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Patterns of Interaction in Public Health PBRNs: Insights from Network Analysis

Rachel Hogg, *University of Kentucky*

Glen P Mays, *University of Kentucky*

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Insight from Network Analysis

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Rachel Hogg, M.S.
Glen P. Mays, Ph.D.



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The Robert Wood Johnson Foundation's *Public Health Practice-Based Research Networks Program* supports research on the organization, financing, and delivery of public health services using the infrastructure of practice-based networks (PBRNs). A Public Health PBRN brings multiple public health agencies into collaboration with an academic research partner to design and conduct studies in real-world practice settings. By promoting research-practice interaction, PBRNs are designed to help the scientific enterprise ask the “right” questions that can inform public health action in the near term. And by engaging practitioners in the design and conduct of research, PBRNs are designed to accelerate the use of research findings in everyday public health practice. Currently, 12 public health PBRNs receive core financial support from the Foundation to conduct applied research projects, and other PBRNs participate in the program as affiliates.

This report presents data from a network analysis survey conducted with public health PBRNs to examine patterns of interaction among researchers and public health practitioners who participate in the networks. These data provide a baseline for tracking the types and frequencies of interaction that occur within networks, and reveal opportunities for promoting more productive patterns of engagement in applied public health research. Over time, these types of data can reveal how and under what circumstances PBRNs facilitate the production and application of research about public health services and delivery systems.

The PBRN network analysis data presented in this report were collected through a self-administered survey fielded with PBRN participants during two waves of data collection. The first wave of data was collected during winter 2010-2011 with participants in the first cohort of five PBRNs to be launched through the program. The second wave of data was collected during winter 2011-2012 with participants in the second cohort of seven PBRNs to be launched through the program, plus participants in two affiliate PBRNs that were actively conducting research at the time of the survey. In each wave, the survey was administered approximately one year after the start-up of the PBRN. Across both waves, the survey captured data on more than 300 people who participate in one of 14 public health PBRNs.

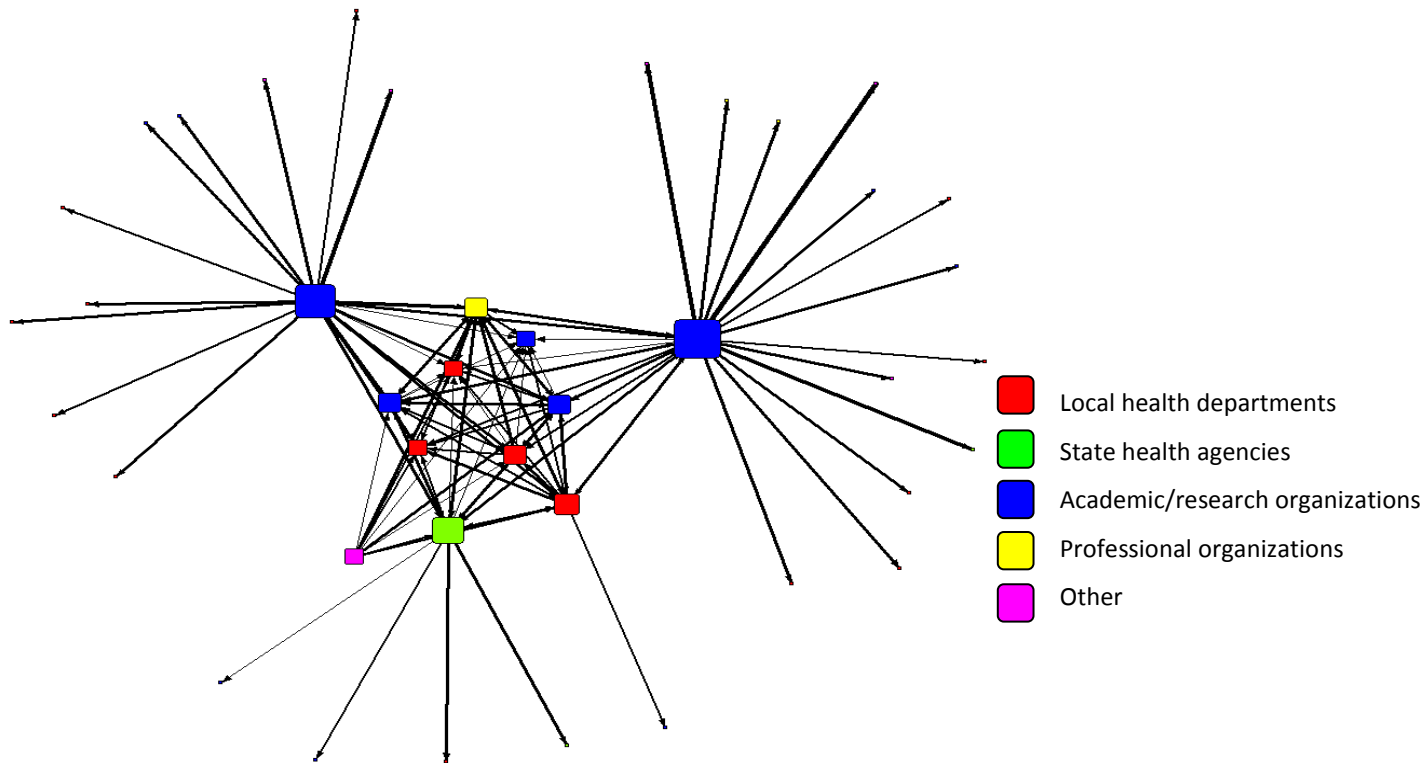
The network analysis portion of the survey asked survey respondents to indicate the type and frequency of interaction with each organizational member of the PBRN for research activities over the past year. Responses to these questions were used to generate standard measures of network structure and to generate standard graphical depictions of network structure. These measures and graphs are shown for each PBRN in the pages that follow.

For more information about this report and the Public Health PBRN program, please contact the authors at publichealthPBRN@uky.edu.

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Network Structure of the Colorado Public Health PBRN • 2010



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality*: number of relationships that an organization maintains with other organizations in the network, on average: 5.45
- *Network Density*: proportion of total possible relationships that exist between organizations in the network: 0.14
- *Network Components*: number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio*: ratio of components to total number of organizations in the network: 0
- *Connectedness*: proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation*: the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance*: the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 2.235
- *Diameter*: the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 3.000
- *Reciprocity*: proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.2472
- *Centralization (Outdegree)*: degree to which out-going relationships between organizations are mediated by a single organization in the network: 28.228%
- *Centralization (Indegree)*: degree to which incoming relationships between organizations are mediated by a single organization in the network: 9.334%

II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
CSPH, other	70	21	29.91	8.97
RMPRC	64	4	27.35	1.71
Boulder LHD	30	18	12.82	7.69
CDPHE	30	26	12.82	11.11
CALPHO	25	28	10.68	11.97
Prowers LHD	20	19	8.55	8.12
CSPH, CPHP	17	28	7.26	11.97
UCD-Public Affairs	17	14	7.26	5.98
CO SOPHE	17	0	7.26	0.00
ADH	0	11	0.00	4.70
Eagle LHD	0	13	0.00	5.56
Tri County HD	0	19	0.00	8.12
El Paso LHD	0	4	0.00	1.71
CO DHCPF	0	3	0.00	1.28
Ctr Research Strategies	0	2	0.00	0.85
CHI	0	1	0.00	0.43
SafeKids Larimer	0	3	0.00	1.28
Larimer Suicide	0	3	0.00	1.28
Larimer Child	0	3	0.00	1.28
Larimer LHD	0	2	0.00	0.85
Poudre School District	0	5	0.00	2.14
Foothills Trauma	0	3	0.00	1.28
Larimer BPE	0	2	0.00	0.85
Denver HHA	0	6	0.00	2.56
Kaiser	0	4	0.00	1.71
Colorado CSTI	0	3	0.00	1.28

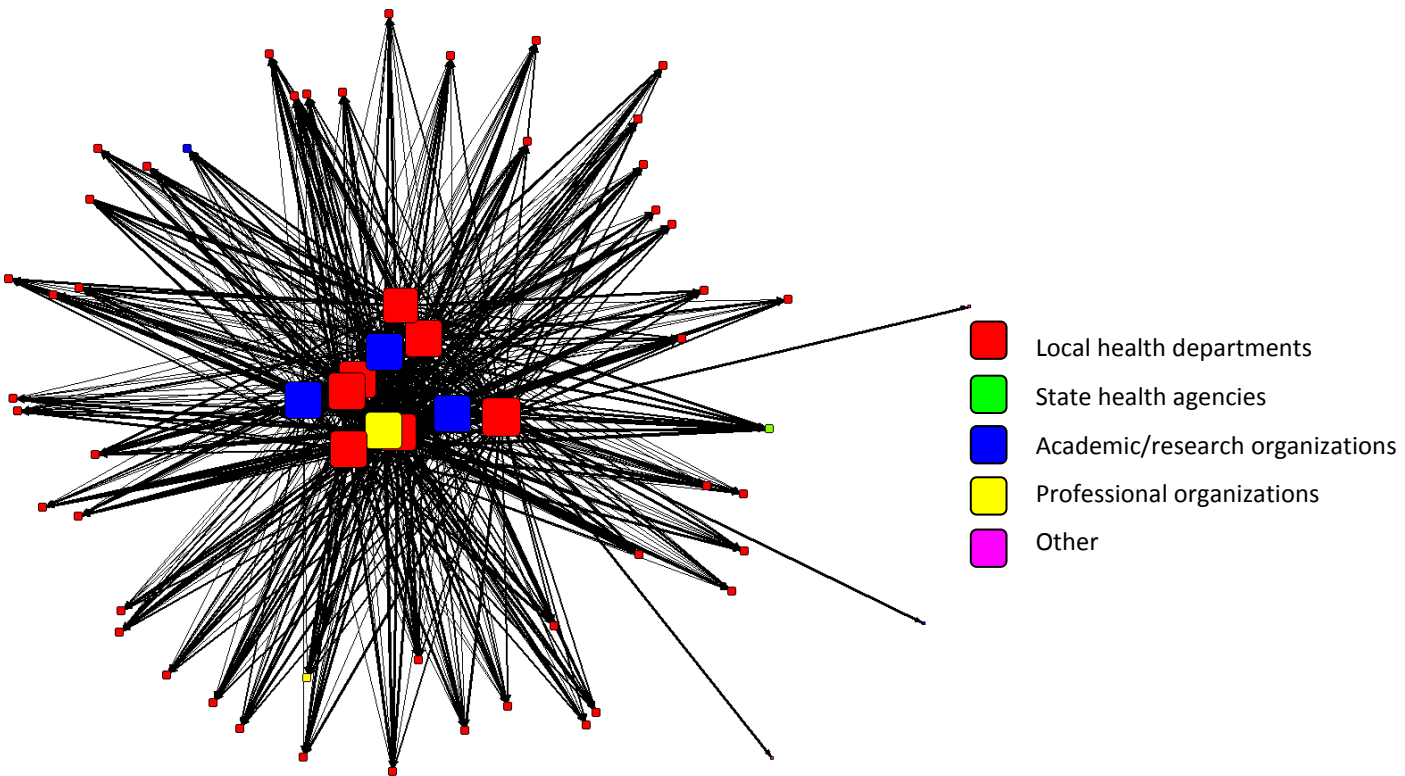
CU-Boulder	0	2	0.00	0.85
CDC	0	5	0.00	2.14
APHA	0	3	0.00	1.28
GSA	0	3	0.00	1.28
Alamosa LHD	0	4	0.00	1.71
Costilla LHD	0	3	0.00	1.28
Saquache CLHD	0	3	0.00	1.28
Rio Grande LHD	0	2	0.00	0.85
Conejos LHD	0	2	0.00	0.85
Mineral LHD	0	2	0.00	0.85
National Jewish	0	5	0.00	2.14
SLV Community Orgs	0	3	0.00	1.28
DU College of Education	0	4	0.00	1.71
UCD, SOM	0	4	0.00	1.71

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the Connecticut Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 19.806
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.325
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.692
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 2.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.0875
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 44.968%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 4.877%

II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
Connecticut Association of Directors of Health	179	34	48.91	9.29
Central Connecticut Health District	171	18	46.72	4.92
Danbury Health Department	141	17	38.52	4.64
Waterbury Health Department	141	14	38.52	3.83
Eastern Highlands Health District	114	18	31.15	4.92
Stratford Health Department	108	16	29.51	4.37
Yale University	80	17	21.86	4.64
New Canaan Health Department	79	16	21.58	4.37
University of Connecticut Master of Public Health Program	78	18	21.31	4.92
Community Research Institute for Community Research	69	16	18.85	4.37
Greenwich Health Department	63	17	17.21	4.64
Bethel Health Department	0	21	0.00	5.74
Bridgeport Health Department	0	25	0.00	6.83
Bristol-Burlington Health District	0	20	0.00	5.46
Chatham Health District	0	18	0.00	4.92
Chesprocott Health District	0	21	0.00	5.74
Colchester Health Department	0	18	0.00	4.92
Connecticut Department of Public Health Office of Local Health	0	37	0.00	10.11
Connecticut Public Health Association	0	23	0.00	6.28
Connecticut River Area Health District	0	21	0.00	5.74
Cromwell Health Department	0	17	0.00	4.64
Darien Health Department	0	22	0.00	6.01
East Hartford Health Department	0	16	0.00	4.37
East Shore District Health Dept	0	19	0.00	5.19
Fairfield Health Department	0	24	0.00	6.56
Farmington Valley Health District	0	23	0.00	6.28

Glastonbury Health Department	0	19	0.00	5.19
Guilford Health Department	0	16	0.00	4.37
Hartford Health Department	0	24	0.00	6.56
Ledge Light Health District	0	24	0.00	6.56
Madison Health Department	0	16	0.00	4.37
Manchester Health Department	0	20	0.00	5.46
Meriden Health Department	0	17	0.00	4.64
Middletown Health Department	0	16	0.00	4.37
Milford Health Department	0	20	0.00	5.46
Naugatuck Valley Health District	0	23	0.00	6.28
New Britain Health Department	0	20	0.00	5.46
New Fairfield Health Department	0	21	0.00	5.74
New Haven Health Department	0	22	0.00	6.01
New Milford Health Department	0	21	0.00	5.74
Newtown Health District	0	22	0.00	6.01
North Central Health District	0	23	0.00	6.28
Northeast District Department of Health	0	22	0.00	6.01
Norwalk Health Department	0	29	0.00	7.92
Pomperaug Health District	0	26	0.00	7.10
Quinnipiack Valley Health District	0	19	0.00	5.19
Ridgefield Health Department	0	22	0.00	6.01
Southern Connecticut State University	0	19	0.00	5.19
Southington Health Department	0	17	0.00	4.64
Stamford Health Department	0	21	0.00	5.74
Torrington Area Health District	0	20	0.00	5.46
Trumbull-Monroe Health District	0	26	0.00	7.10
Uncas Health District	0	20	0.00	5.46
Wallingford Health Department	0	16	0.00	4.37
West Hartford-Bloomfield Health District	0	22	0.00	6.01
West Haven Health Department	0	19	0.00	5.19
Westport-Weston Health District	0	23	0.00	6.28

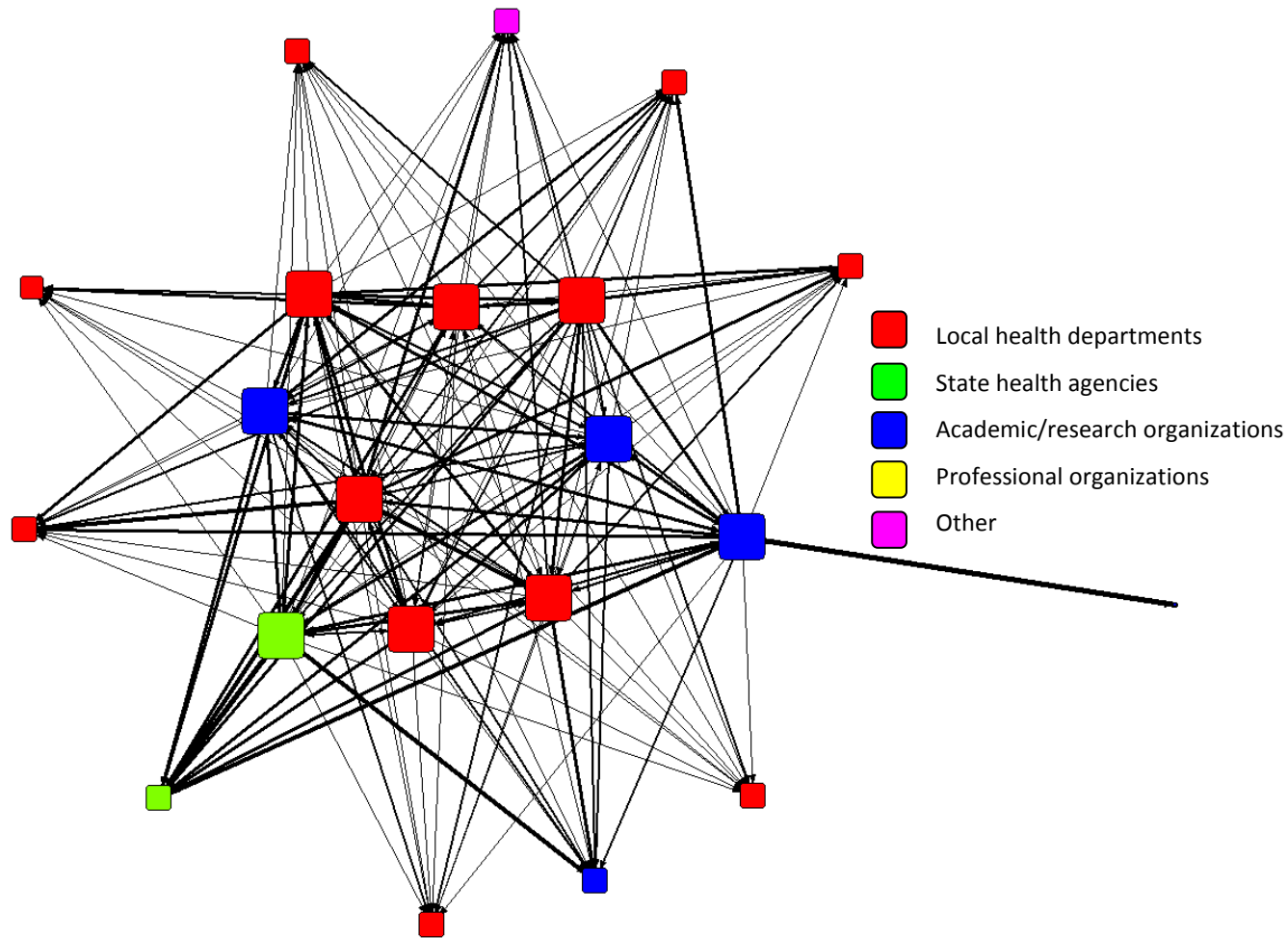
Wilton Health Department	0	21	0.00	5.74
Windsor Health Department	0	19	0.00	5.19
Western Connecticut State University	0	4	0.00	1.09
United Way of Western CT	0	4	0.00	1.09
Danbury Hospital	0	4	0.00	1.09

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the Florida Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality*: number of relationships that an organization maintains with other organizations in the network, on average: 14.81
- *Network Density*: proportion of total possible relationships that exist between organizations in the network: 0.74
- *Network Components*: number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio*: ratio of components to total number of organizations in the network: 0
- *Connectedness*: proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation*: the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance*: the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.314
- *Diameter*: the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 3.000
- *Reciprocity*: proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.2552
- *Centralization (Outdegree)*: degree to which out-going relationships between organizations are mediated by a single organization in the network: 29.947%
- *Centralization (Indegree)*: degree to which incoming relationships between organizations are mediated by a single organization in the network: 20.000%

II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
Duval County	43	3	43	3
Bradford County Health Department	41	17	41	17
University of Florida	39	21	39	21
Florida Public Health Institute	32	17	32	17
Florida State University	32	15	32	15
Volusia County Health Department	32	21	32	21
Orange County Health Department	30	12	30	12
Clay County Health Department	29	18	29	18
Lee County Health Department	29	13	29	13
Florida Department of Health other unit(s)	27	25	27	25
Bay County Health Department	0	12	0	12
Miami-Dade County Health Department	0	17	0	17
Florida Department of Health Statistics and Assessment (including Office of Planning Evaluation & Data Analysis)	0	34	0	34
Franklin County Health Department	0	11	0	11

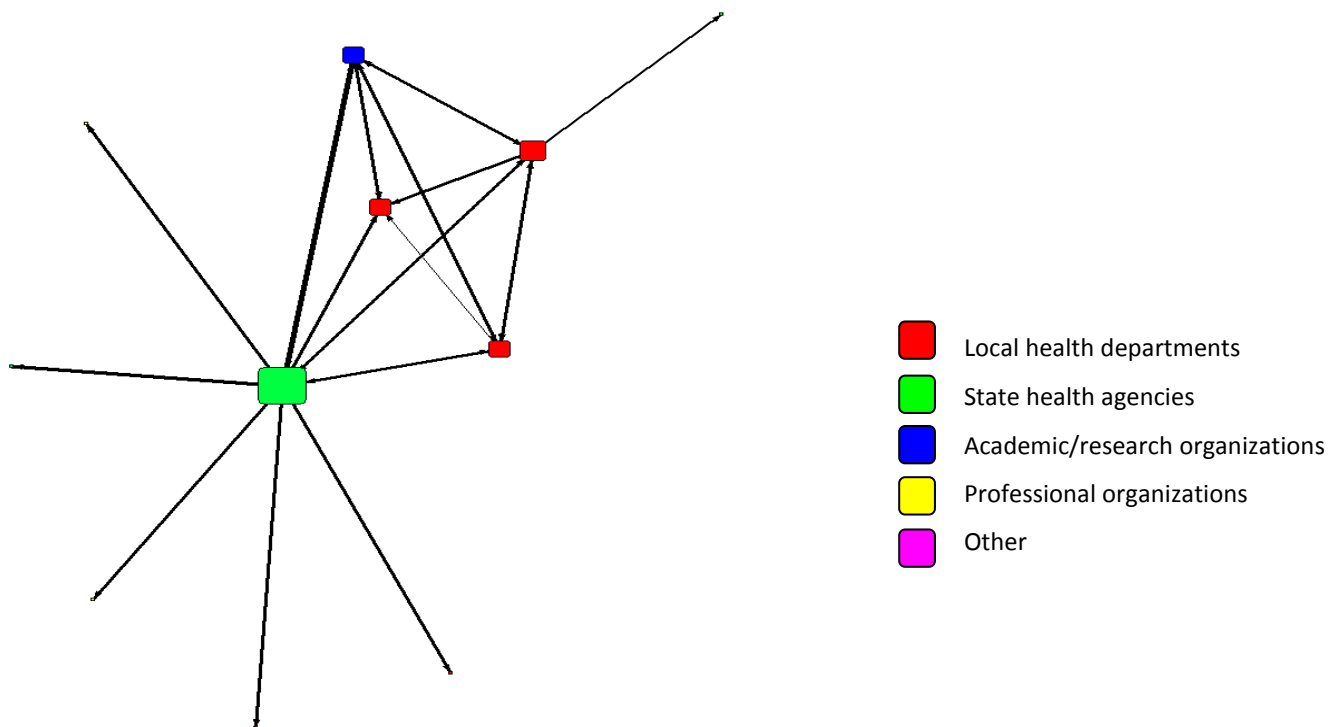
Nassau County Health Department	0	17	0	17
Northeast Florida Area Health Education Center	0	14	0	14
Okaloosa County Health Department	0	11	0	11
Osceola Health Department	0	12	0	12
Union County Health Department	0	19	0	19
University of South Florida College of Public Health	0	20	0	20
University of Washington	0	5	0	5

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the Georgia Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 3.909
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.391
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.8
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 3.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.375
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 60.370%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 11.481%

II. Organization-Level Measures

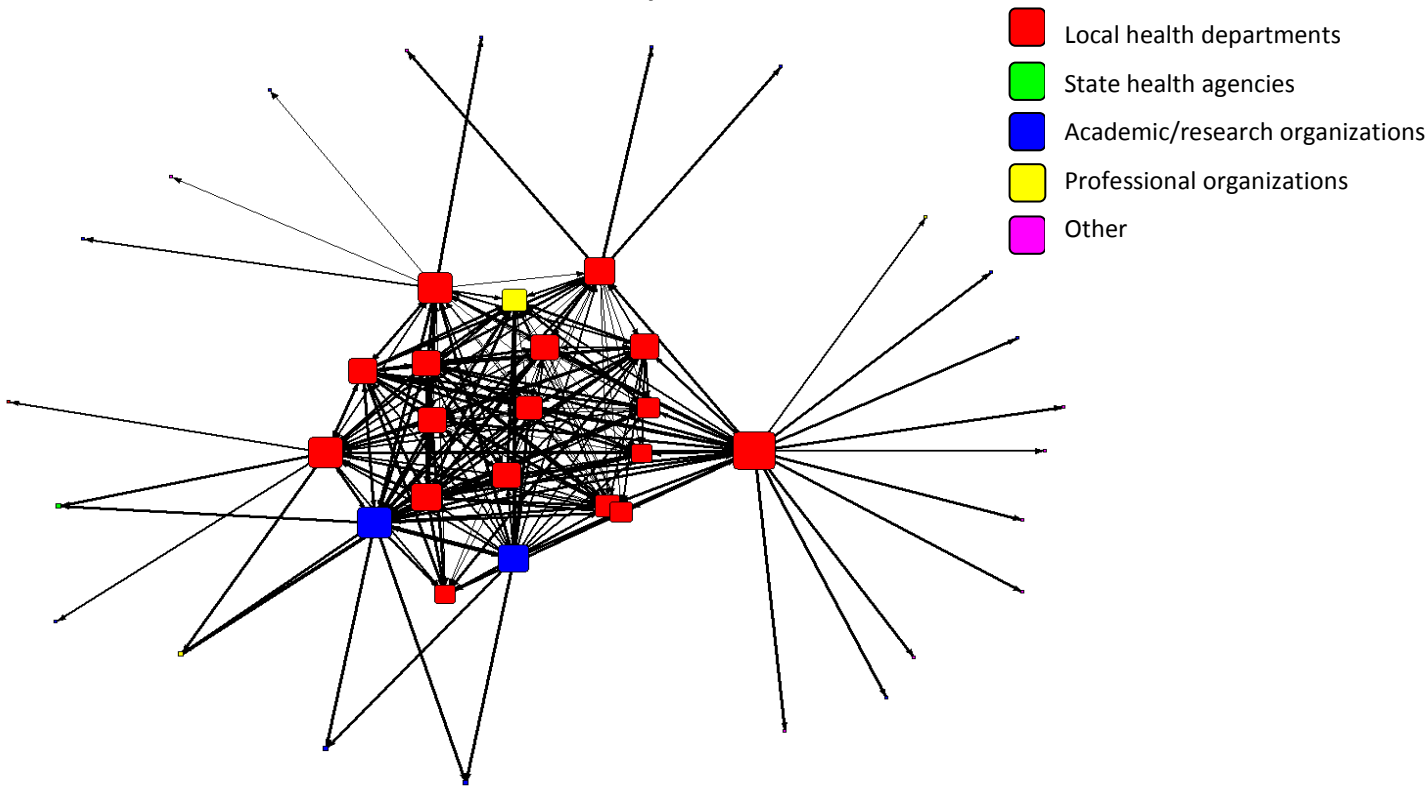
<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
Georgia State Office of Rural Health (SORH)	36	6	60.00	10.00
Georgia Southern University	16	12	26.67	20.00
East Central Health District 6	12	8	20.00	13.33
Coastal Health District 9-1	6	11	10.00	18.33
Southeast Health District 9-2	0	12	0.00	20.00
Public Health District 8-1	0	3	0.00	5.00
GA Association for Primary Health Care	0	4	0.00	6.67
GA Dept of Public Health	0	5	0.00	8.33
Mcintosh County Board of Health	0	4	0.00	6.67
GA Public Health Association	0	3	0.00	5.00
Georgia Department of Public Health, Office of Improvement	0	2	0.00	3.33

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the Kentucky Public Health PBRN • 2010



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 10.535
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.251
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.984
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 3.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.3659
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 29.230%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 10.918%

II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
Northern Kentucky HD	85	25	33.73	9.92
Franklin HD	77	26	30.56	10.32
UKY	69	41	27.38	16.27
Marshall HD	54	24	21.43	9.52
Wedco HD	54	24	21.43	9.52
Three Rivers HD	52	27	20.63	10.71
UK CPHSSR	52	8	20.63	3.17
Barren River HD	41	28	16.27	11.11
Lincoln Trail HD	29	26	11.51	10.32
Lake Cumberland HD	28	28	11.11	11.11
Purchase HD	20	27	7.94	10.71
Madison HD	19	32	7.54	12.70
Green River HD	18	27	7.14	10.71
Montgomery HD	18	26	7.14	10.32
Floyd HD	8	28	3.17	11.11
KPHA	5	41	1.98	16.27
Clark HD	3	29	1.19	11.51
Jessamine HD	3	28	1.19	11.11
Fayette HD	0	29	0	11.51
Magoffin HD	0	29	0	11.51
U of L	0	3	0	1.19
EKU	0	2	0	0.79
WKU	0	1	0	0.40
CRD, Somerset	0	1	0	0.40
Purchase AHEC	0	3	0	1.19
Kentucky Cancer Program	0	3	0	1.19

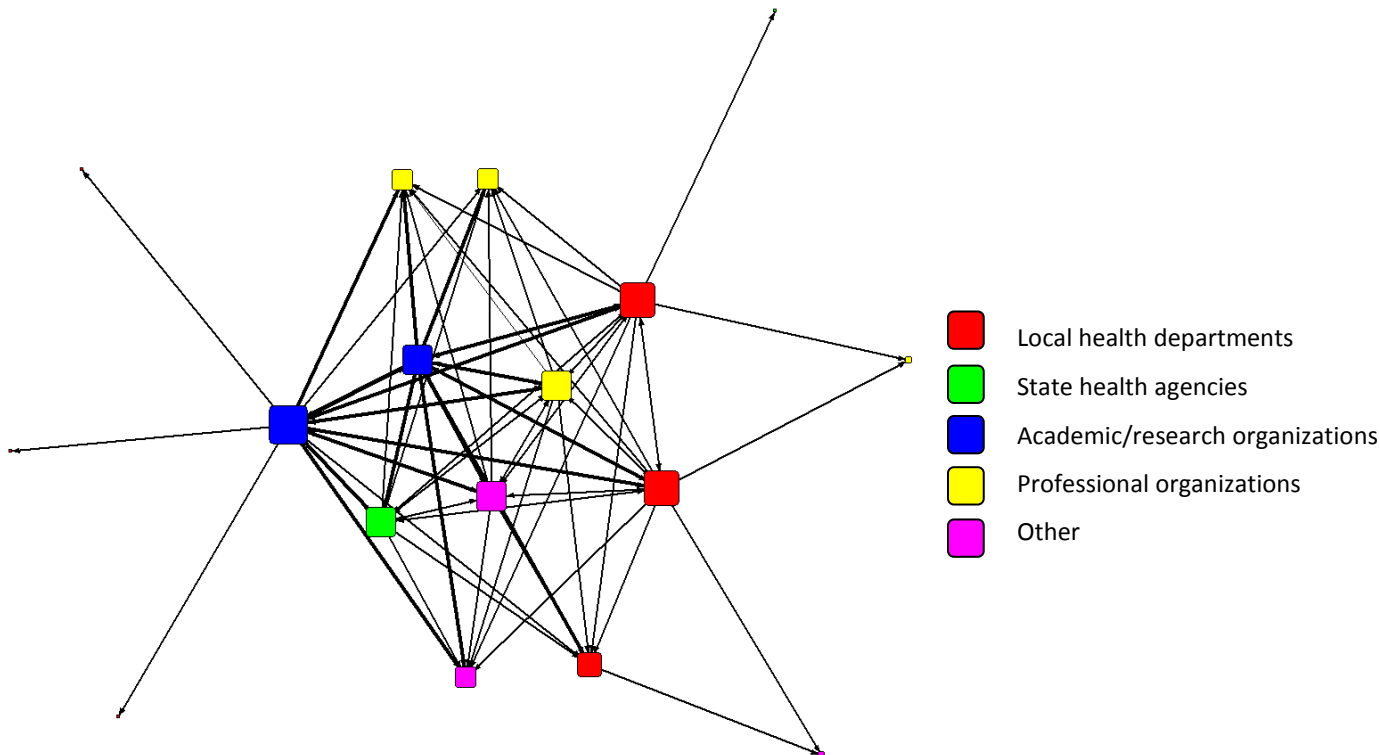
Western Baptist Hospital	0	3	0	1.19
KY DPH	0	7	0	2.78
KHDA	0	12	0	4.76
KY IOM	0	2	0	0.79
Bullitt HD	0	2	0	0.79
Cincinnati Children's Hospital	0	3	0	1.19
KY Water	0	4	0	1.59
University of Cincinnati	0	3	0	1.19
HFGC	0	3	0	1.19
FHKY	0	3	0	1.19
NIH	0	2	0	0.79
Florence YMCA	0	4	0	1.59
NKU	0	4	0	1.59
PHF	0	3	0	1.19
NACCHO	0	2	0	0.79
KAN	0	6	0	2.38
UK CCTS	0	6	0	2.38

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the Massachusetts Public Health PBRN • 2010



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality*: number of relationships that an organization maintains with other organizations in the network, on average: 7.706
- *Network Density*: proportion of total possible relationships that exist between organizations in the network: 0.482
- *Network Components*: number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio*: ratio of components to total number of organizations in the network: 0
- *Connectedness*: proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation*: the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance*: the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.654
- *Diameter*: the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 2.000
- *Reciprocity*: proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.3684
- *Centralization (Outdegree)*: degree to which out-going relationships between organizations are mediated by a single organization in the network: 45.5%
- *Centralization (Indegree)*: degree to which incoming relationships between organizations are mediated by a single organization in the network: 11.5%

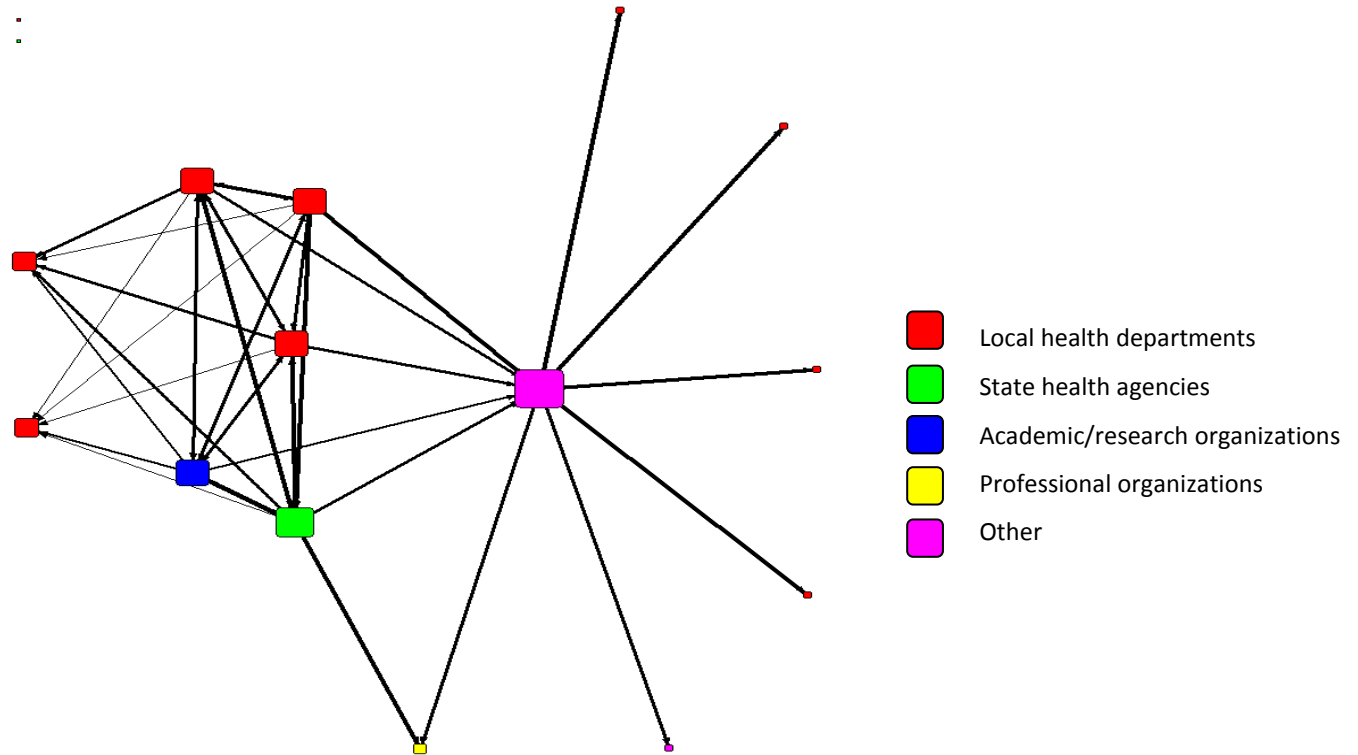
II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
ICH	47	21	58.75	26.25
BUSPH	41	19	51.25	23.75
Belmont LHD	36	20	45	25
Westford BOH	36	20	45	25
Franklin RCOG	31	20	38.75	25
MADPH	30	20	37.5	25
MAHB	29	20	36.25	25
Natick BOH	3	22	3.75	27.5
MACLPH	0	23	0	28.75
MAPHNA	0	22	0	27.5
MAPHA	0	22	0	27.5
MHOA	0	6	0	7.5
MEHA	0	6	0	7.5
MADEP	0	3	0	3.75
Quabbin HD	0	3	0	3.75
Northampton LHD	0	3	0	3.75
South Berkshires BOH	0	3	0	3.75

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

Network Structure of the Minnesota Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality*: number of relationships that an organization maintains with other organizations in the network, on average: 5.000
- *Network Density*: proportion of total possible relationships that exist between organizations in the network: 0.333
- *Network Components*: number of fully interconnected subgroups of organizations within the network: 3.000
- *Component Ratio*: ratio of components to total number of organizations in the network: 0.133
- *Connectedness*: proportion of relationships that must be removed to disconnect the network: 0.758
- *Fragmentation*: the proportion of pairs of organizations that cannot reach each other directly: 0.242
- *Average Distance*: the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.758
- *Diameter*: the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 3.000
- *Reciprocity*: proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.3125
- *Centralization (Outdegree)*: degree to which out-going relationships between organizations are mediated by a single organization in the network: 26.476%
- *Centralization (Indegree)*: degree to which incoming relationships between organizations are mediated by a single organization in the network: 12.762%

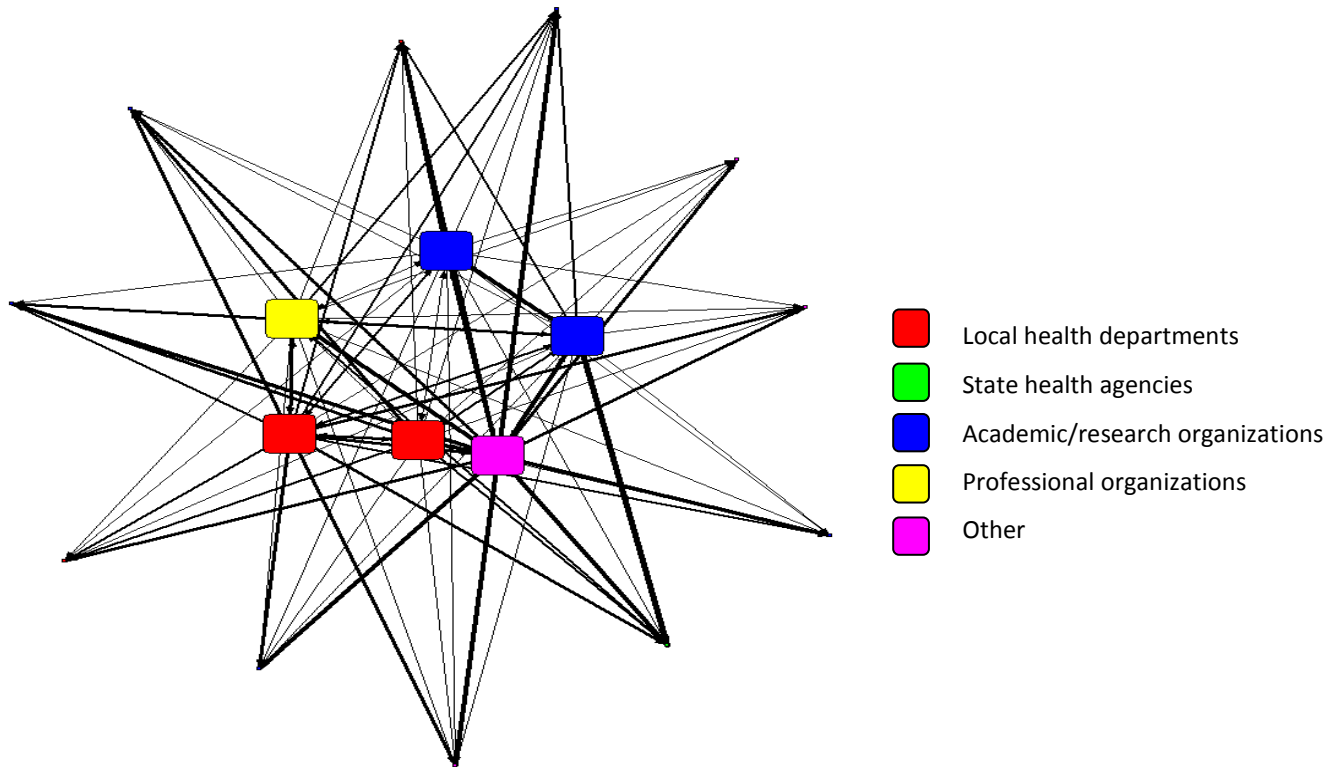
II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
Minnesota Department of Health	25	16	33.33	21.33
Carlton-Cook-Lake-St. Louis Community Health Board	22	15	29.33	20
Chisago County Public Health Department	20	10	26.67	13.33
Mille Lacs County Public Health	19	11	25.33	14.67
University of Minnesota School of Public Health	19	13	25.33	17.33
Stearns County Division of Public Health	17	13	22.67	17.33
Olmsted County Board of Commissioners	0	12	0	16
Volusia County Health Department	0	6	0	8
MN Local Public Health Association	0	7	0	9.33
Generations Health Care Initiative	0	3	0	4
Carlton County Public Health and Human Services	0	4	0	5.33
Lake County Human Services	0	4	0	5.33
Cook County Public Health and Human Services	0	4	0	5.33
St. Louis County Public Health and Human Services	0	4	0	5.33
Other local health departments in Minnesota	0	0	0	0
State Community Health Services Advisory Committee	0	0	0	0

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

Network Structure of the Missouri Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality*: number of relationships that an organization maintains with other organizations in the network, on average: 10.529
- *Network Density*: proportion of total possible relationships that exist between organizations in the network: 0.658
- *Network Components*: number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio*: ratio of components to total number of organizations in the network: 0
- *Connectedness*: proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation*: the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance*: the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.404
- *Diameter*: the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 2.000
- *Reciprocity*: proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.1852
- *Centralization (Outdegree)*: degree to which out-going relationships between organizations are mediated by a single organization in the network: 65.917%
- *Centralization (Indegree)*: degree to which incoming relationships between organizations are mediated by a single organization in the network: 7.833%

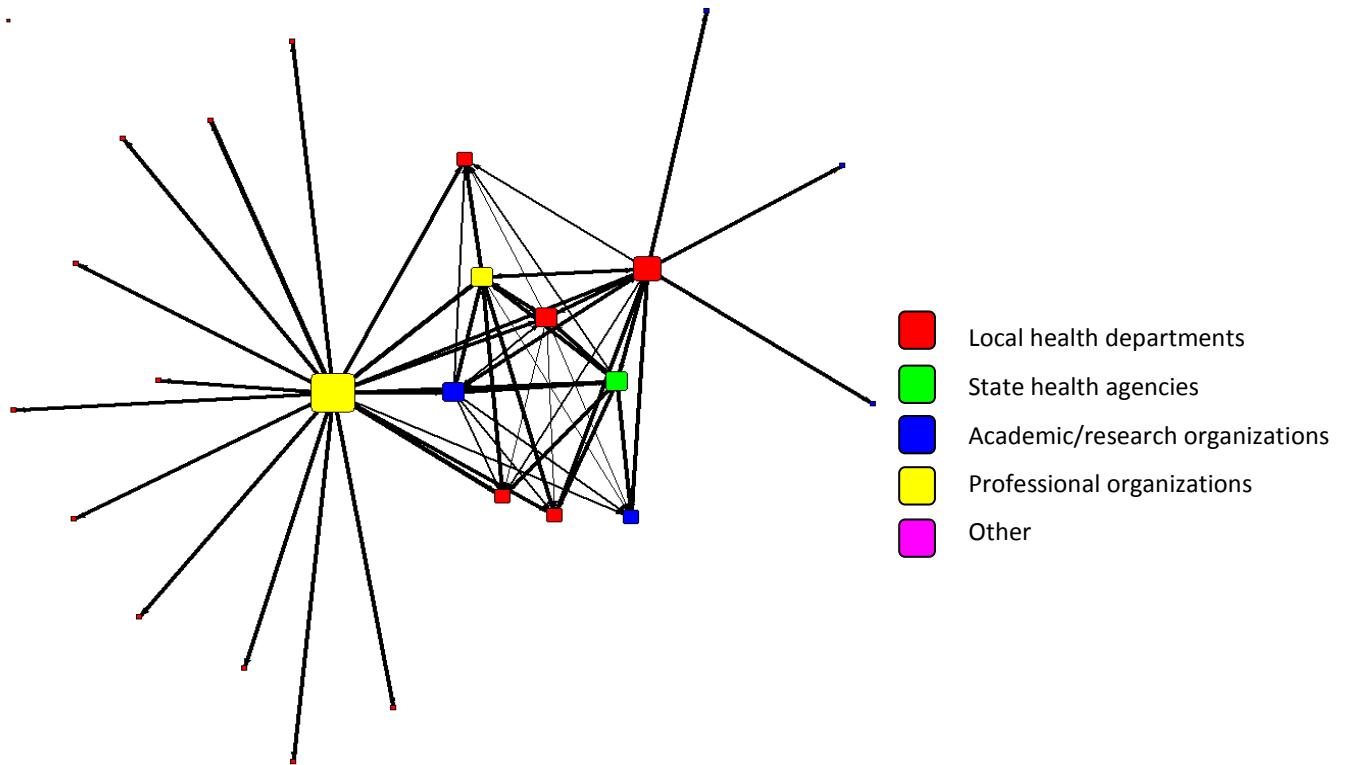
II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
Missouri Institute for Community Health	58	13	72.5	16.25
Douglas County Health Department	39	9	48.75	11.25
Washington University	32	11	40	13.75
Reynolds County Health Center	25	11	31.25	13.75
St. Louis University	22	12	27.5	15
Missouri Association for Local Public Health Agencies	19	11	23.75	13.75
Columbia-Boone County Department of Public Health & Human Services	0	10	0	12.5
Mid-Missouri Area Health Education Center	0	10	0	12.5
Missouri Department of Health & Senior Services	0	17	0	21.25
Ozarks Public Health Institute Missouri State University	0	10	0	12.5
Missouri State University Other unit(s)	0	11	0	13.75
National Network of Libraries of Medicine Mid-Continental Region	0	11	0	13.75
Southeast Missouri State University	0	12	0	15
St. Louis County Department of Health	0	13	0	16.25
Public Health Consulting LLC (formerly Triana Consulting)	0	14	0	17.5
U.S. Department of Agriculture	0	8	0	10
University of Missouri	0	12	0	15

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

Network Structure of the Nebraska Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 5.24
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.218
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 2.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0.042
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 0.92
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0.08
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.928
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 3.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.1887
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 62.726%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 9.511%

II. Organization-Level Measures

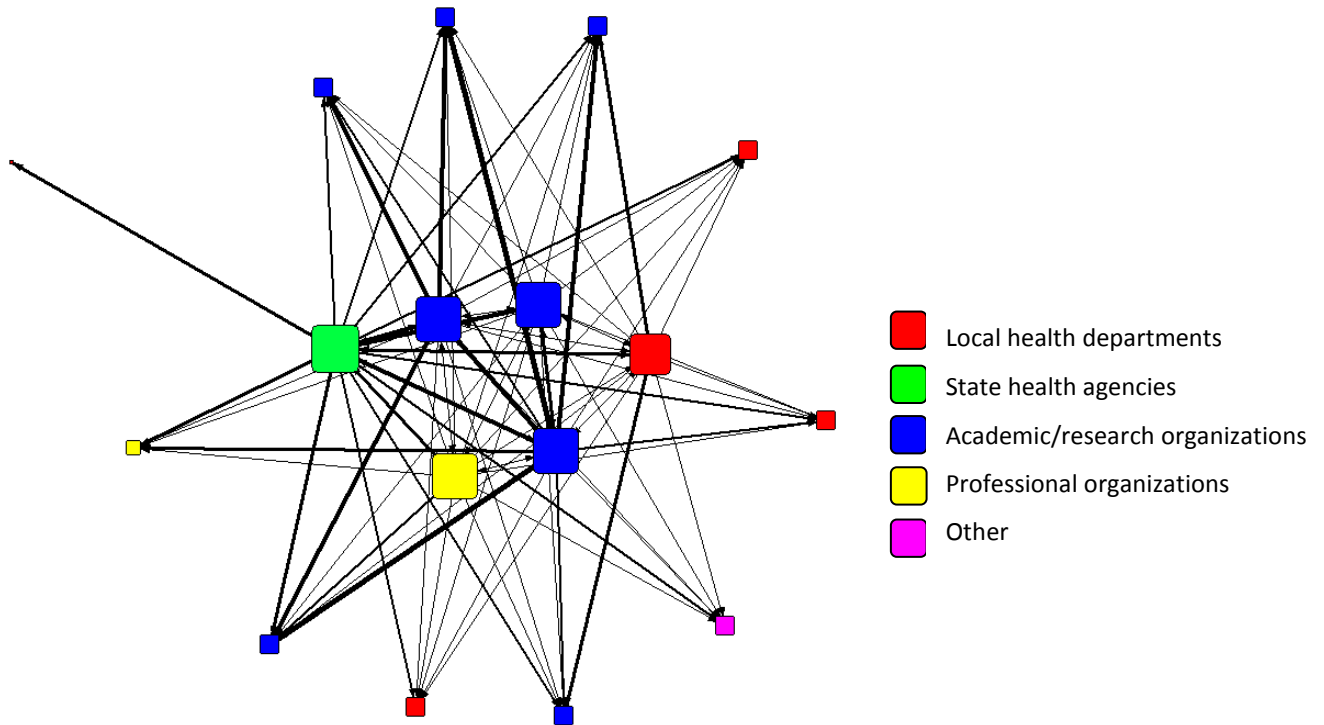
<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
Nebraska State Association of Local Boards of Health	62	0	64.58	0
South Heartland District Health Department	31	12	32.29	12.5
Nebraska Division of Public Health	23	14	23.96	14.58
Public Health Association of Nebraska	22	14	22.92	14.58
University of Nebraska Medical Center	19	13	19.79	13.54
Elkhorn Logan Valley Public Health Department	8	14	8.33	14.58
Four Corners Health Department Board of Health	0	15	0	15.63
Panhandle Public Health District	0	15	0	15.63
Two Rivers Public Health Department	0	13	0	13.54
University of Nebraska-Omaha	0	12	0	12.5
Douglas County Health Department	0	3	0	3.13
Lincoln/Lancaster Health Department	0	3	0	3.13
Three Rivers Health Department	0	3	0	3.13
Northeast Nebraska Health Department	0	3	0	3.13
Northcentral Health Department	0	3	0	3.13
Southeast Nebraska Health Department	0	3	0	3.13
Public Health Solutions	0	3	0	3.13
East Central Health Department	0	4	0	4.17
Central Health Department	0	3	0	3.13
Loup Basin Health Department	0	3	0	3.13
Southwest Health Dept	0	3	0	3.13
Center for Preparedness	0	3	0	3.13
College of Public Health (UNMC)	0	3	0	3.13
Creighton University	0	3	0	3.13
Other Local Health Departments in NE. at least once	0	0	0	0

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the New York Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 6.235
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.390
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 4.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0.188
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 0.353
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0.647
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.073
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 2.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.1867
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 42.167%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 9.583%

II. Organization-Level Measures

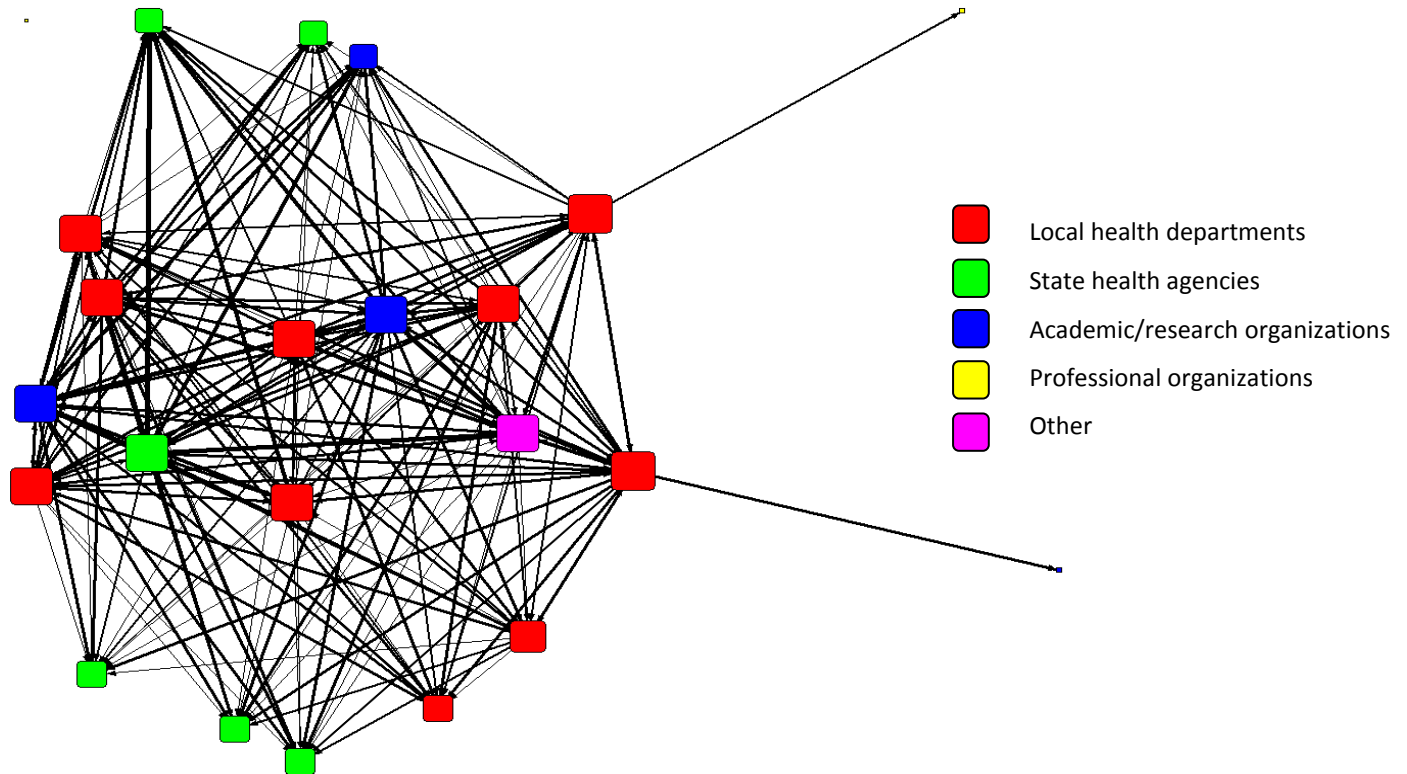
<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
New York State Department of Health	39	15	48.75	18.75
University of Albany School of Public Health Other Unit (s)	36	10	45	12.5
University of Kentucky College of Public Health	30	7	37.5	8.75
Onondaga County Department of Health	19	6	23.75	7.5
New York Academy of Medicine	18	5	22.5	6.25
Health Research Inc.	15	10	18.75	12.5
Chautauqua County Health Department	0	7	0	8.75
Clinton County Department of Health	0	8	0	10
Public Health Solutions	0	7	0	8.75
NY State Association of County Health Officials	0	9	0	11.25
Columbia University School of Nursing	0	10	0	12.5
Suffolk County Department of Health Services	0	7	0	8.75
University of Albany Center for Public Health Continuing Education	0	14	0	17.5
University of Albany Northeast Regional Public Health Leadership Institute	0	11	0	13.75
The New York New Jersey Public Health Training Center	0	12	0	15
University of Albany Center for Health Workforce Studies	0	16	0	20
All Other Local Health Departments in New York State	0	3	0	3.75

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other.

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Network Structure of the North Carolina Public Health PBRN • 2010



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 15.609
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.709
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 2.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0.045
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 0.913
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0.087
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.277
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 3.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.1887
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 43.687%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 12.987%

II. Organization-Level Measures

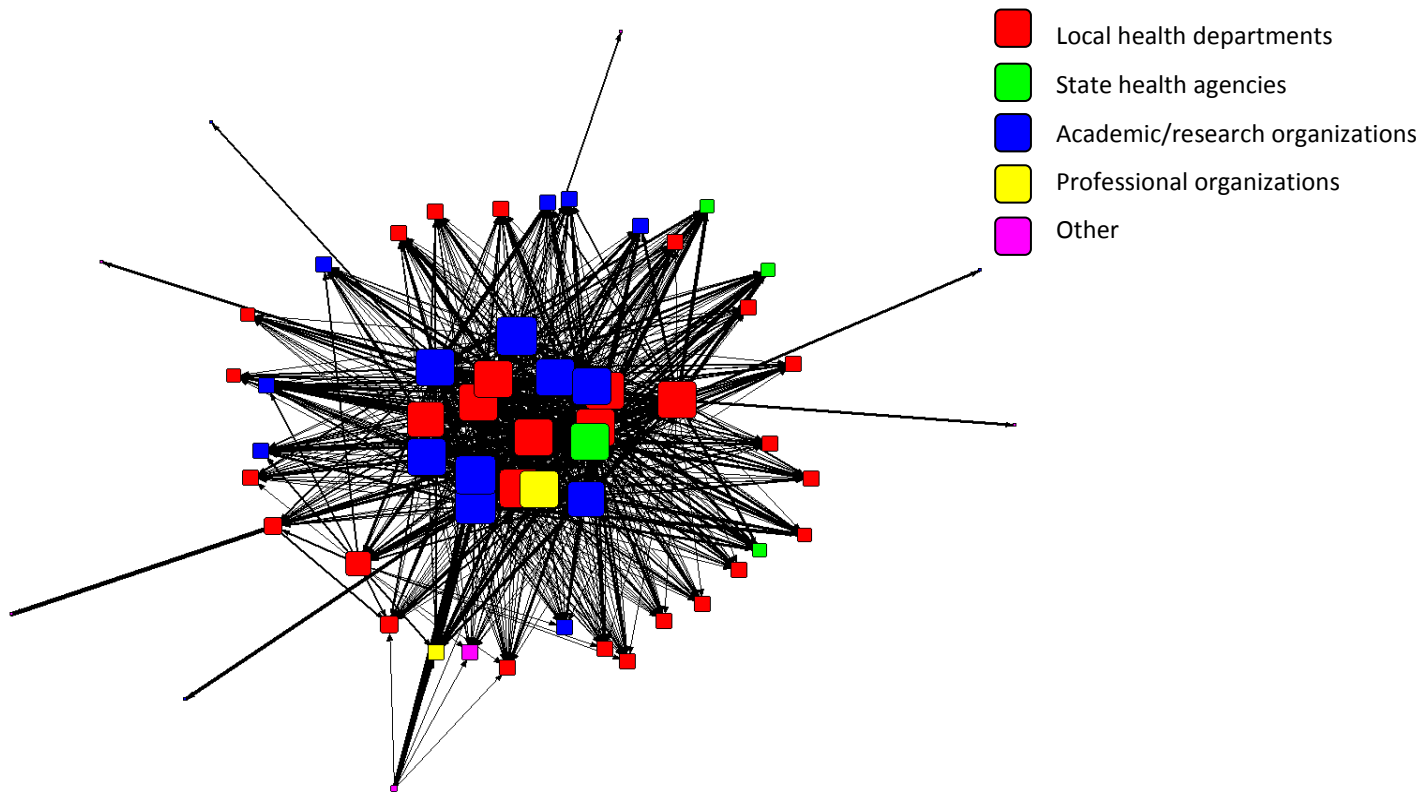
<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
NCIPH	78	41	59.09	31.06
NCDPH Healthy Carolinians	65	23	49.24	17.42
Person LHD	63	29	47.73	21.97
UNC and HPDP	58	24	43.94	18.18
Orange LHD	57	33	43.18	25
Guilford LHD	45	28	34.09	21.21
Guilford County	43	25	32.58	18.94
Alamance LHD	41	28	31.06	21.21
Wake LHD	37	29	28.03	21.97
CDC	29	33	21.97	25
Caswell LHD	28	26	21.21	19.70
Chatham LHD	27	28	20.45	21.21
Durham LHD	12	30	9.09	22.73
NCDPH, BabyLove	0	23	0	17.42
NCDPH, Children & Youth	0	22	0	16.67
UNC, HPM	0	30	0	22.73
NCDPH	0	41	0	31.06
Rockingham LHD	0	31	0	23.48
State Center Health Statistics	0	28	0	21.21
NCDPH Women's and Children's	0	26	0	19.70
UNC-G	0	3	0	2.27
NCPHA	0	2	0	1.52
NCALD	0	0	0	0

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the Ohio Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 27.133
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.46
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.594
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 3.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.2015
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 41.964%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 7.189%

II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
Akron Health Department	169	40	0	8.47
American Red Cross Ashland County	137	37	0	5.65
Association of Ohio Health Commissioners	125	50	0	12.71
Athens City County Health Department	104	25	16.10	6.50
Belmond County Health Department	104	22	0	6.78
Brown County Health Department	94	33	0	6.50
Canton City Health Department	81	44	0	7.34
Case Western Reserve University Jewish Community Health Initiative	72	35	0	6.21
Case Western Reserve University Master of Public Health Program	70	45	35.31	14.12
Case Western Reserve University Prevention Research Center for Healthy Neighborhoods	66	28	20.34	9.89
Case Western Reserve University Other Units	65	20	19.77	12.71
City of Steubenville Health Department	59	29	0	6.50
Clermont County Health District	57	23	0	6.50
Cleveland Department of Public Health	56	34	38.70	10.45
Columbiana County Health Department	53	21	0	6.50
Columbus Public Health Department	52	29	9.32	9.32
Conneaut City Health Department	51	32	0	6.21
Cuyahoga County Health Department	51	36	22.88	12.43
East Liverpool City Health Department	33	33	0	5.93
Elyria City Health District	17	0	29.38	7.06
Hamilton County Public Health	8	30	0	7.06
Hocking County Health Department	0	30	0	6.50
Ironton City Health Department	0	20	0	6.21
Kent State College of Public Health	0	45	14.41	9.04
Knox County Health Department	0	24	0	6.21
Licking County Health Department	0	23	0	5.93

Lorain County General Health District	0	26	18.64	7.91
Mahoning County District Board of Health	0	22	26.55	9.32
Monroe County Health Department	0	23	0	6.21
Morrow County Health Department	0	23	18.36	5.65
Northeast Ohio Medical University Consortium of Eastern Ohio MPH program	0	23	14.41	10.17
Ohio Department of Health Bureau of Environmental Health	0	22	0	8.76
Ohio Department of Health Bureau of Health Services Information and Operational Support	0	21	0	10.73
Ohio Department of Health Center for Public Health Statistics and Informatics	0	25	47.74	11.30
Ohio Department of Health Other Unit (s)	0	23	0	11.02
Ohio Public Health Association	0	22	14.69	8.19
Ohio State University Ohio Public Health Training Center	0	22	0	9.89
Ohio State University Center for Public Health Practice (other than OPHTC above)	0	21	15.82	9.60
Ohio State University College of Nursing	0	22	29.38	6.21
Ohio State University Other Unit (s)	0	31	0	8.19
Portage County Combined General Health District	0	38	14.97	5.93
Public Health Foundation	0	39	0	6.21
Shaker Heights Health Department	0	35	0	9.32
Stark County Health Department	0	29	0	6.78
Summit County Health Department	0	22	2.26	8.47
The Center for Community Solutions	0	33	0	9.32
Tuscarawas County General Health District	0	24	0	6.21
University of Cincinnati	0	33	0	8.19
University of Toledo Department of Public Health and Preventive Medicine	0	22	0	8.19
Wright State University Public Health Program	0	29	16.67	8.19
Wright State University Center for Global Health	0	29	0	7.91
Zanesville-Muskingum County Health Department	0	28	0	6.78
Cleveland VA Medical Center	0	24	4.80	0
Ohio Voluntary Accreditation Team	0	2	0	0.56

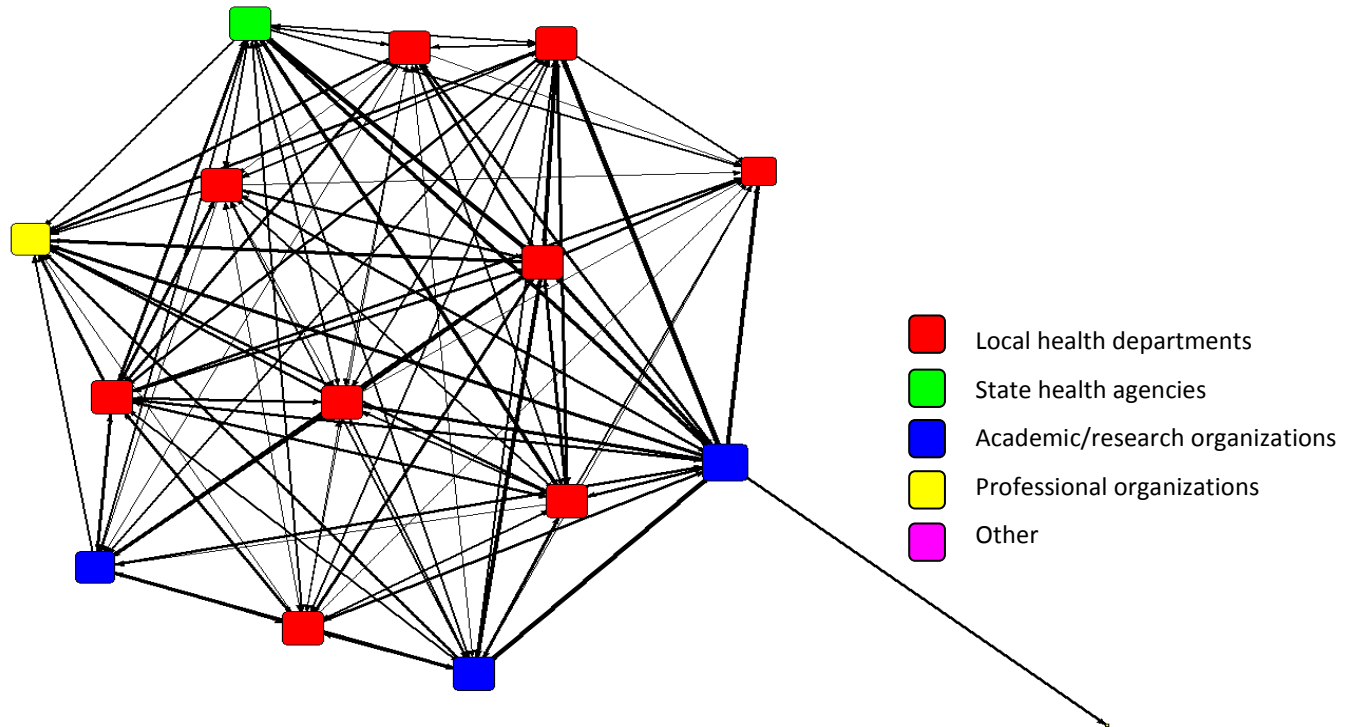
Case Western Family Medicine Shared PBRN Resource	0	5	0	1.41
Lorain County Community College	0	4	0	1.13
Data Use Consortium	0	3	0	0.85
Nationwide Children's Hospital	0	3	0	0.85
Wright State University College of Nursing	0	2	0	0.56
Austen Bioinnovation of Akron	0	6	0	1.69

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of "0" for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the Washington Public Health PBRN • 2010



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 13
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.929
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 1.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 1.000
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.143
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 2.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.7
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 45.604%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 17.582%

II. Organization-Level Measures

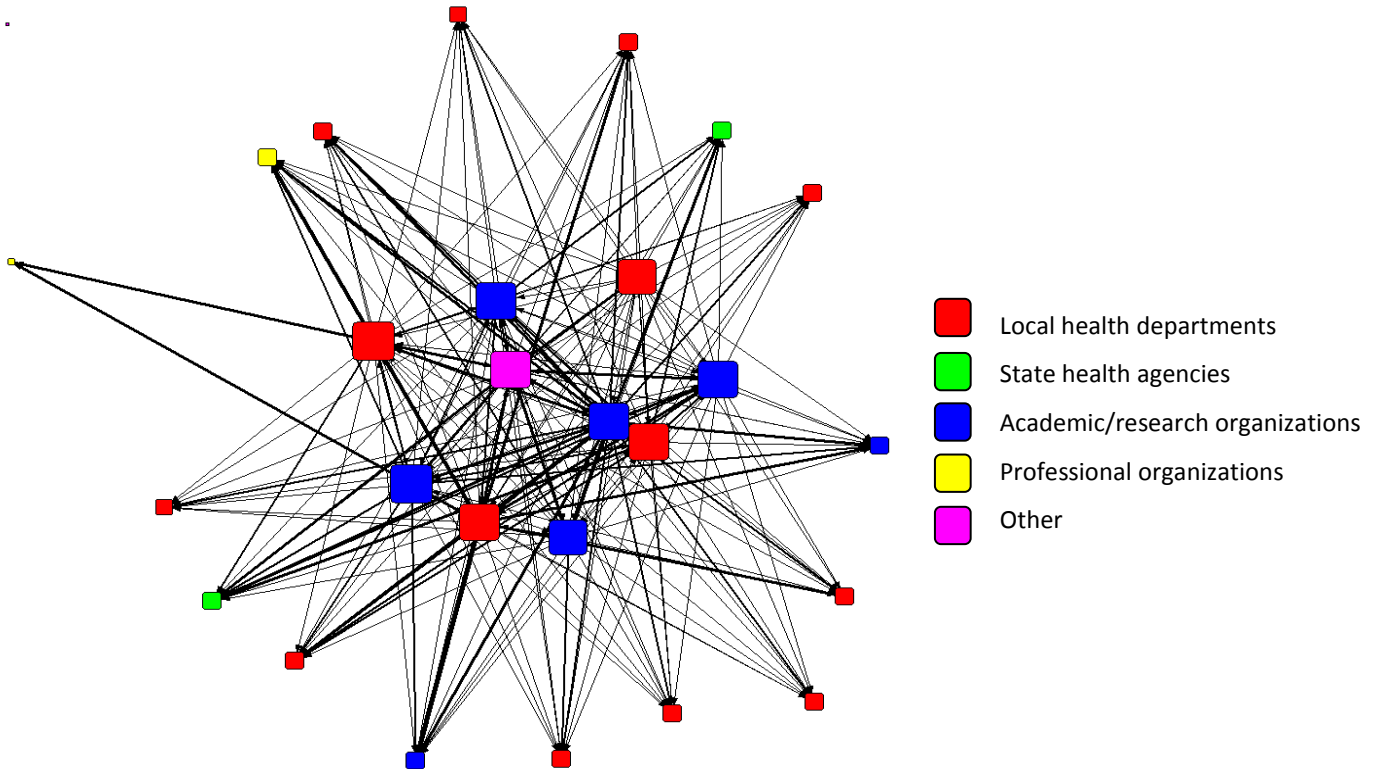
<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
UWSON	50	30	71.43	42.86
PH Seattle-King	46	31	65.71	44.29
Thurston HD	38	18	54.29	25.71
Tacoma-Pierce HD	31	22	44.29	31.43
Chelan-Douglas HD	30	19	42.86	27.14
UWSPH	25	27	35.71	38.57
WADOH	23	29	32.86	41.43
NWCPHP	21	24	30	34.29
Spokane HD	21	21	30	30
Kitsap HD	18	18	25.71	25.71
Benton-Franklin HD	16	18	22.86	25.71
Snohomish HD	16	21	22.86	30
WALPHO	0	33	0	47.14
Clark HD	0	21	0	30
CHLF	0	3	0	4.29

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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Network Structure of the Wisconsin Public Health PBRN • 2011-12



NOTE: The line thickness indicates frequency of interaction between pairs of organizations (for research purposes). The box size indicates the total volume of interactions that an organization maintains with others. The position of the box within the core or periphery of graph indicates the organization's relative position in mediating relationships between other organizations in the network.

I. Network-Level Measures

- *Average Degree Centrality:* number of relationships that an organization maintains with other organizations in the network, on average: 15.444
- *Network Density:* proportion of total possible relationships that exist between organizations in the network: 0.594
- *Network Components:* number of fully interconnected subgroups of organizations within the network: 2.000
- *Component Ratio:* ratio of components to total number of organizations in the network: 0.038
- *Connectedness:* proportion of relationships that must be removed to disconnect the network: 0.926
- *Fragmentation:* the proportion of pairs of organizations that cannot reach each other directly: 0.074
- *Average Distance:* the minimum number of relationships that must be traversed to connect a pair of organizations, on average: 1.4
- *Diameter:* the maximum number of relationships that must be traversed to connect a pair of organizations, on average: 2.000
- *Reciprocity:* proportion of relationships between pairs of organizations that are reciprocated (A reports working with B and B reports working with A): 0.1846
- *Centralization (Outdegree):* degree to which out-going relationships between organizations are mediated by a single organization in the network: 36.41%
- *Centralization (Indegree):* degree to which incoming relationships between organizations are mediated by a single organization in the network: 8.026%

II. Organization-Level Measures

<u>Organization/Unit</u>	<u>Centrality Measures*</u>			
	<u>Nominal</u>		<u>Normalized</u>	
	<u>OutDegree</u>	<u>InDegree</u>	<u>OutDegree</u>	<u>InDegree</u>
University of Wisconsin-Madison Other Unit(s)	66	20	42.31	12.82
City of Milwaukee Health Department	52	14	33.33	8.97
University of Wisconsin-Madison Population Health Institute	37	17	23.72	10.90
Polk County Health Department	34	11	21.79	7.05
Wood County Health Department	33	16	21.15	10.26
Institute for Wisconsin's Health Inc.	31	25	19.87	16.03
University of Wisconsin-Madison Robert M. La Follette School of Public Affairs	30	12	19.23	7.69
Medical College of Wisconsin	27	15	17.31	9.62
Wisconsin Research and Education Network (WREN)	26	15	16.67	9.62
Portage Co Health and Human Services	26	0	16.67	0
Center for Urban Population Health	0	16	0	10.26
City of Oshkosh Health Department	0	11	0	7.05
Dodge County Health Department	0	10	0	6.41
Greenfield Health Department	0	13	0	8.33
Lincoln County Health Department	0	11	0	7.05
Oak Creek Health Department	0	13	0	8.33
Oneida County Health Department	0	12	0	7.69
Public Health Madison and Dane County	0	14	0	8.97
Rock County Health Department	0	10	0	6.41
University of Wisconsin-Milwaukee	0	19	0	12.18
Watertown Health Department	0	11	0	7.05
West Allis Health Department	0	17	0	10.90
Wisconsin Department of Health Services Division of Public Health	0	20	0	12.82
Wisconsin Department of Health Services Other Unit (s)	0	14	0	8.97
Wisconsin Public Health Association (WPHA)	0	19	0	12.18
Wisconsin Association of Local Health Departments and Boards	0	7	0	4.49

Marshfield Clinic Research Foundation

0 0 0 0

*Larger values indicate that the organization mediates a larger volume of the out-going (out-degree) and in-coming (in-degree) relationships between organizations in the network. Normalized measures are adjusted to account for the total possible number of relationships between organizations in the network.

Note: An out-going relationship for an organization (out-degree) is defined when that organization reports working with another organization. An in-coming relationship for an organization (in-degree) is defined when another organization reports working with that organization. A reciprocal relationship exists between a pair of organizations when both organizations report working with each other. Some organizations show a value of “0” for out-degree because they did not respond to the survey and therefore did not report working with other organizations. In these cases, in-degree provides the best indication of their connectedness within the network.

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