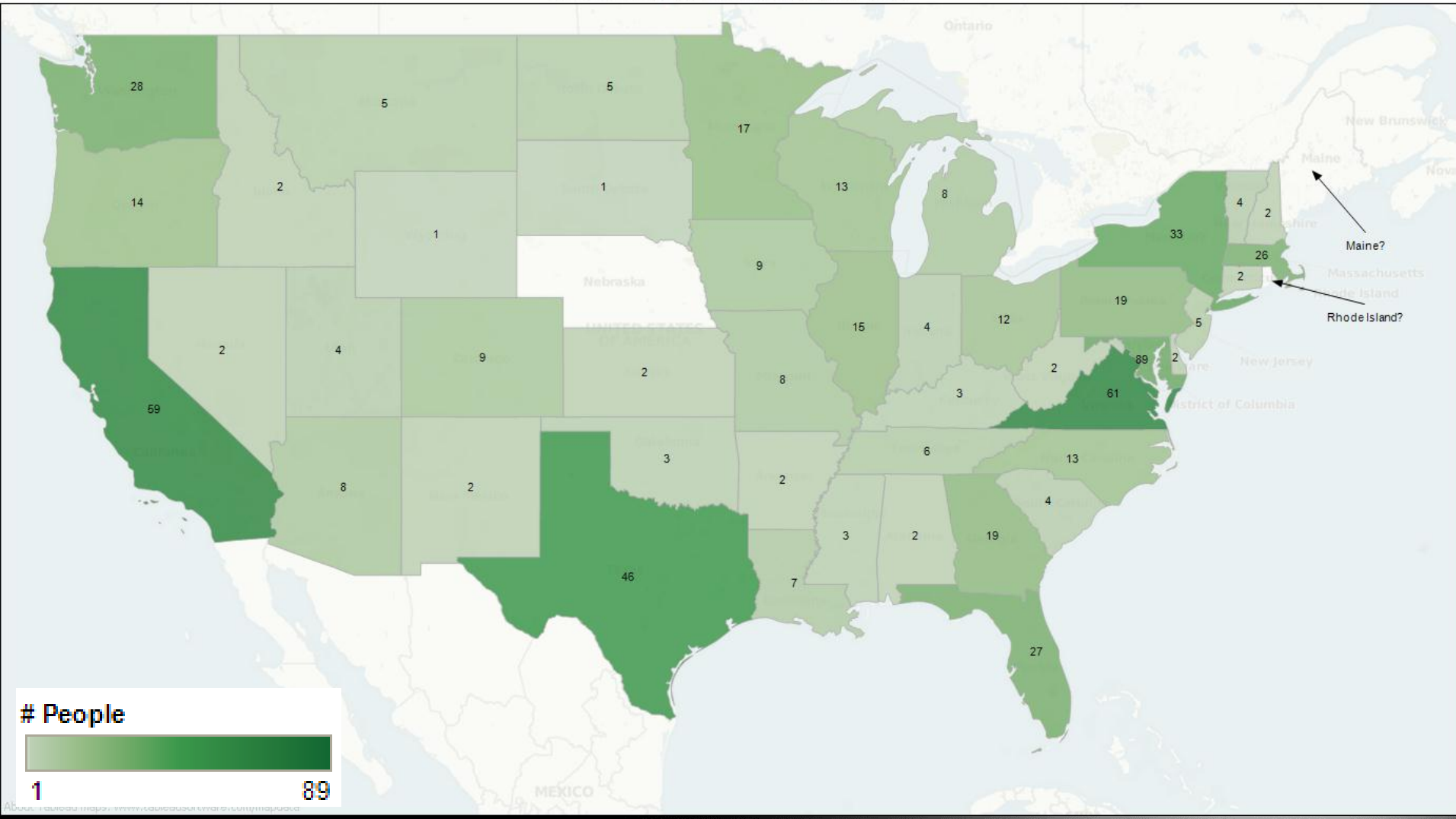


Observation: US will be focus of subsequent analysis...

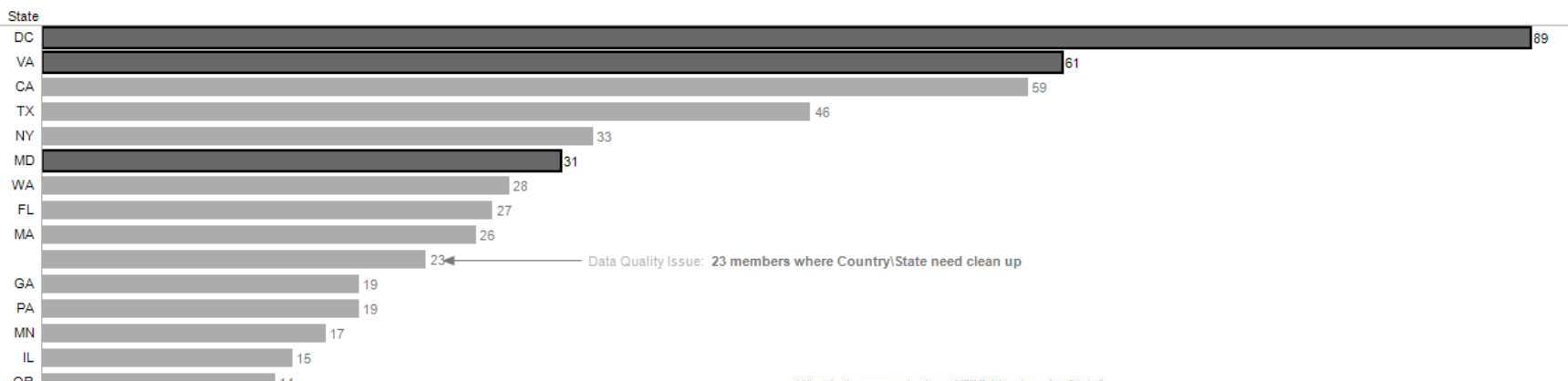
# Geospatial Analysis – United States

Observation: Regional membership concentration patterns emerge...

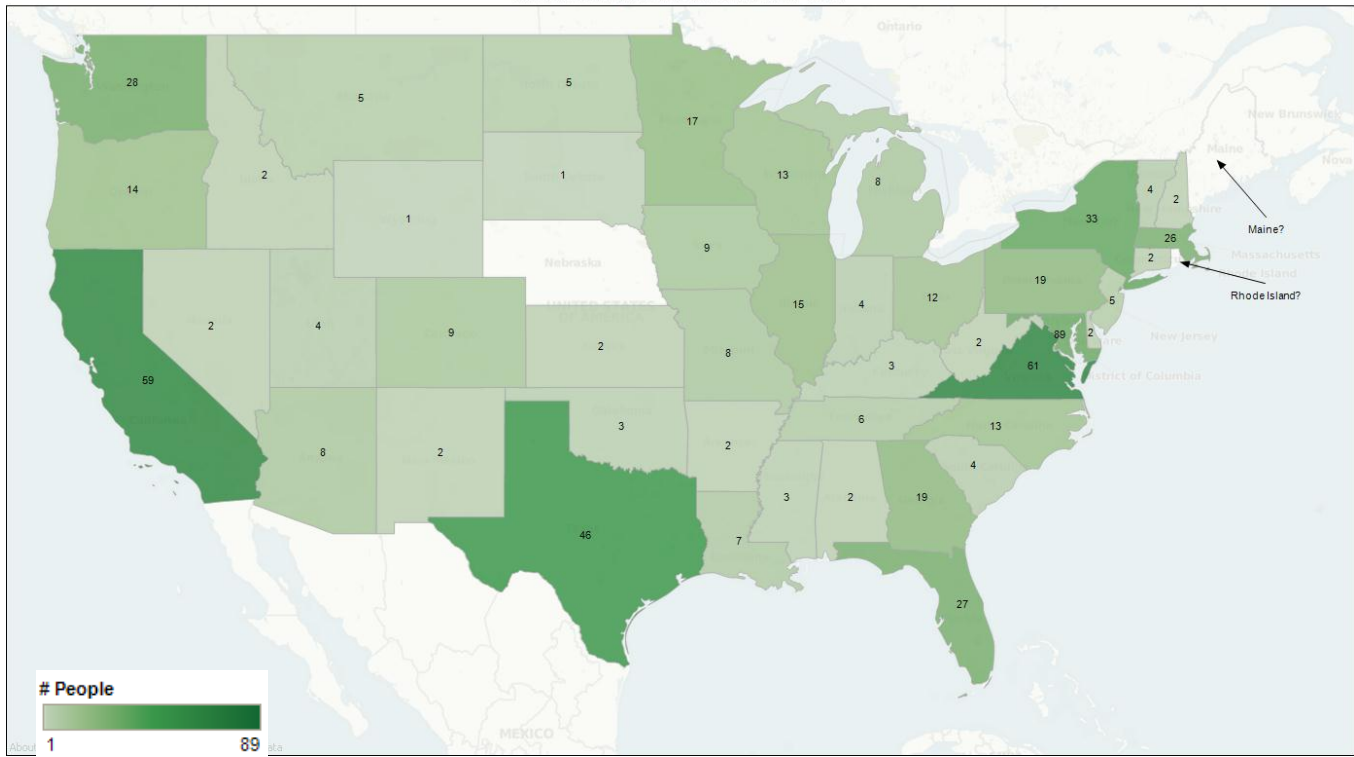
What is the concentration of TRB Members by State?



# What is the rank of Member concentration by State?

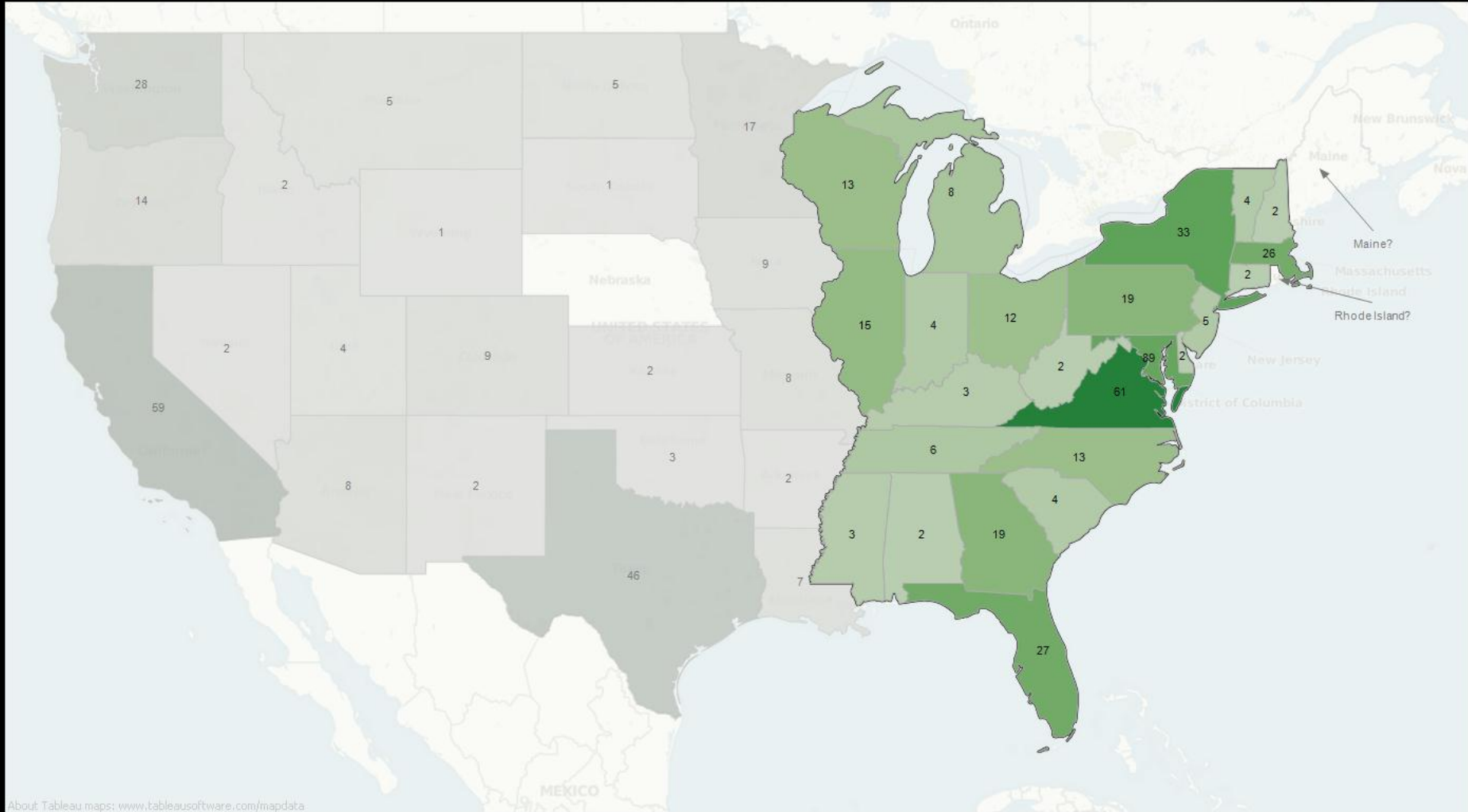


## What is the concentration of TRB Members by State?



West of Mississippi = 237 Members (36%)

East of Mississippi = 405 Members (61%)



Unknown State\Country = 23 Members (3%)



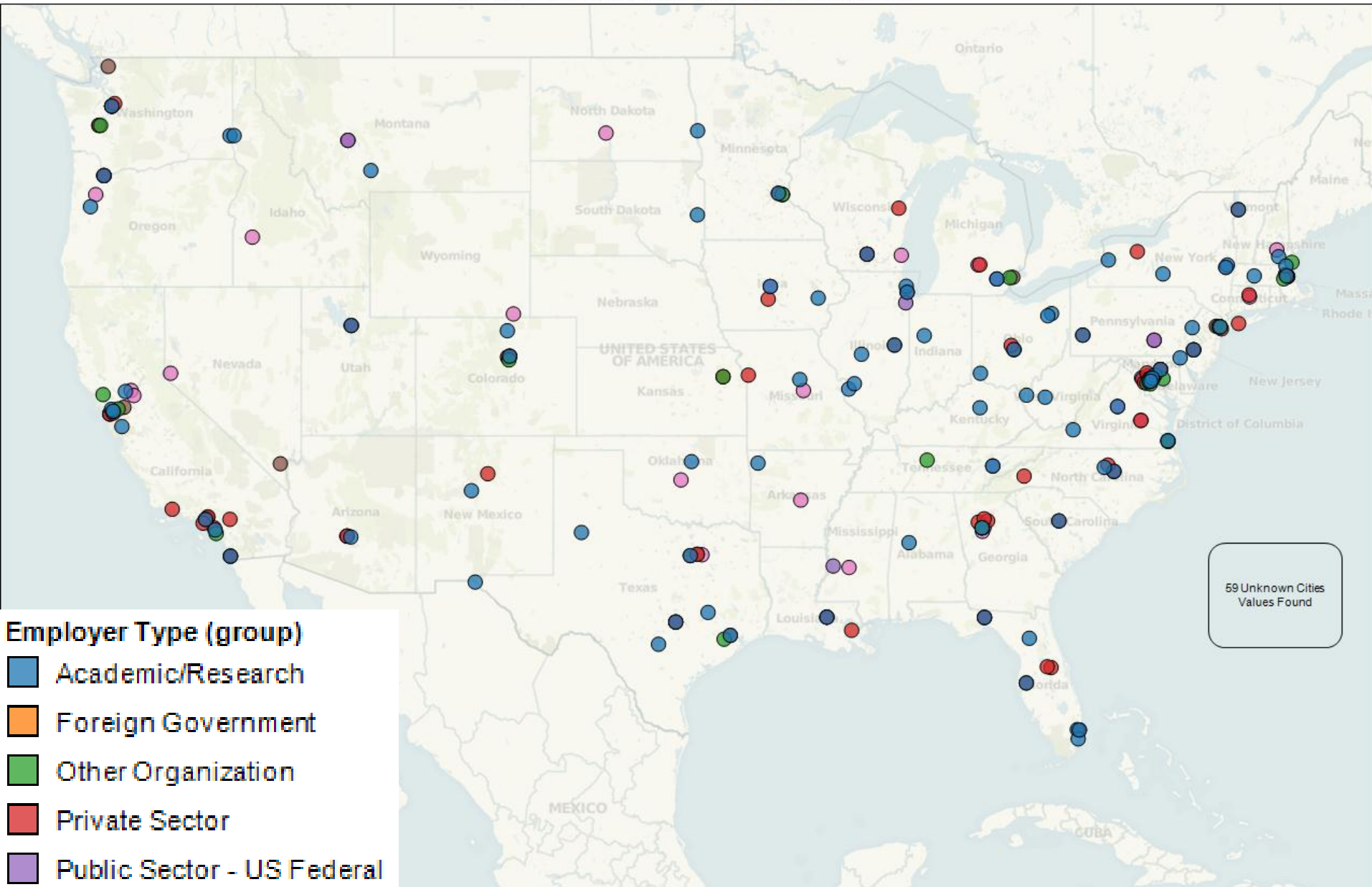
# Employer Type Concentration/Rank

Which Employer Types Have the largest member concentration?

Employer Type (group)	Employer Type	
Academic/Research	Academic Institution	218
	Research Institution	57
Private Sector	Consultant	136
	Industry	36
	Service / Trade Organization or Association	25
	Law Firm	1
Public Sector - US State	State Highway / Transportation Department	103
	Other State Government	4
Public Sector - US Federal	US DOT	73
	Federal Agency other than US DOT	17
Other Organization	Other Organization	51
Public Sector - US Other	Local or Regional Government	35
	Transit Agency	9
	Port / Port Authority	3
Foreign Government	Foreign Government	19
<b>Grand Total</b>		<b>787</b>

Employer Type (group)	
Academic/Research	35%
Private Sector	25%
Public Sector - US State	14%
Public Sector - US Federal	11%
Other Organization	6%
Public Sector - US Other	6%
Foreign Government	2%
<b>Grand Total</b>	<b>100%</b>

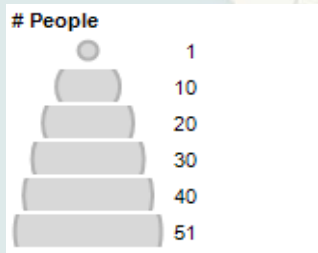
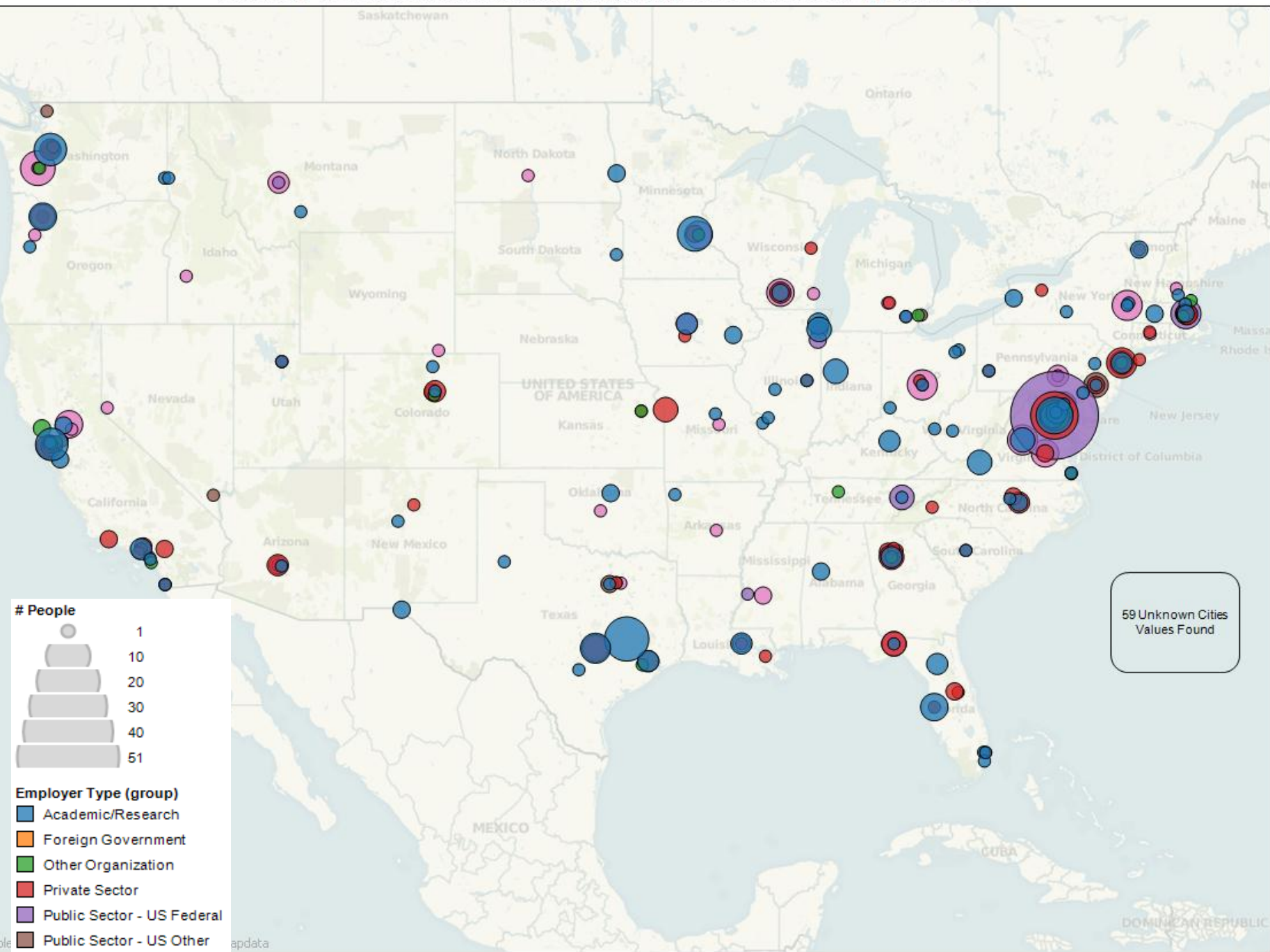
What are the cities where members are from? By Employer Group



59 Unknown Cities Values Found

- Employer Type (group)**
- Academic/Research
  - Foreign Government
  - Other Organization
  - Private Sector
  - Public Sector - US Federal
  - Public Sector - US Other
  - Public Sector - US State

What are the Cities where Members are from, sized by Member concentration, for all Employer Groups



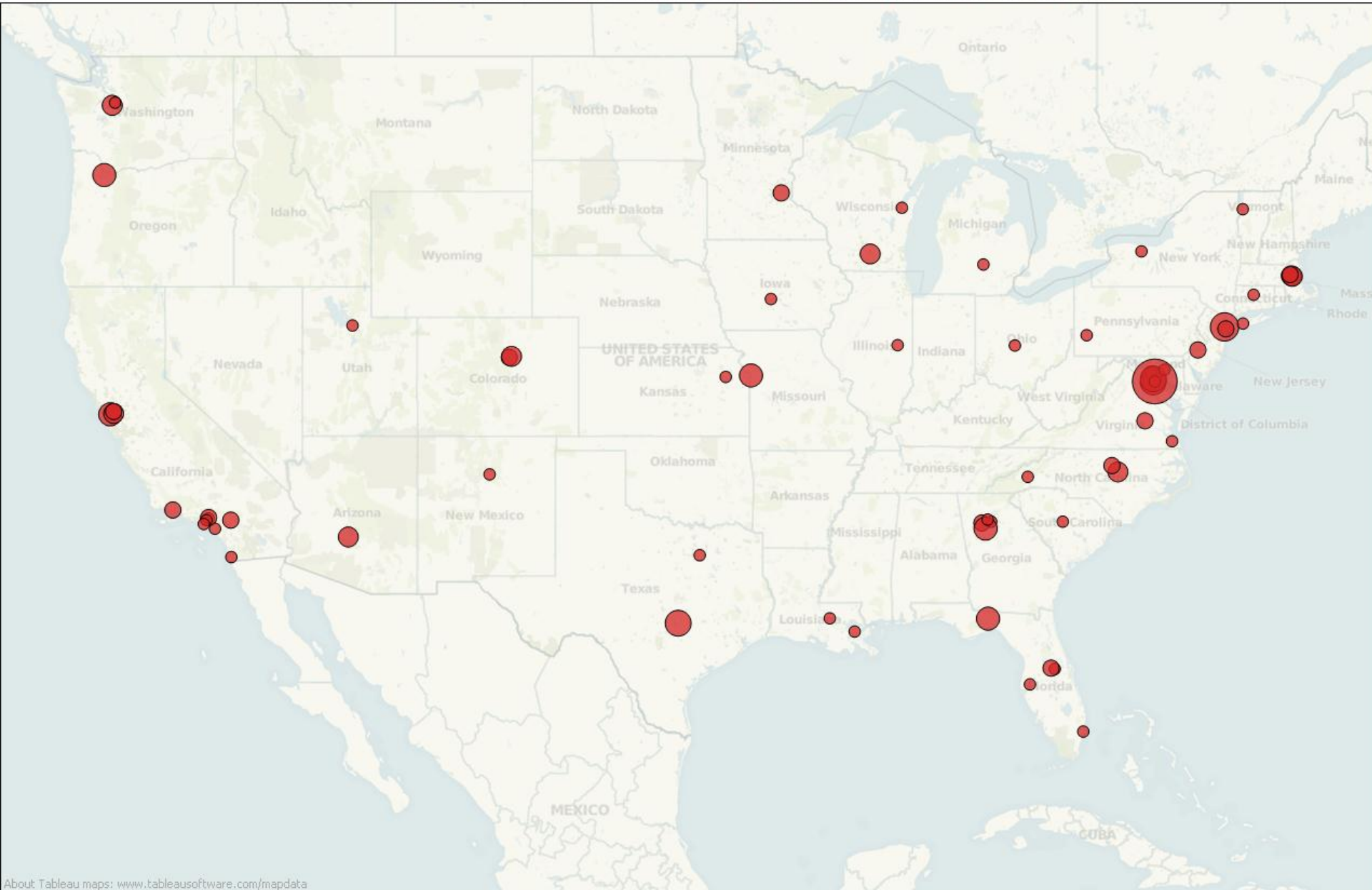
- Employer Type (group)**
- Academic/Research
  - Foreign Government
  - Other Organization
  - Private Sector
  - Public Sector - US Federal
  - Public Sector - US Other
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59 Unknown Cities  
Values Found

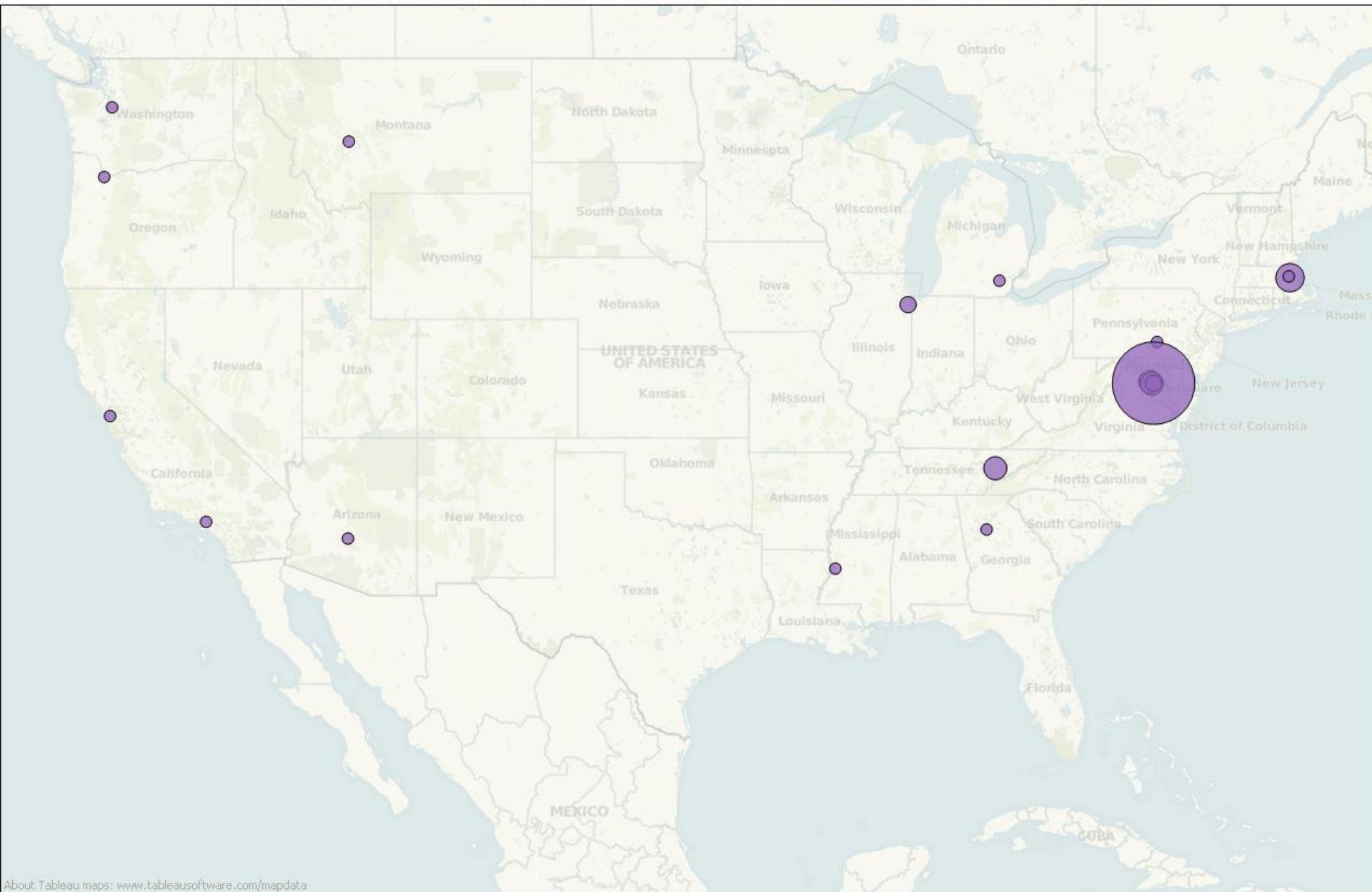




What are the Cities where Members are from sized by Member concentration where Employer Group is **Private Sector**



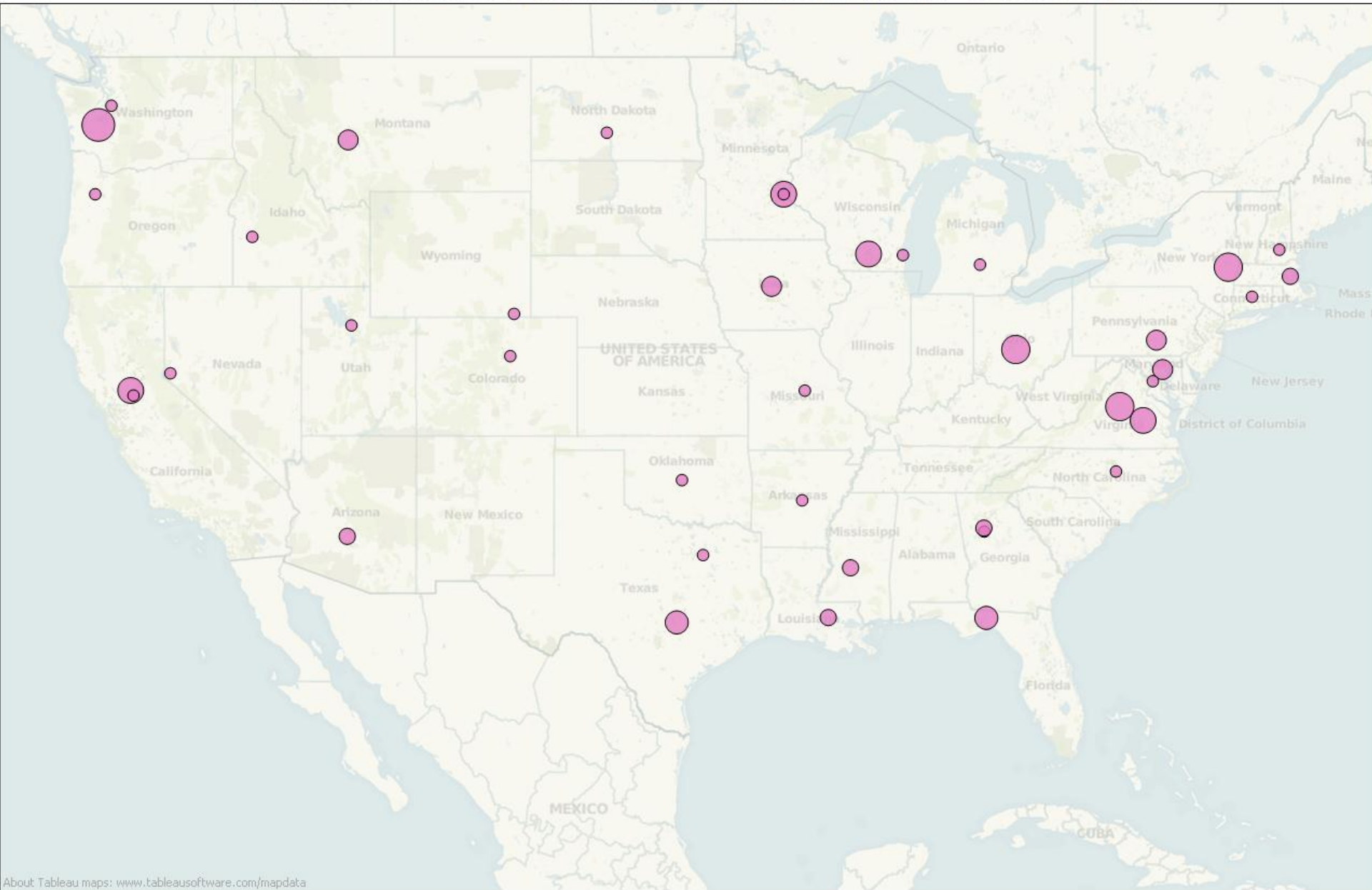
What are the Cities where Members are from sized by Member concentration where Employer Group is **Public Sector - US Federal**



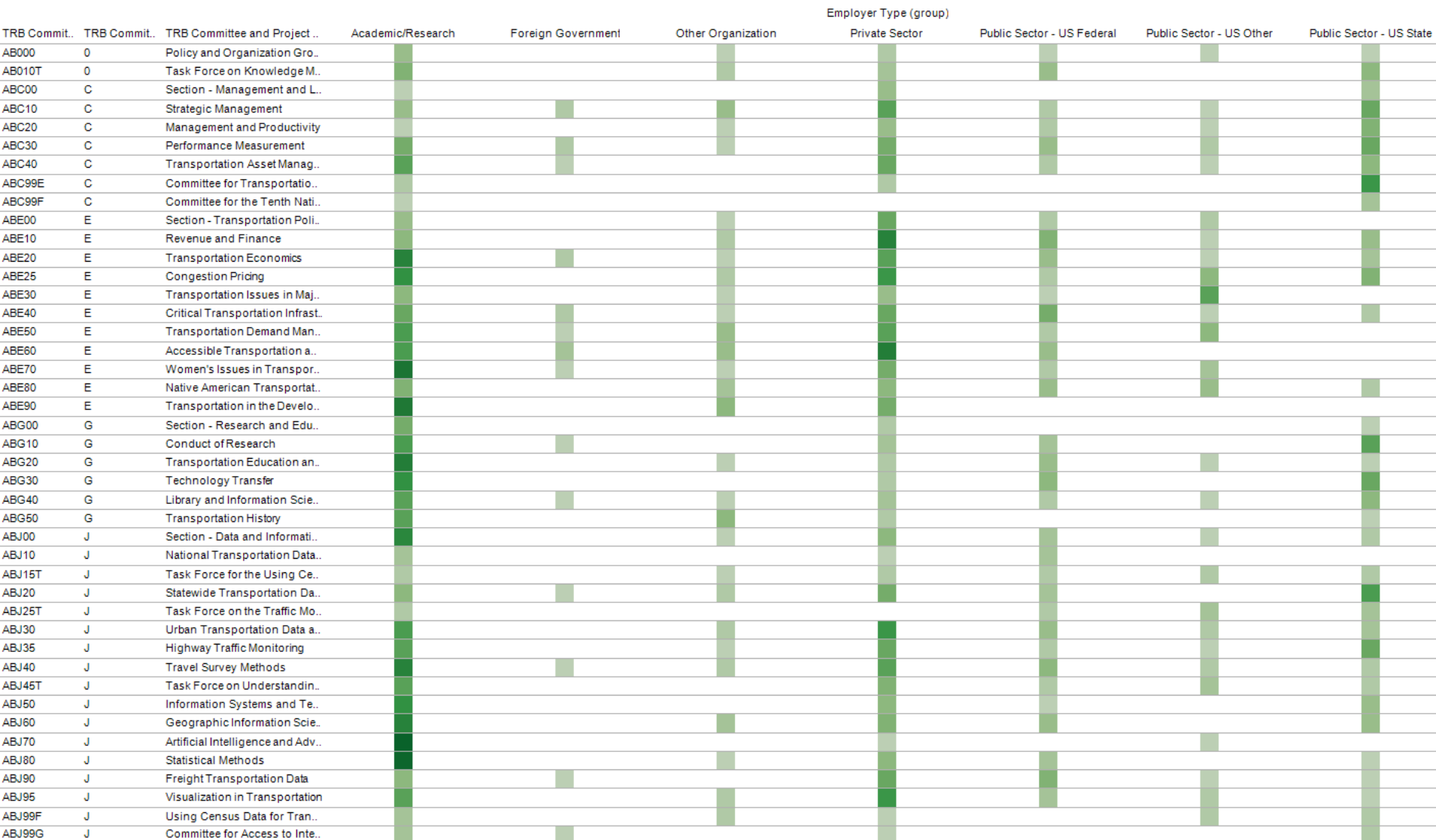




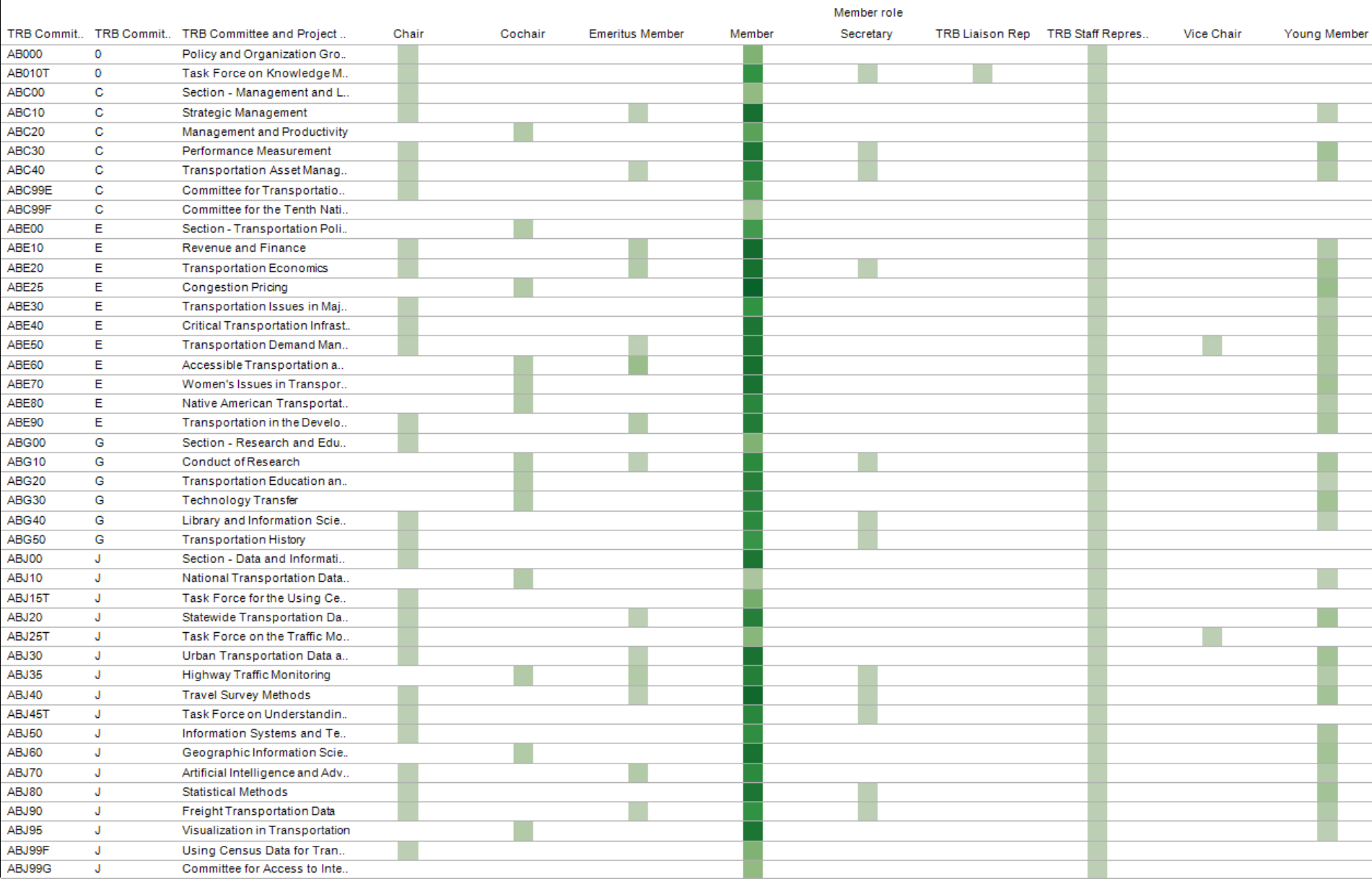
What are the Cities where Members are from sized by Member concentration where Employer Group is **Public Sector - US State**



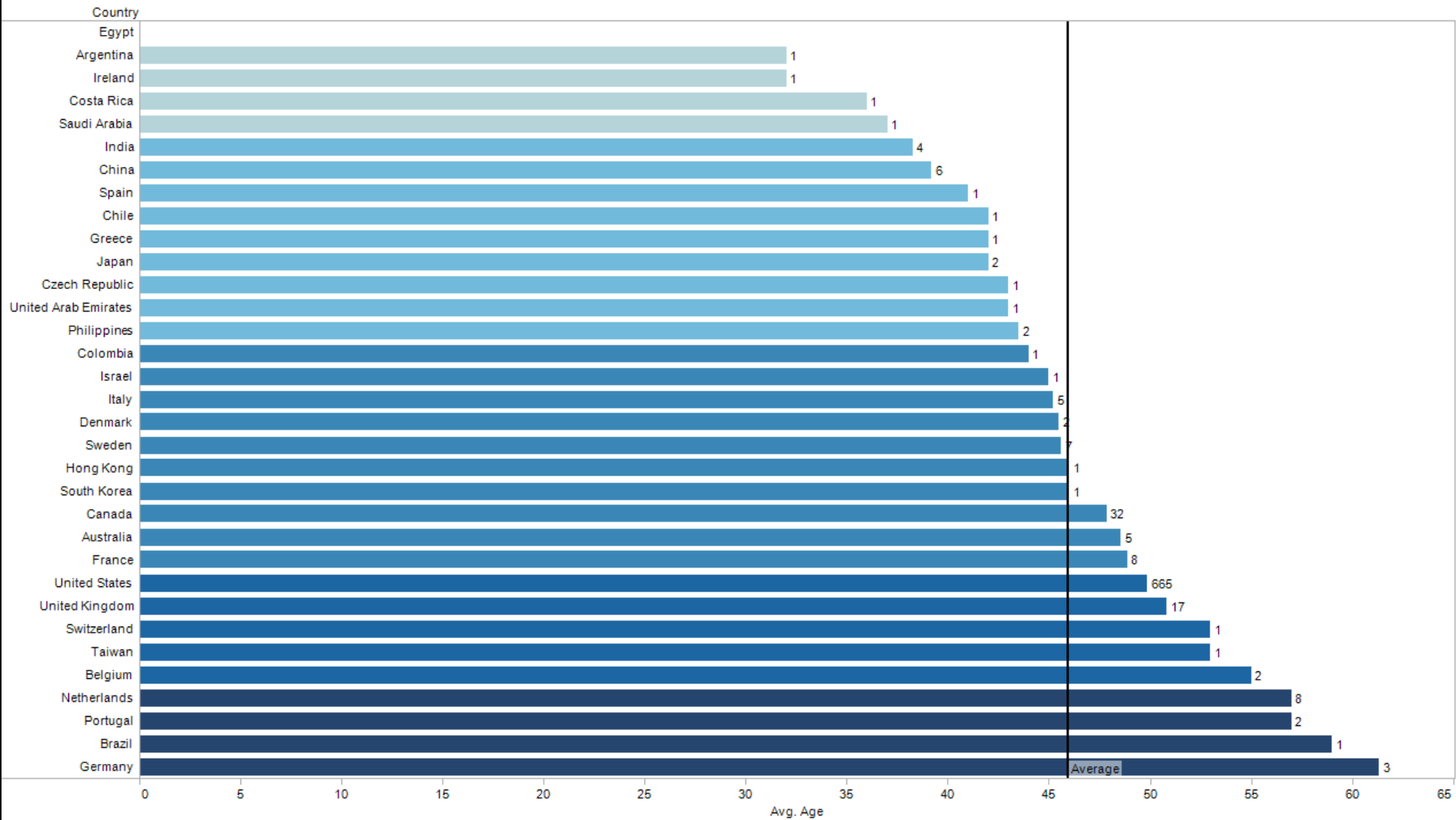
Heat Map Committee vs Employer Group - # People



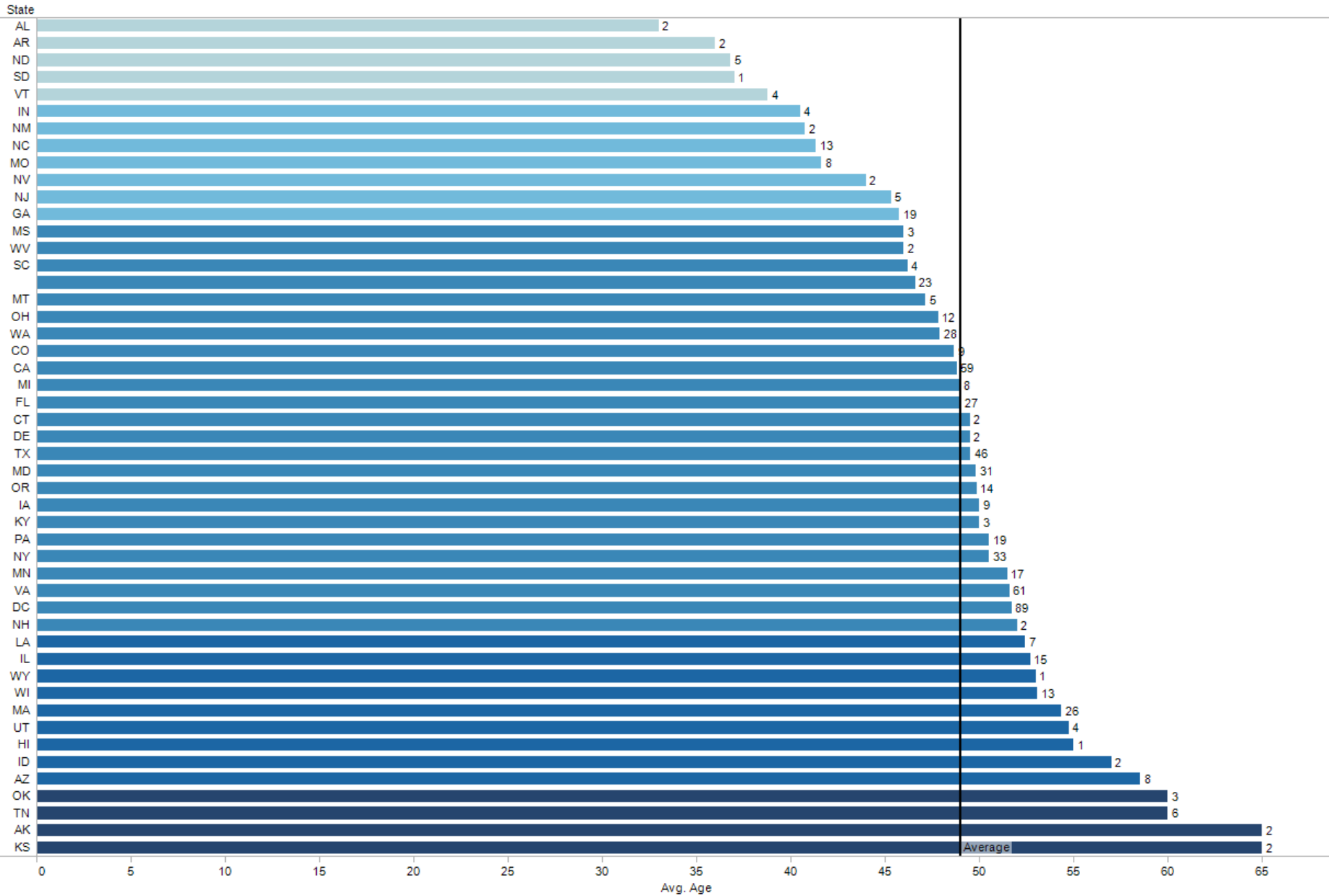
### Heat Map Committee vs Member Role



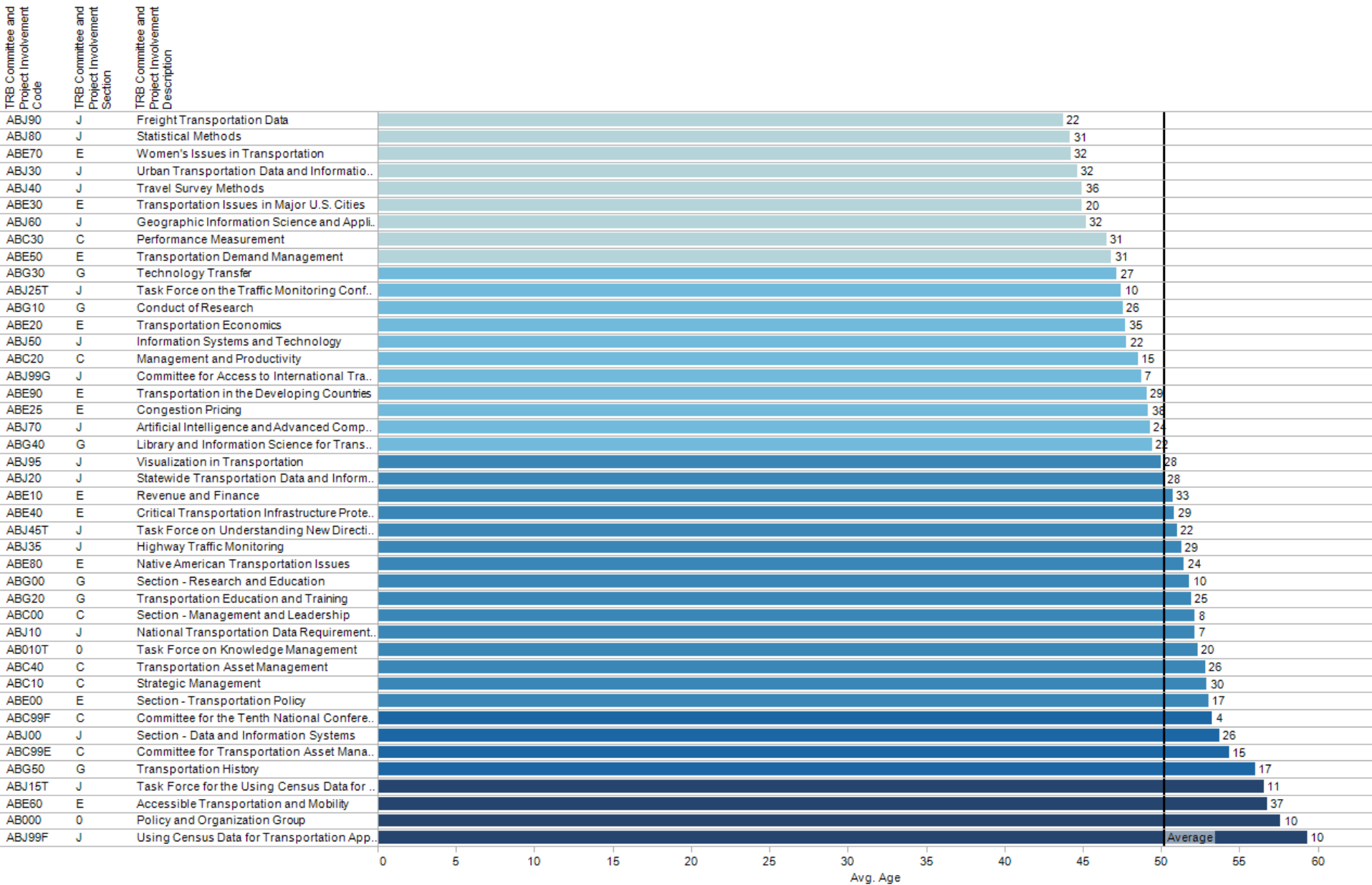
### Average Age by Country



# Average Age by US State

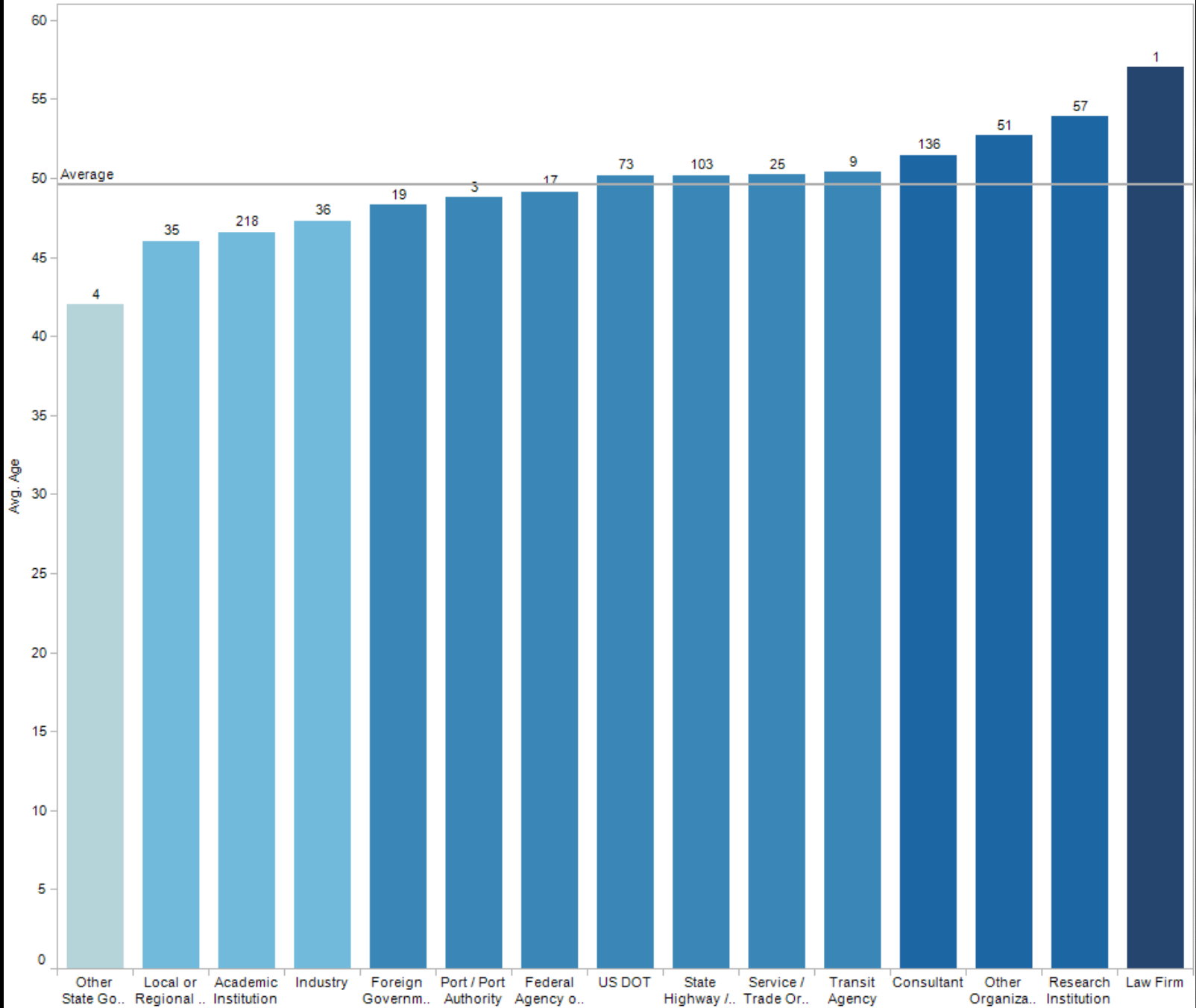


## Average Age by Committee



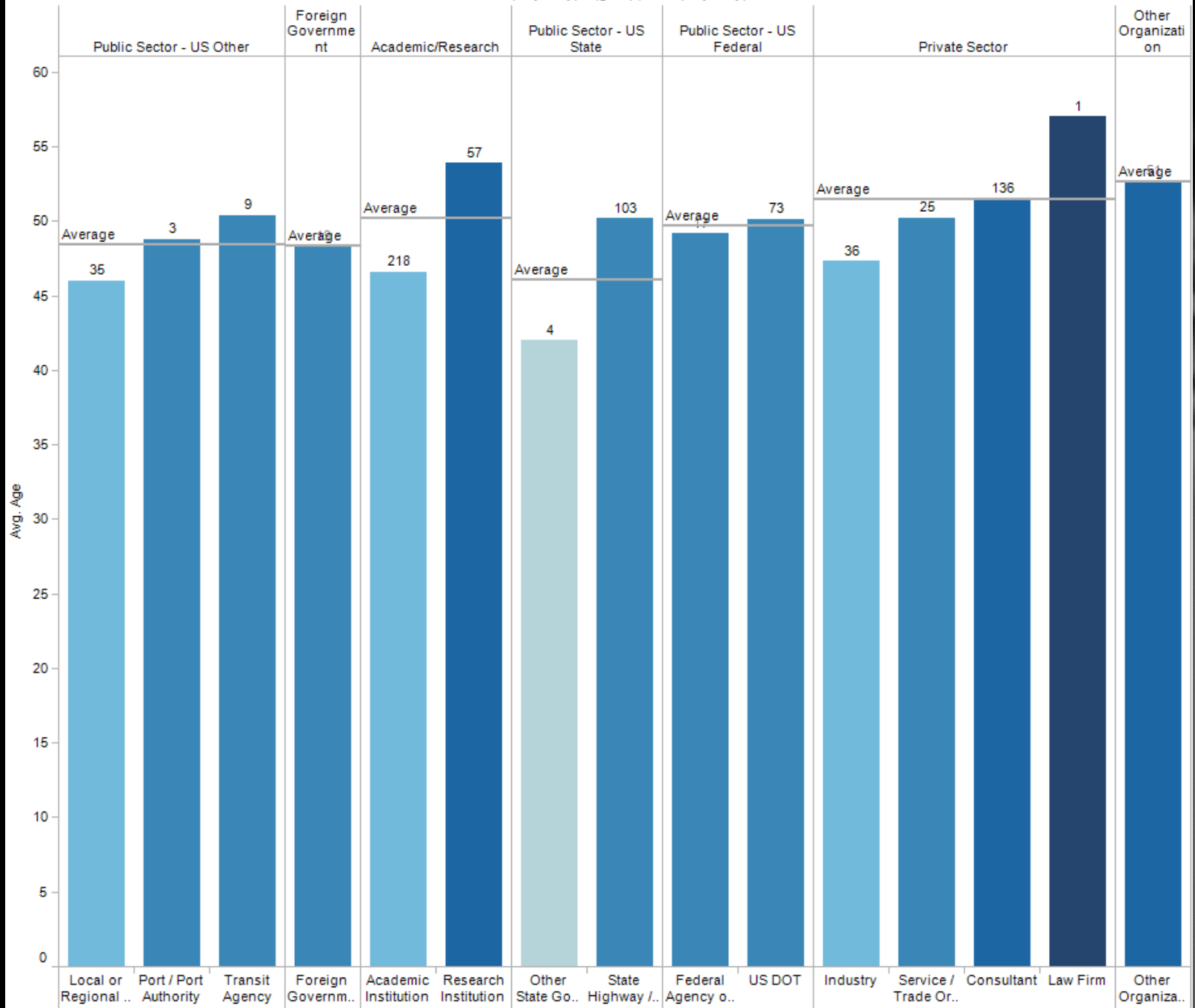
# Average Age by Employee Type

Employer Type



# Average Age by Employee Type\Group

Employer Type (group) / Employer Type





## Committee Membership

TRB Committee and Project Involvement Description	TRB Committee and Project Involvement Code	TRB Committee and Project Involvement Section	
Congestion Pricing	ABE25	E	38
Accessible Transportation and Mobility	ABE60	E	37
Travel Survey Methods	ABJ40	J	36
Transportation Economics	ABE20	E	35
Revenue and Finance	ABE10	E	33
Geographic Information Science and Applications	ABJ60	J	32
Urban Transportation Data and Information Systems	ABJ30	J	32
Women's Issues in Transportation	ABE70	E	32
Performance Measurement	ABC30	C	31
Statistical Methods	ABJ80	J	31
Transportation Demand Management	ABE50	E	31
Strategic Management	ABC10	C	30
Critical Transportation Infrastructure Protection	ABE40	E	29
Highway Traffic Monitoring	ABJ35	J	29
Transportation in the Developing Countries	ABE90	E	29
Statewide Transportation Data and Information Systems	ABJ20	J	28
Visualization in Transportation	ABJ95	J	28
Technology Transfer	ABG30	G	27
Conduct of Research	ABG10	G	26
Section - Data and Information Systems	ABJ00	J	26
Transportation Asset Management	ABC40	C	26
Transportation Education and Training	ABG20	G	25
Artificial Intelligence and Advanced Computing Applications	ABJ70	J	24
Native American Transportation Issues	ABE80	E	24
Freight Transportation Data	ABJ90	J	22
Information Systems and Technology	ABJ50	J	22
Library and Information Science for Transportation	ABG40	G	22
Task Force on Understanding New Directions for the National House..	ABJ45T	J	22
Task Force on Knowledge Management	AB010T	0	20
Transportation Issues in Major U.S. Cities	ABE30	E	20
Section - Transportation Policy	ABE00	E	17
Transportation History	ABG50	G	17
Committee for Transportation Asset Management: A National Confer..	ABC99E	C	15
Management and Productivity	ABC20	C	15
Task Force for the Using Census Data for Transportation Application..	ABJ15T	J	11
Policy and Organization Group	AB000	0	10
Section - Research and Education	ABG00	G	10
Task Force on the Traffic Monitoring Conferences	ABJ25T	J	10
Using Census Data for Transportation Applications: A Conference	ABJ99F	J	10
Section - Management and Leadership	ABC00	C	8
Committee for Access to International Transportation Research Infor..	ABJ99G	J	7
National Transportation Data Requirements and Programs	ABJ10	J	7
Committee for the Tenth National Conference on Transportation Ass..	ABC99F	C	4
<b>Grand Total</b>			<b>787</b>

Who's on the most committees (>3)

Member role	Name	Title	Employer Type (group)	Organization	Country	State	
Member	Dr. Steven E. Polzin	Director, Mobility Policy Research	Academic/Research	University of South Florida	United States	FL	4
	Mr. Guy Rousseau	Surveys and Transportation Model Development Manager	Public Sector - US Other	Atlanta Regional Commission	United States	GA	4
	Ms. Penelope Z. Weinberger	Census Transportation Planning Products Program Manager	Private Sector	AASHTO (American Associatio..	United States	DC	4
	Dr. Anthony R. Kane	Director Engineering and Technical Services	Private Sector	AASHTO (American Associatio..	United States	DC	3
	Dr. Harvey J. Miller	Professor	Academic/Research	University of Utah	United States	UT	3
	Dr. Shashi S. Nambisan	Professor of Civil Engineer and Director of Transportation	Academic/Research	Iowa State University	United States	IA	3
	Mr. Jack R. Stickel	Transportation Planner	Public Sector - US State	Alaska Department of Transport..	United States	AK	3
	Mr. James Michael Bridges	Undersecretary for the Office of Management and Finance	Public Sector - US State	Louisiana Department of Transp..	United States	LA	3
	Mr. Kenneth J. Cervenka	Community Planner	Public Sector - US Federal	Federal Transit Administration (..	United States	DC	3
	Mr. Mark F. Muriello	Assistant Director, Tunnels, Bridges and Terminals	Public Sector - US Other	Port Authority of New York and ..	United States	NJ	3
	Mrs. Susan C. Sillick	Research Programs Manager	Public Sector - US State	Montana Department of Transp..	United States	MT	3
TRB Staff Representative	Mr. Thomas M. Palmerlee	Associate Division Director - Data and Information Services	Academic/Research	Transportation Research Board	United States	DC	19
	Ms. Martine A. Micozzi	Senior Program Officer - Management, Policy, and International Relatio..	Academic/Research	Transportation Research Board	United States	DC	12
	Ms. Jennifer A. Rosales	Senior Program Officer - Public Transportation Engineer	Academic/Research	Transportation Research Board	United States	DC	8
	Dr. Richard F. Pain	Senior Program Officer - Transportation Safety Coordinator	Academic/Research	Transportation Research Board	United States	DC	3

## Organizational Representation &gt;4 Members

Organization	Employer Type (group)	# People	# Records
Federal Highway Administration (FHWA)	Public Sector - US Federal	39	47
	Other Organization	25	30
Research and Innovative Technology Administration (RITA)	Public Sector - US Federal	20	24
Texas A&M Transportation Institute	Academic/Research	15	18
Federal Transit Administration (FTA)	Public Sector - US Federal	9	12
Virginia Department of Transportation	Public Sector - US State	9	12
Washington State Department of Transportation	Public Sector - US State	9	14
University of California, Berkeley	Academic/Research	8	10
New York State Department of Transportation	Public Sector - US State	7	7
University of Minnesota	Academic/Research	7	9
University of Washington	Academic/Research	7	10
Virginia Polytechnic Institute and State University (Virginia Tech)	Academic/Research	7	8
AASHTO (American Association of State Highway and Transportation Officials)	Private Sector	6	12
California Department of Transportation (CALTRANS)	Public Sector - US State	6	10
Cambridge Systematics, Inc.	Private Sector	6	7
Minnesota Department of Transportation	Public Sector - US State	6	7
Ohio Department of Transportation	Public Sector - US State	6	8
Texas Department of Transportation	Public Sector - US State	6	7
Transportation Research Board	Academic/Research	6	44
Wisconsin Department of Transportation	Public Sector - US State	6	7
IFSTAR	Academic/Research	5	6
Parsons Brinckerhoff	Private Sector	5	7
Baltimore Metropolitan Council (BMC)	Public Sector - US Other	4	5
Delft University of Technology	Academic/Research	4	4
Florida Department of Transportation	Public Sector - US State	4	4
Oak Ridge National Laboratory	Public Sector - US Federal	4	4
Purdue University	Academic/Research	4	4
Texas A&M University	Academic/Research	4	5
The World Bank	Private Sector	4	7
Transport Canada	Foreign Government	4	4
University of Maryland	Academic/Research	4	6
University of Virginia	Academic/Research	4	4
USF Center for Urban Transportation Research	Academic/Research	4	6



# RECOMMENDATIONS GOING FORWARD

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# Recommendations

- Consider doing more targeted exercises – subcommittees, task forces, intra-committee
- Consider doing broader analysis – all of TRB – to get a good picture of communications
- Consider experimenting with supplementary data sets



# Recommendations

- Complete a citation analysis to create a view of the knowledge network
- Make the ONA available on the TRB KMTF website so people can interact with it and make new observations



Comments and Discussion  
**THANK YOU!**

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