Assessment of Vermont's Health Service Area (HSA) Health and Human Service Networks

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Overview

The Vermont Blueprint for Health Leadership and the VCHIP Blueprint Program Evaluation team developed a plan for observing, mapping and measuring the network of organizations that has emerged in each Blueprint Health Service Area (HSA) to support population and individual health, focusing on modes of collaboration and relationships between organizations. This plan included observation of meetings attended by health and human service organizations in each HSA that are convened by the Blueprint Project Manager and a survey about how health and human service areas throughout each HSA interact. It was also decided that sharing this information and soliciting feedback from stakeholders across Vermont would be of value.

In spring 2013, VCHIP attended 15 community meetings. In addition to making general observations, VCHIP listened for meeting leadership style, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking, and resulting action items. VCHIP found that meetings are generating strong attendance and participation. Groups gather to steer Blueprint activities and National Committee for Quality Assurance (NCQA) Patient Centered Medical Home roll-out in their communities (steering meetings), or to share information and build relationships with the aim of improving service integration (service integration meetings). In some communities this work is done by a single group, it is split among several. In the midst of rapid changes in health care delivery and payment, these meetings also serve the purpose of improving understanding of the latest state and national initiatives, by enhancing peer-to-peer communication

To learn more about how organizations that are part of each HSA's Integrated Services Workgroups (sometimes referred to as Extended CHTs) work together, VCHIP developed and disseminated a survey measuring participants' perceptions of how well health and human service organizations in their community worked together as a team, what benefits and drawbacks of collaboration they experienced and with what impact, and how each organization in the community was connected to each other organization.

Results were shared with the Blueprint's leadership as they emerged and were also presented to a number of groups working to improve the delivery of healthcare and human services. For example, VCHIP shared findings with the Vermont Health Care Innovation Project's Care Models and Care Management Workgroup and with the Blueprint's Project Managers. VCHIP also presented this work at the Blueprint's 2014 Annual Conference.

VCHIP then took HSA-specific findings back to the communities; presenting to Project Managers, Facilitators, CHT Leads, Community Health Teams, and the Integrated Services Workgroups. Throughout these presentations, VCHIP solicited feedback from community members, asking them to share the stories behind the numbers and reflect on how closely the network graphs matched their perceptions of their network, how these graphs might be useful, and what they would want their network to look like in the future.

The survey is described below. Detailed reports for each HSA follow a general description of survey content, methodology and statewide results. Reports have been distributed to Project Managers in each HSA.

Survey Content

The survey included questions about respondents' perceptions of their network of local health and human service organizations; the ways and extent to which local organizations work together as a team, the benefits and drawbacks of working together, and the connections between the respondent's organization and each organization in the community.

Team-based care questions were inspired by the Institute of Medicine's (IOM) concept of team-based care[1] and were included to determine the extent to which community-based health and human service organizations function as a multi-disciplinary team. Respondents were asked to indicate if the groups working in their community exhibited the five core principles of team-based care, as defined by the IOM: shared goals, mutual trust, clear roles, effective communication, and measurement of processes and outcomes.

Respondents were also asked about the benefits and drawbacks of organizations working together. Questions included in the survey were based on work published by Provan, Veazie, Staten, and Teufel-Shone[2,3]. See Tables 4 and 5 for questions included in the survey. The work by Provan and his colleagues also guided the development of four additional questions that respondents were asked to answer about each of the other organizations in their HSA's "network." Respondents were asked if they shared information with the organization, shared resources with the organization, and/or if referrals were made to and/or received from the organization. These questions allowed VCHIP to study how individuals working in each HSA perceive their organization's relationship to other health and human service providers and more broadly, what these community networks look like across Vermont.

List of Participating Network Organizations

VCHIP asked Project Managers (and in some cases CHT leads) to generate lists of organizations and people they had invited to participate in their community's Blueprint Integrated Health Services Workgroup or Extended CHT, since project inception. VCHIP provided a list of types of organizations for PMs and CHT Leads to consider including (see Table 1), noting that this list was only a starting point and that each HSA would likely have other types of organizations engaged in Blueprint work that ought to be included among potential respondents.

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[1] Mitchell, P., Wynia, M., Golden, R., McNellis, B., Okun, S., Webb, C.E., Rohrbach, V. & Von Kohorn, I. (2012). Core principles & values of effective team-based health care. Discussion Paper, Institute of Medicine, Washington, DC. www.iom.edu/tbc.

[2] Provan, K., Veazie, M., Staten, L., & Teufel-Shone, L. (2005). The use of network analysis to strengthen community partnerships. *Public Administration Review*, 65(5).

[3] VCHIP received approval from Dr. Provan to include survey questions developed by his team in the survey tool

Table 1: Suggested Types of Organization to Include
Hospitals
Primary Care Practices / Family Medicine Practices / Pediatric Practices
Support and Services at Home (SASH) Teams
Home Health and Hospice Agencies
Medicaid District Offices
Insurance Companies
Department of Children and Families
Schools
Mental health and substance abuse agencies
Department of health district offices
Community service organizations
Economic service agencies

Lists were reviewed and cleaned by VCHIP. Final lists included between 31 and 113 organizations per HSA. A unique survey was built for each HSA including their community's list.

Survey Distribution

Project Managers were asked to identify up to five people who most often represented the organizations they had listed as part of their HSA's Integrated Health Services Workgroup or Extended CHT. In total, they provided over 700 names. Links to the survey were first sent to people in two HSAs. Because initial the response rate was good and no problems with the survey instrument were identified, the survey was sent to people in the remaining HSAs soon after the first group received links to the survey.

Potential respondents received invitations to participate in a web-based survey via email.   Participation was tracked and two follow-up reminders were sent to non-respondents over the course of about three weeks. All respondents were automatically entered in a drawing for three $75 Amazon gift cards and an IPad.

Analysis

Descriptive data analysis was conducted using IBM SPSS Statistics, Version 21.0[4]. Gephi,[5] an open-source visualization and exploration platform and and UCINET[6], a software package for the analysis of social network data, were used to explore the relationships between organizations within each HSA.

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[4] IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

[5] Bastian, M., Heymann, S. & Jacomy, M. (2009). Gephi: an open source software for exploring and manipulating networks. International AAAI Conference on Weblogs and Social Media.

[6] Borgatti, S., Everett, M., and Freeman, L. (2002). UCINET for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies.

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Network analysis is a study of relationships; documenting connections between nodes (people or organizations) in order to map and measure the network that is formed by these connections. These measurements can help us understand what interventions (if any) are necessary to make the community more effective. Network data (respondents' answers to the questions about information sharing, resource sharing, and referrals to and from each organization in their communities) was transformed into node lists (lists of organizations) and edge lists (lists of two organizations, the source and the target, of each connection) and imported into Gephi. Data was adjusted so that the connection between any two organizations was only counted once for each of the networks, even if there were multiple respondents from that organization reporting a connection.

Network-level statistics (group measures) calculated for each HSA using Gephi included average degree, average shortest path length, graph density, and modularity. Betweeness Centrality was calculated at the organization-level. See Table 2 for a brief description of each measure.

Table 2: Description of Network Measures

Node	The "nodes" on these graphs are the dots that represent organizations
Edge	The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)
Centrality	Importance or prominence of an actor in a network
Betweenness Centrality	A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.
Average Degree	The average number of edges connected to each node in the network
Average Shortest Path Length	The average number of edges on the shortest path between each pair of nodes in the network
Graph Density	The proportion of all possible connections (represented as edges) that are present
Modularity	A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).
Key Player	The nodes (defined here as the 3 organizations in the HSA) that, if removed from the network, would cause the maximum disruption to that network overall. The analysis was run in 10 starts and 20 iterations.

A "force-based" algorithm, which operates on the principle that linked nodes attract each other and non-linked nodes are pushed apart, was used to develop network graphs (also referred to as maps).

Graphs for the information sharing, resource sharing, and referrals (a combination of referrals from and to) networks as well as full network aggregates for each HSA are included in the HSA-specific reports that are appended.

Additionally, data was imported into UCINET so that "key players" for each HSA could be identified using a program called KeyPlayer. This analysis provides a way of finding a set of nodes in a network, which if removed, would maximally disrupt communication among the remaining nodes. This analysis also measures how much fragmentation the removal of these organizations would cause, a measure of a network's fragility or durability. VCHIP used KeyPlayer to identify sets of three organizations in each HSA whose removal would cause the most disruption.

Brokerage Analysis, a method of determining the type of role (e.g., coordinator, representative, gatekeeper, consultant or liaison) certain nodes play when they lie on the path between two other unconnected nodes or groups of nodes, was also explored. However, the interconnectedness of the sub-networks, with no cut-points and many redundant ties observed in Vermont's HSA health and human service networks make it unlikely that any one organization plays a brokerage role.

Survey Results

Respondents

Over half of the people invited to participate in the survey responded. See Table 3 for the number of surveys returned per HSA. Respondent data was included in the analysis even if respondents had not answered all of the questions on the survey.

Table 3: Survey Response Rate

Health Service Area	Surveys Sent	Total Responses	Response Rate
Barre	38	24	63%
Bennington	31	22	71%
Brattleboro	47	26	55%
Burlington	113	59	52%
Middlebury	60	30	50%
Morrisville	43	28	65%
Newport	38	23	61%
Randolph	50	25	50%
Rutland	54	28	52%
Springfield	87	42	48%
St. Albans	38	26	68%
St. Johnsbury	74	40	54%
Upper Valley	32	15	47%
White River Jct[1]	48	17	35%
Windsor	31	17	55%
State	784	422	54%

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As seen in Figure 1, the majority of respondents reported regularly participating in HSA community meetings. Therefore, although there may be additional individuals and organizations providing health and human services within the HSA, respondents represent stakeholder organizations in the community.

Figure 1: Community Meeting Attendance

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community?
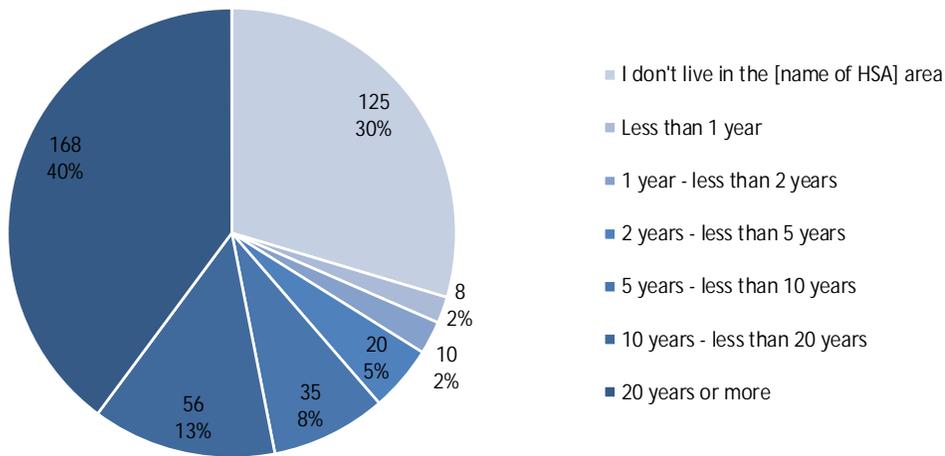

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

43 10%
82 20%
59 14%
72 17%
163 39%
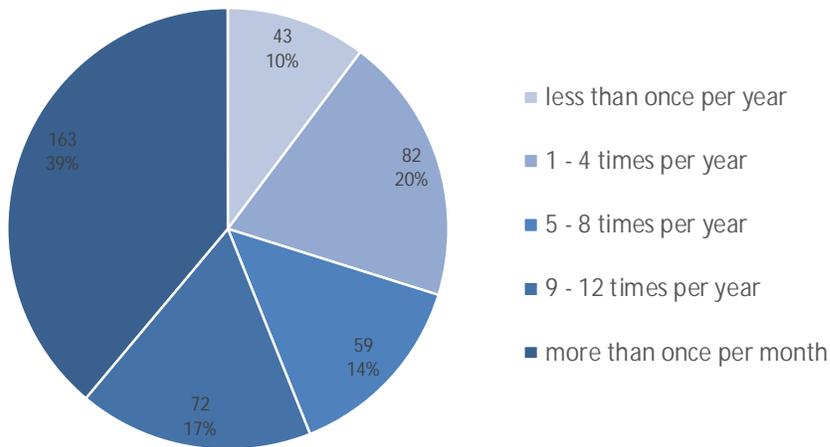
To understand the extent to which networks may be built on relationships between people with personal and professional history, respondents were asked how long they had lived in the HSA. In some HSAs, the percent of respondents who reported living in the HSA was relatively low. We believe that some people may have misinterpreted the question, thinking that it was asking if they lived in the specific town (e.g., Springfield) rather than the HSA (e.g., the Springfield HSA). Figure 2 shows the average length of residence of respondents.

Figure 2: Length of Residence in HSA

How long have you lived in the [name of HSA] area?

Legend:
- I don't live in the [name of HSA] area
- Less than 1 year
- 1 year - less than 2 years
- 2 years - less than 5 years
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more

Pie chart values:
- 125 / 30%
- 8 / 2%
- 20 / 5%
- 10 / 2%
- 35 / 8%
- 56 / 13%
- 168 / 40%

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Respondents were also asked to describe their role(s) within their organizations. As seen in Figure 3, responses were received from organization leaders as well as from non-clinical providers and people providing direct services. Qualitative analysis of "other" roles written-in by respondents revealed that the majority of these people could be classified as non-clinical professionals. The most frequently written-in roles were care coordinator/chronic care coordinator, regional resource manager/regional resource supervisor (which may be specific to the organization, Vermont 211), CHT lead/CHT manager, community relations/community liaison and school nurse.

Figure 3: Role within Organization
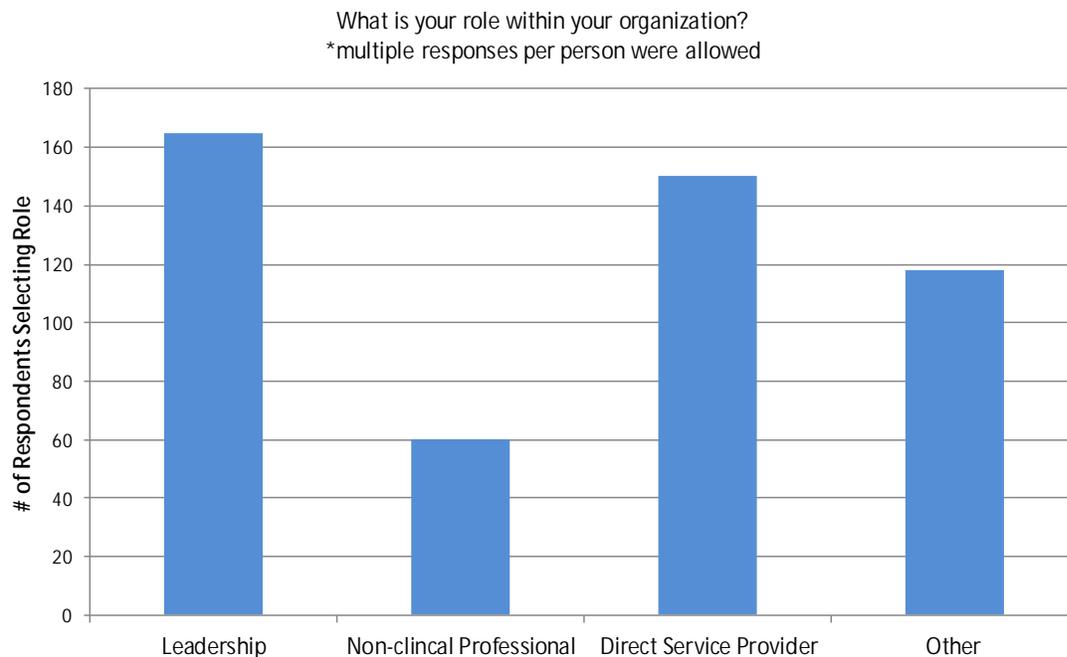

Team-Based Care

As seen in Figure 4, "shared goals" and "mutual trust' create a strong basis for collaboration in Blueprint communities. More than three-quarters of respondents from across Vermont agreed or strongly agreed that their communities lived these principles. "Effective communication" and "clear roles" were confirmed by more than two-thirds of respondents, showing that the practical work of collaboration is happening right now, with some room for growth. Fewer than half of all respondents agreed that their network "measures the work we do together." This finding is not unexpected in networks of independent organizations but should be worked on over time.

Strengths and opportunities for improvement emerged for each HSA and no one HSA always rated at the top or bottom of the score distribution. It may be beneficial for the top-scoring HSA in each

component to share their practices in a public forum, so that the other communities can learn from those best practices.

Figure 4: Characteristics of Team-Based Care

Average % of Respondents Who "Agree" or "Strongly Agree" that the Group of Organizations in their HSA Exhibit the Following Characteristics of Team-Based Care
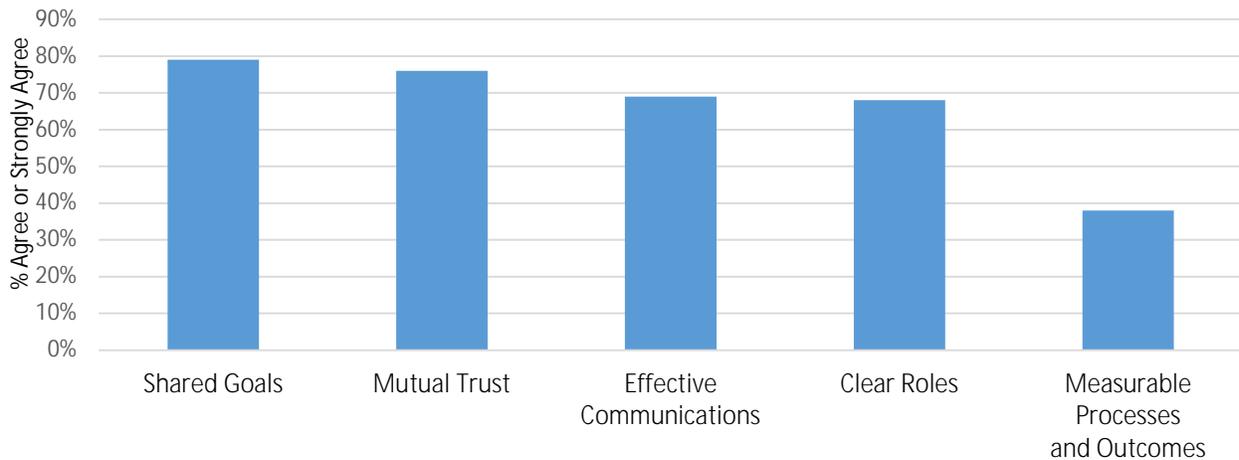
Benefits and Drawbacks to Working Together

Clearly the benefits of organizations working together are recognized by respondents. As seen in Table 4, a large majority (nearly all) of respondents reported that most of the potential benefits had in fact occurred. Some of these benefits directly impact patients and clients and others are more focused on organizational infrastructure. Resource reallocation and additional funding were cited as outcomes less frequently than the others, but still by more than half of respondents. Generally, the more commonly occurring benefits were also felt to have the biggest impact.

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Table 4: Benefits of Working Together

BENEFITS of WORKING TOGETHER Percent* (and number) of respondents whether the following benefits have or have not occurred *Rounded to the nearest whole number*			POSITIVE IMPACT of WORKING TOGETHER Mean impact of benefits that have occurred On a scale of 1-3, representing impacts from "small" to "medium" to "big"
Benefit	Has Occurred % (n)	Has Not Occurred % (n)	Impact
Building New Relationships	97 (342)	3 (12)	2.4
Ability to Serve my Clients Better	96 (337)	5 (16)	2.3
Acquisition of New Knowledge or Skills	94 (334)	6 (22)	2.2
Heightened Public Awareness of My Organization	93 (333)	7 (25)	2.1
Better use of My Organization's Resources	92 (319)	8 (28)	2.2
Greater Capacity to Serve the Community	91 (327)	9 (31)	2.1
Enhanced Influence in the Community	87 (303)	13 (47)	1.8
Increased Ability to Reallocate Resources	68 (232)	32 (111)	1.4
Acquisition of additional funding	63 (213)	37 (126)	1.4

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According to respondents, working together can also have some drawbacks. More than half of respondents said that working together takes time and resources. Other potential downsides, including internal or external conflict, lack of credit, and loss of control over decisions were each confirmed by about between a quarter and one-half of respondents. Mean impact scores between "small" and "medium" indicate these downsides don't pose immediate threats in Vermont Blueprint for Health communities, but they should be watched and minimized wherever possible.   See Table 5 for the drawbacks of working together.

Table 5: Drawbacks of Working Together

DOWNSIDES of WORKING TOGETHER Percent* (and number) of respondents whether the following downsides have or have not occurred *Rounded to the nearest whole number			NEGATIVE IMPACT of WORKING TOGETHER Mean impact of downsides that have occurred On a scale of 1-3, representing impacts from "small" to "medium" to "big"
Downside	Has Occurred % (n)	Has Not Occurred % (n)	Impact
Taking too much time and resources	60 (208)	40 (138)	1.6
Difficulty in dealing with partner organizations	46 (161)	54 (187)	1.4
Not enough credit given to my organization	36 (125)	64 (221)	1.6
Loss of control / autonomy over decisions	33 (112)	67 (232)	1.6
Strained relations within my organization	28 (97)	72 (248)	1.5

Observations of Network Graphs

VCHIP has qualitatively analyzed each HSA's network graphs. VCHIP has also solicited input about network graphs from Project Managers, CHT leads, and many HSA stakeholders. These observations are included in each HSA's report. The following themes emerged across the state:

- Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.
- Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.
- Blueprint Community Health Teams are usually among the most central organizations in the network.
- Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be encouraged to build more or stronger relationships with any of these types of organizations.
- Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.
- It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).
- Small networks are less likely to have sub-network than larger networks.

Network Measures

As seen in Table 6, networks ranged from 21 to 99 organizations. The average degree (number of connections for each organization) ranged from 6.3 organizations to15.5. The average shortest path length was less than two for all HSAs. Density ranged from 0.1 to 0.7. Density is likely to vary by HSA size (smaller communities are typically denser than large ones) and because the ideal density may vary widely, it is better determined through community discussion than by following a standard metric. As demonstrated by modularity scores (0.2 or less), organizations within each HSA work with organizations providing different types of services or to different populations rather than through tight sub-networks.

Table 6: Network Measures

	Network Size (# of Nodes)	Average Degree	Average Shortest Path Length	Graph Density	Modularity
Barre	24	9.2	1.4	0.4	0.1
Bennington	25	9.0	1.4	0.4	0.1
Burlington	99	12.1	1.9	0.1	0.2
Brattleboro	37	11.2	1.5	0.3	0.1
Middlebury	52	10	1.6	0.2	0.2
Morrisville	22	13.6	1.2	0.7	0.1
Newport	20	8.1	1.3	0.4	0.0
Randolph	43	8.7	1.5	0.2	0.1
Rutland	60	7.7	1.6	0.1	0.1
Springfield	49	15.5	1.4	0.3	0.1
St. Albans	21	10.2	1.3	0.5	0.1
St. Johnsbury	34	12.9	1.4	0.4	0.1
Upper Valley	26	5.6	1.5	0.2	0.1
Windsor	22	10.0	1.5	0.5	0.1
White River	32	6.3	1.5	0.2	0.1

Key Player analysis revealed durable networks across the state. Results are included in individual HSA reports.

Sharing Results and Soliciting Feedback from Local Blueprint Leadership and Community-Based Health and Human Service Groups

VCHIP arranged phone calls and meetings for the purpose of presenting this research to the people who participated and other stakeholders in each HSA. A preliminary call with the Project Manager (sometimes a Facilitator and/or the CHT Lead joined the call) to walk-through the findings, get some initial impressions and feedback and plan for the in-person presentation to the community group. Following these discussions, VCHIP typically met with the larger network of community organizations to go over study results and solicit feedback. Some Project Managers opted for smaller discussions since

they were not able to set-up a community-wide meeting due to scheduling constraints (some groups meet infrequently and have agendas planned many months in advance). In total, VCHIP talked to all but two of the project managers (in some cases also talking to Practice Facilitators, CHT Leads, and/or other administrators as well) and met with a larger group in eight HSAs. Several additional meetings will occur in early July, 2014.

Limitations and Conclusions

Network analysis can help develop a picture of the community and explore the relationships between local organizations. Once these relationships are visible, we can start to look for patterns within and across networks, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change. Provan et. al. (2005) describe using network analysis to strengthen relationships among organizations and build a "community's capacity to address critical needs in areas such as health, human services, social problems and economic development."

However the goal of network analysis is to document all connections, not to sample them, so any missing data limits our understanding of the network as a whole. We must treat the network graphs in the reports that follow as partial representations of the network of organizations in each HSA, not full pictures. Also, like any static picture, a network graph shows a single point in time. It cannot tell you how or why the relationships it represents formed; it does not show whether connections are formal or informal, durable or tenuous, friendly or tense; it will not answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency; and it does not offer instructions for how to change the shape of the network, should you want to.

Fortunately, this analysis has encouraged organizations and communities to come together to start to answer these questions. Over the course of the last six months, key stakeholders around the state have begun to discuss the "health neighborhood" that exists within each HSA. They have identified common strengths and opportunities for growth around the state as well as noting unique characteristics of each community. They have also started to think about how successful relationships in one HSA can be fostered in another.

The reports that follow begin to describe the networks of organizations that provide health and human services in each of Vermont's HSAs.

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Health Service Area Reports for: Barre, Bennington, Brattleboro, Burlington, Middlebury, Morrisville, Newport, Randolph, Rutland, Springfield, St.Albans, St. Johnsbury, Upper Valley, White River Junction (generally considered part of the Randolph HSA), & Windsor

Vermont Blueprint for Health Community Health Network Study
Barre HSA

June 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.
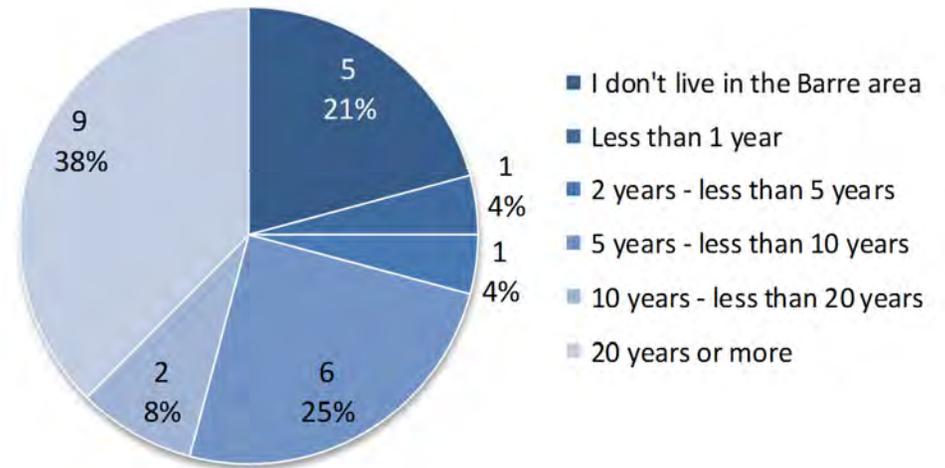
Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."
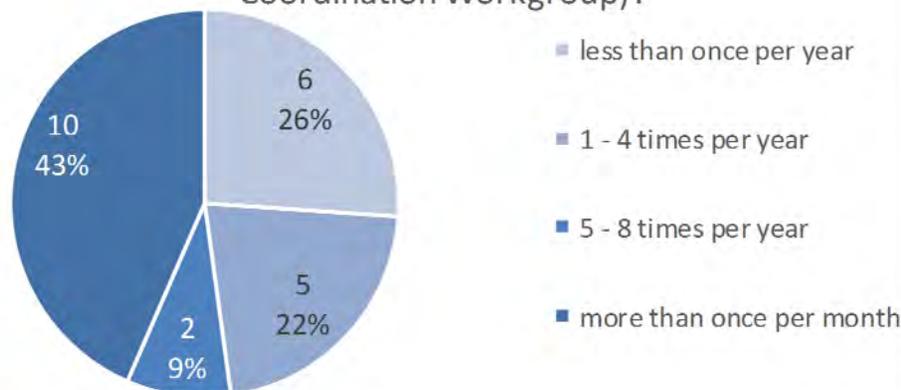
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Barre HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Barre	38	24	63%
Vermont	763	422	55%

How long have you lived in the Barre area?

- I don't live in the Barre area — 5, 21%
- Less than 1 year — 1, 4%
- 2 years - less than 5 years — 1, 4%
- 5 years - less than 10 years — 6, 25%
- 10 years - less than 20 years — 2, 8%
- 20 years or more — 9, 38%

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community (such as the Care Coordination Workgroup)?

- less than once per year — 6, 26%
- 1 - 4 times per year — 5, 22%
- 5 - 8 times per year — 2, 9%
- more than once per month — 10, 43%

What is your role within your organization?
*Multiple responses allowed, n=24

- Leadership — 10
- Non-clincal Professional — 3
- Direct Service Provider — 19
- Other — 14

3
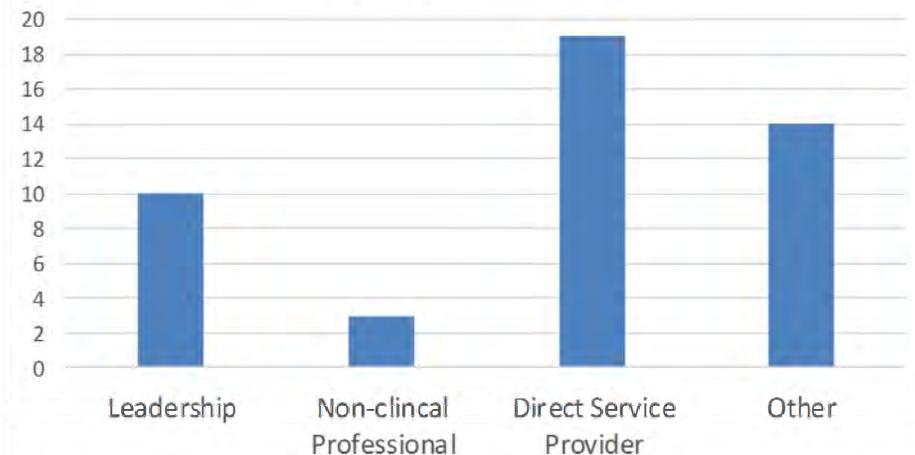
Perceptions of "Teamness" in the Barre HSA
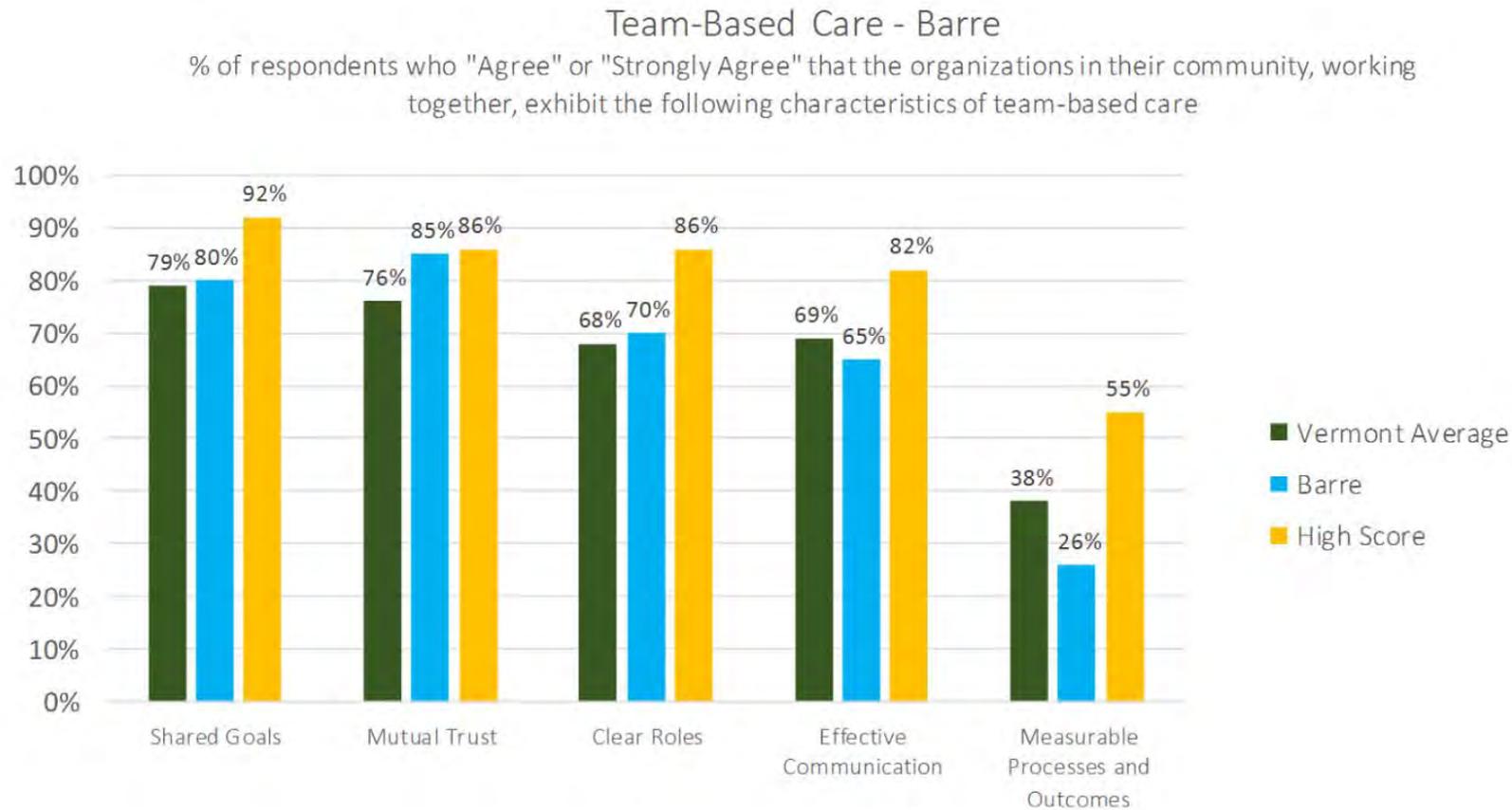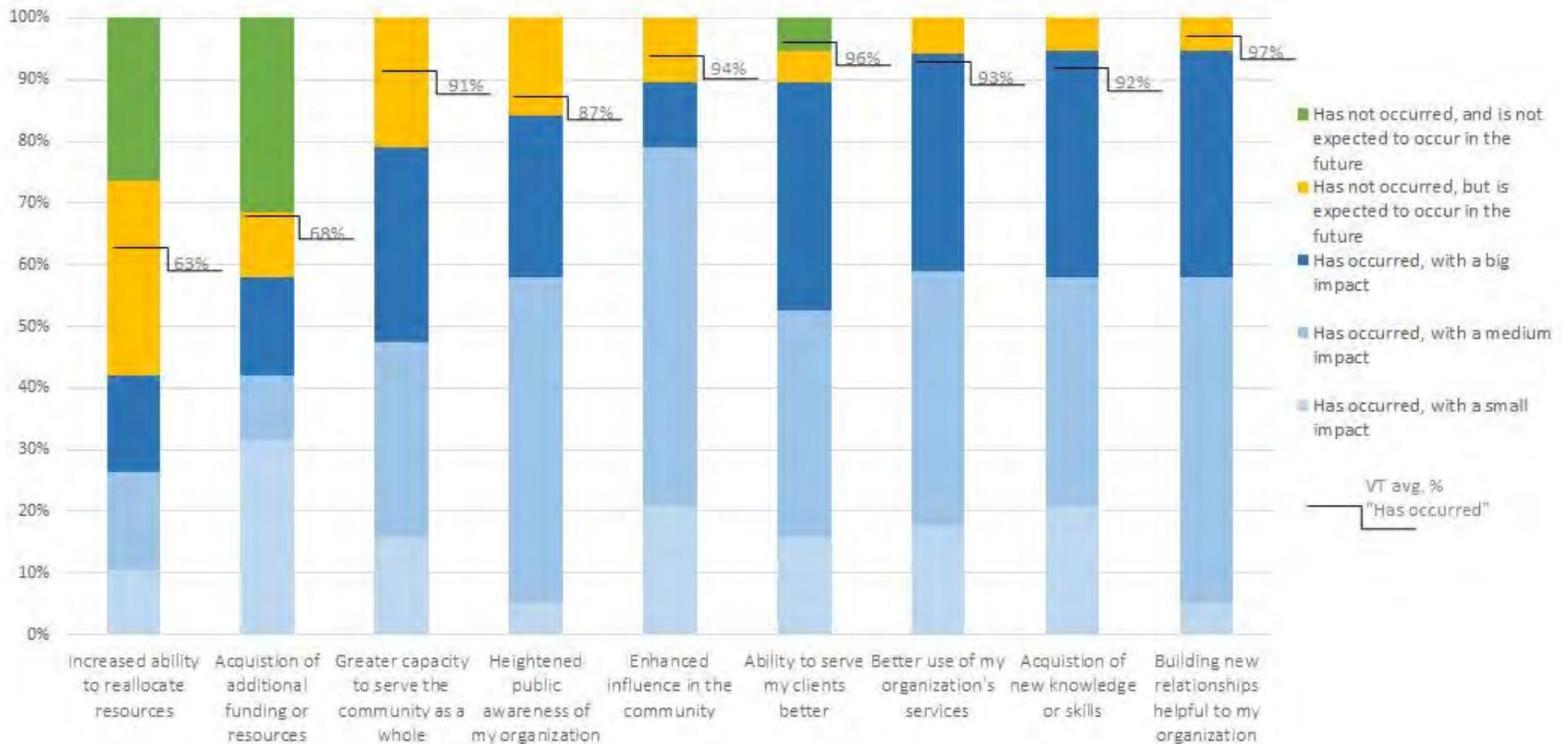
In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care - Barre

% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care

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Benefits of Working Together in the Barre HSA

Drawbacks of Working Together in the Barre HSA

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Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways— sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

Q7 Edit Question ▼ Move Copy Delete

Below is a list of organizations in your community that provide either direct health services, or social and economic services that help individuals and families care for themselves and, by extension, their health.

Check each of the ways your organization has worked with the organization listed.

(Please note that there will be no value judgement assigned to whether or not organizations work together in these particular ways. In some cases, these type of interactions may be useful to your organization's mission and in some cases they may not. In the final report, this is the one question where organization names may be reported in order to map functional relationships in your community.)

	Our organizations share information	Our organizations share resources (joint funding, shared equipment, personnel, facilities, etc.)	My organization sends referrals to this organization	My organization receives referrals from this organization
Alzheimer's Association of Vermont	☐	☐	☐	☐
APS Healthcare	☐	☐	☐	☐
Bayada Home Health Care	☐	☐	☐	☐

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

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Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

Barre HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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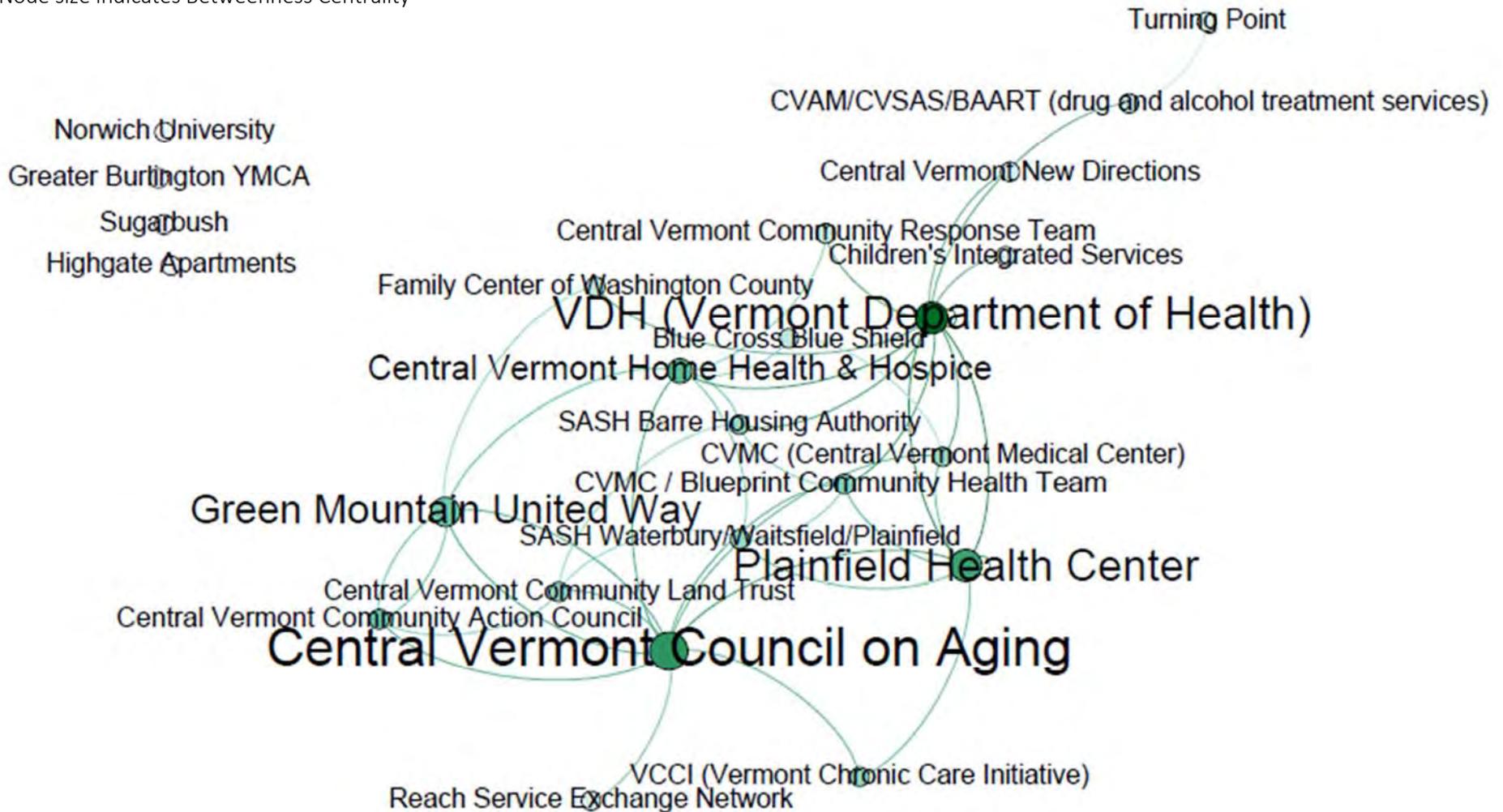802 656 8210 TEL   802 656 8368 FAX

Barre HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Barre HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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Barre HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality

Barre Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	24	The network contains 24 nodes (organizations)
Average Degree	9.2	Nodes in the network average about 9.2 connections each
Average Shortest Path Length	1.4	The average distance between any two randomly selected nodes in the network is about 1.4 connections
Graph Density	0.40	Of all possible connections in the network, about 40% are present
Modularity	.12	This is a measure of how readily a network dissolves into communities or sub-networks. The value is moderate relative to the modularity measured in other HSAs.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Barre, these nodes are **CVMC—Blueprint CHT, VDH,** and **Blue Cross Blue Shield.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Barre's Network Graphs

These are preliminary observations based on the graphs alone—the Barre community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. The Barre HSA has a large group of central organizations—suggesting shared responsibility or a broad distribution of power

2. The Vermont Department of Health is central in the Barre HSA's Information and Resources networks.

3. The Blueprint Community Health Team is central in the referrals and network

4. The Blueprint Community Health Team is part of a sub-network that includes its SASH partners

5. The sub-networks do not appear to have formed based on population served (elder care, child and family health, and mental health and substance abuse treatment are spread across the graph).

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Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

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6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Vermont Blueprint for Health Community Health Network Study

Bennington HSA

April 2014

![VCHIP logo] **VCHIP**
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Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.
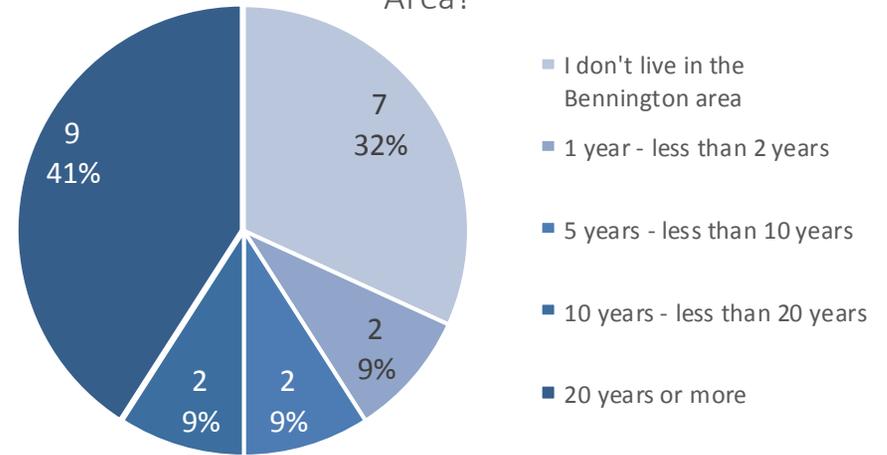
Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."
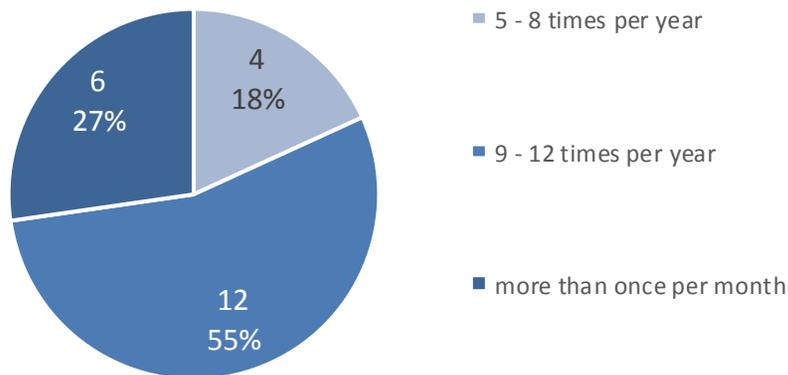
Bennington HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Bennington	31	22	71%
Vermont	763	422	55%

How long have you lived in the Bennington Area?

- I don't live in the Bennington area
- 1 year - less than 2 years
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more
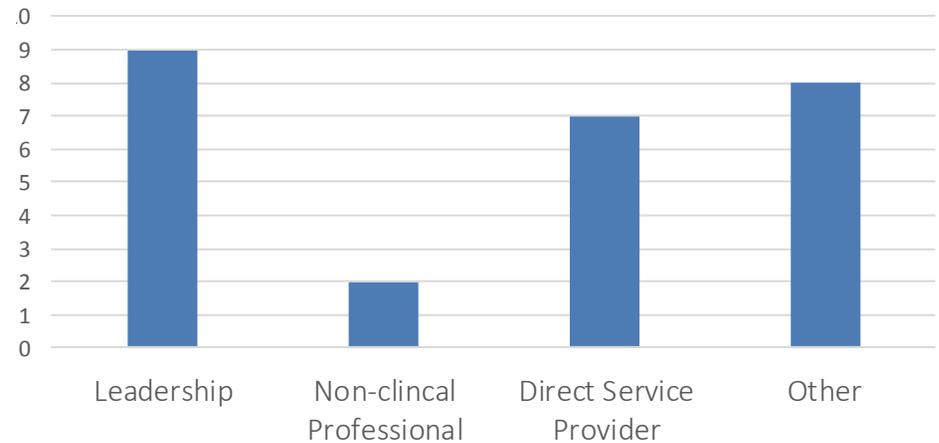
7 — 32%
9 — 41%
2 — 9%
2 — 9%
2 — 9%

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community (such as the Blueprint Advisory Group)?

- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

4 — 18%
6 — 27%
12 — 55%

What is your role within your organization?
*Multiple responses allowed, n=22

Leadership: 9
Non-clinical Professional: 2
Direct Service Provider: 7
Other: 8

Perceptions of "Teamness" in the Bennington HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

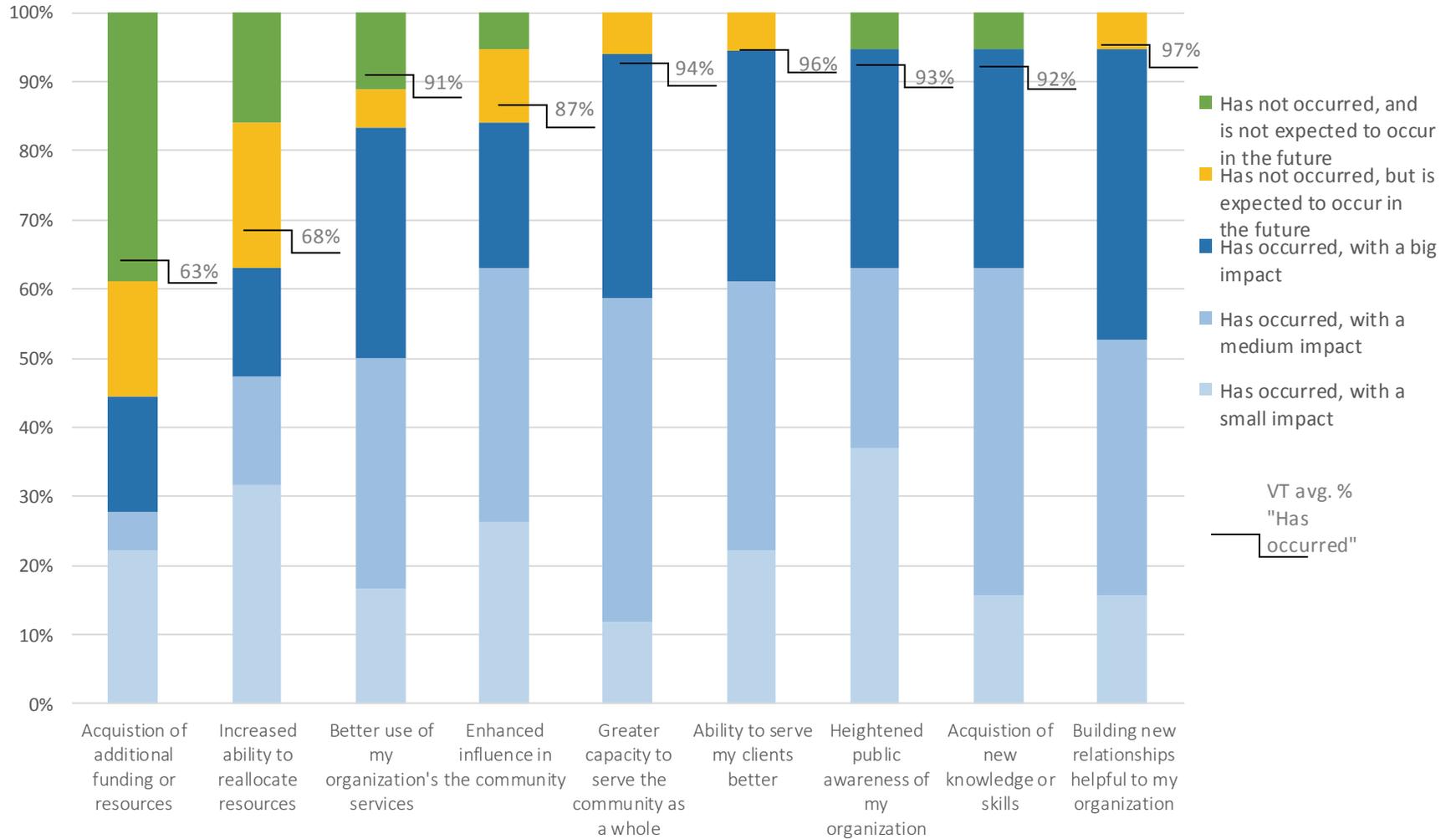We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.
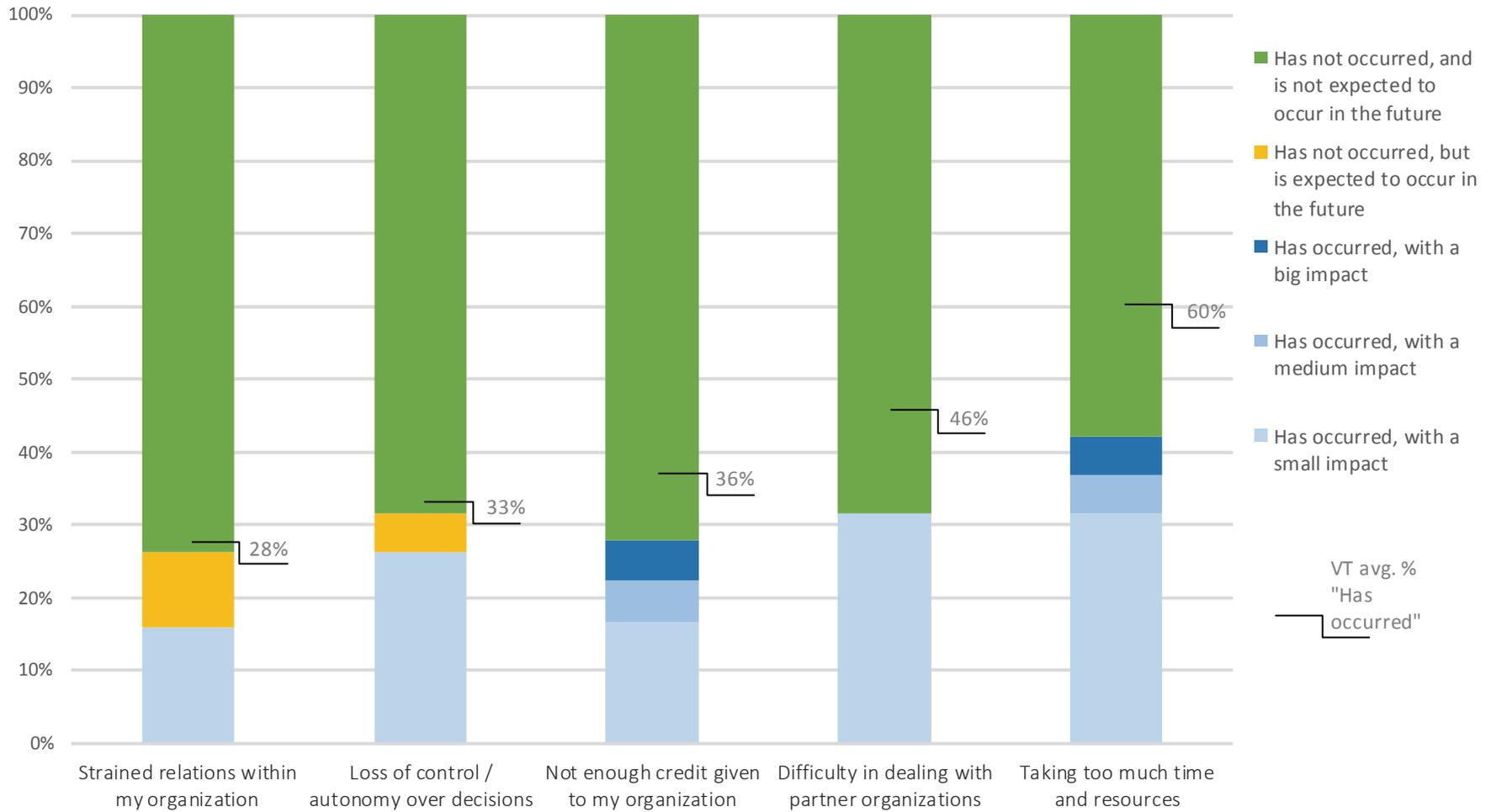

Team-Based Care - Bennington
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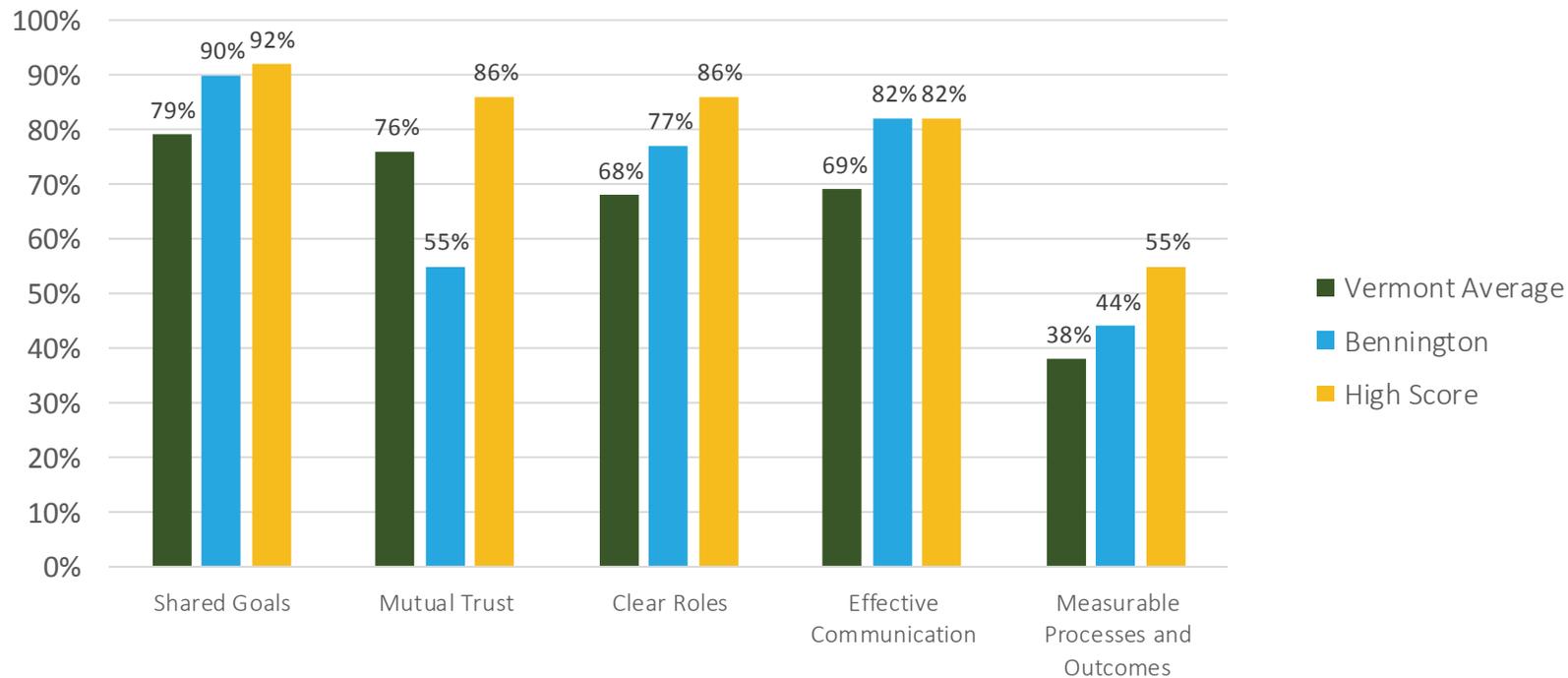
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Screenshot of network analysis question:

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Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

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Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

Bennington HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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Bennington HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

* Unconnected nodes are placed artificially close to the network (overriding the algorithm) in order to fit on the page

![VCHIP - Vermont Child Health Improvement Program, UNIVERSITY OF VERMONT COLLEGE OF MEDICINE]

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Bennington HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Southshire Substance Abuse Coalition
Deerfield Valley Partnership
The Collaborative
Vermont Department of Health (VDH)
SVMC - Financial Advisor
SVMC - Community Wellness
201
David Brown (Private Psychologist)
Children's Integrative Services
SVMC - Pharmacy
United Counseling Service
SVMC - Health Resources Management
Carol Moore (Private Psychologist)
Manchester Home Care Services
Blueprint Community Health Team
SVMC - Pediatrics
Mount Anthony Primary Care
SVMC - Visiting Nurse and Hospice
Southwestern Vermont Council on Aging
SASH
Vermont Legislature
SVMC - Medical Practice Division
Southern Vermont Area Health Education Center
Bayada Home Health Care
Vermont Agency of Human Services

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11

Bennington HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality

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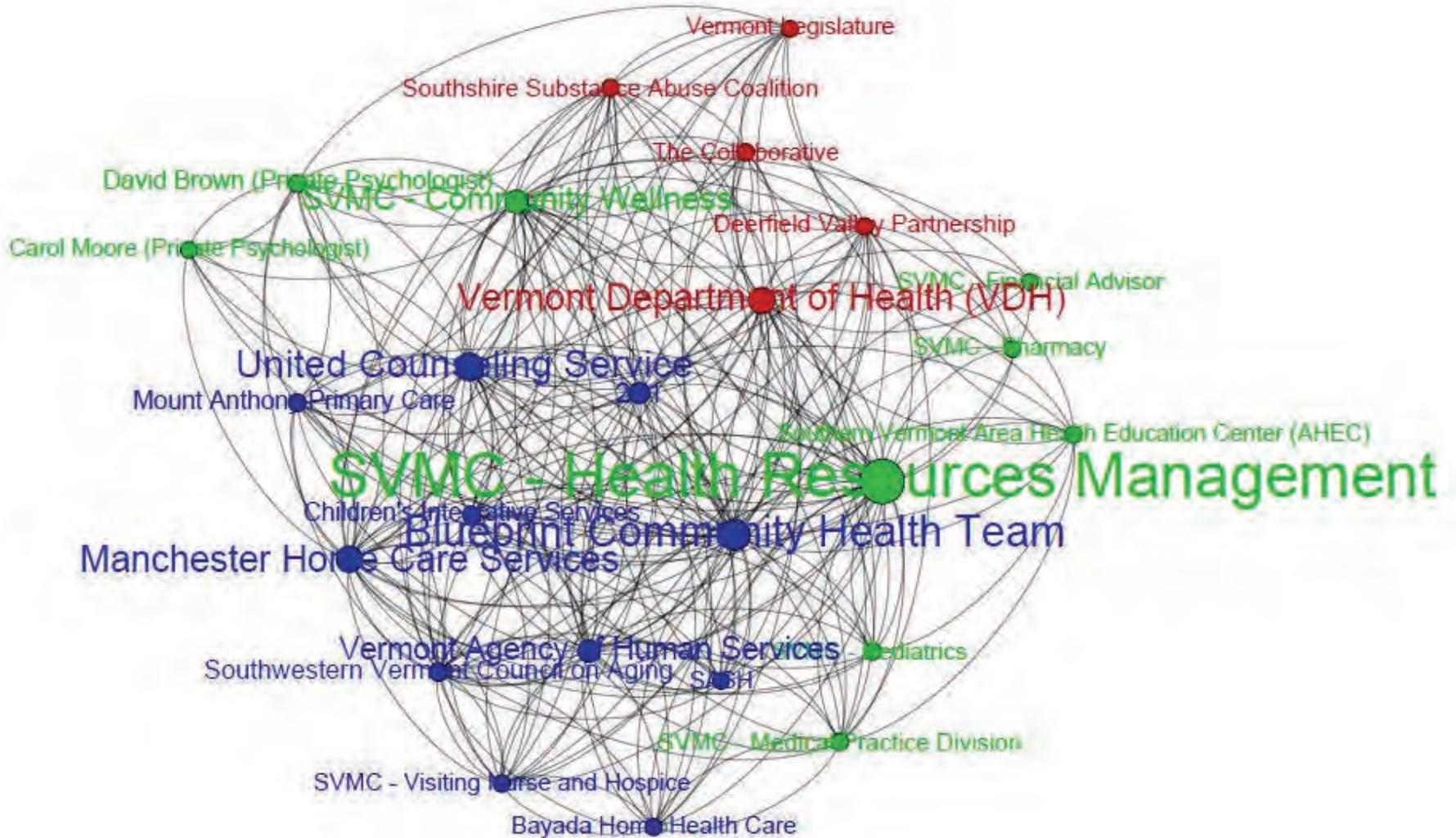
Bennington Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	25	The network contains 25 nodes (organizations)
Average Degree	11	Nodes in the network average 11 connections each
Average Shortest Path Length	1.5	The average distance between any two randomly selected nodes in the network is a about one and a half connections
Graph Density	0.46	Of all possible connections in the network, about 46% are present
Modularity	0.12	This measure of the how readily a network dissolves into communities or sub-networks is moderate relative to other HSAs.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Bennington, these nodes are the **Blueprint CHT, SVMC—Community Wellness, and SVMC—Health Resources Management.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

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7. Very small networks are less likely to have sub-networks.

Observations of Bennington's Network Graphs

These are preliminary observations based on the graphs alone—the Bennington community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. The Bennington network is densely interconnected

2. The Blueprint Community Health Team has a strong central role, especially in the information and resource sharing networks.

3. SVMC—Health Resources Management is the most central organization/department in the referrals network and overall.

4. SVMC has departments in every sub-network in the Bennington HSA

5. The sub-networks that exist in the Bennington HSA are very well connected to each other

6. Mental health and substance abuse providers are well represented in the Bennington network

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

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6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

Bennington Blueprint leadership including the Project Manager, Facilitator, and CHT Leader provided feedback on this report.

1. The low level of trust reported in the Bennington HSA is most likely due to the relationship between the hospital and other health care providers in the community which has been difficult historically . Additionally, the hospital is not the Blueprint fiduciary agent.

2. Fewer Bennington respondents reported experiencing the benefit "acquisition of additional funding or resources" than the state average. It is hypothesized that this perception is due to the longevity of the Blueprint project in the community—at this point these resources are standard/expected vs. "additional."

3. United Counseling Service is very central in all Bennington networks and the most central organization in the resources network, reflecting its role providing behavioral health staff to the Blueprint CHT.

4. SVMC Health Resources Management is the team of care managers at the hospital, a major source of referrals , which is why they are central in the referrals network. Manchester Home Care is also central in the referrals network , several practices use them and they provide one of the SASH wellness nurses.

5. The relatively peripheral role of the CHT in the referrals network may be explained by the integration of CHT staff into practices, referrals to the CHT may be perceived as referrals to or within practices.

6. The sub-networks include one made up primarily of coalitions and advocacy groups and includes the Vermont Legislature (this is the red sub-network).

7. SVMC practices are combined on these graphs, they should be broken out in future surveys. The next list should also include all practices including Dr. Wood, Bennington Family and the 4 spoke practices—Mount Anthony, Deerfield, Shaftsbury and Dr. Kloster.

8. The overall density of connections in the Bennington network is "evidence of a lot of work that's been done to break silos down."

Vermont Blueprint for Health Community Health Network Study Brattleboro HSA

June 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

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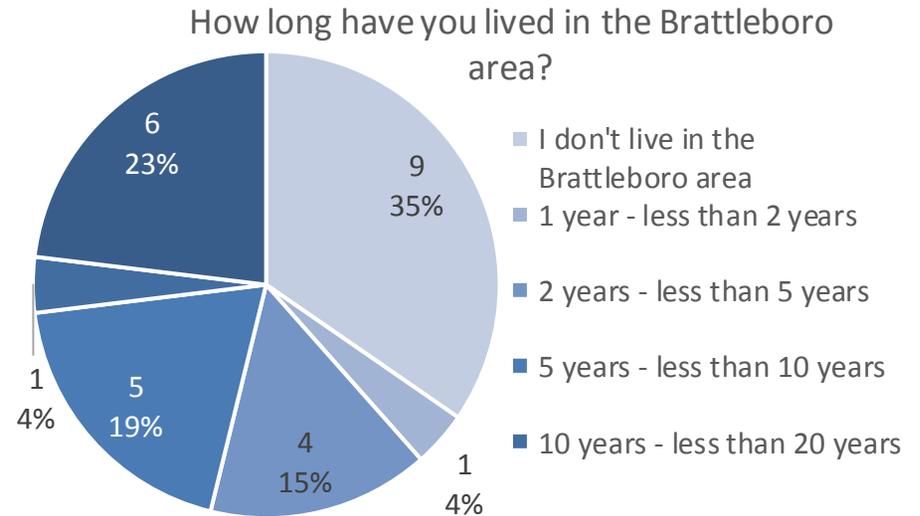
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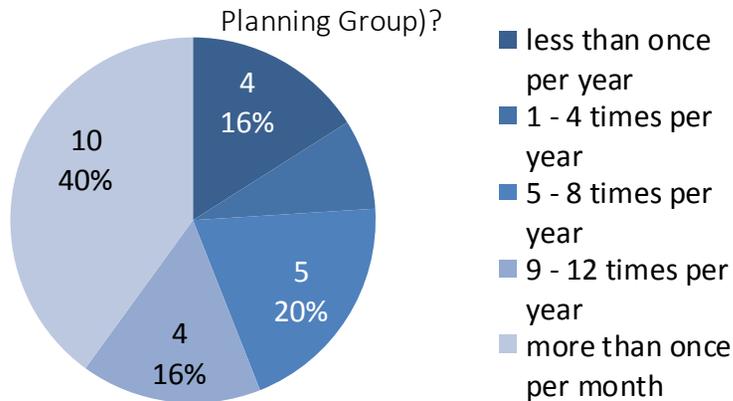
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Brattleboro HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Brattleboro	47	26	55%
Vermont	763	422	55%

How long have you lived in the Brattleboro area?

- I don't live in the Brattleboro area
- 1 year - less than 2 years
- 2 years - less than 5 years
- 5 years - less than 10 years
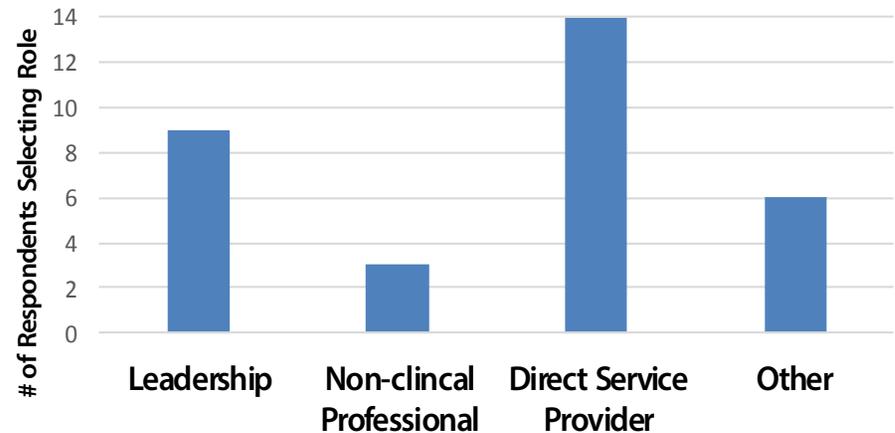- 10 years - less than 20 years

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community (such as the Blueprint Clinical Planning Group)?

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

Brattleboro - What is your role within your organization?
*Multiple responses allowed, n=26

3

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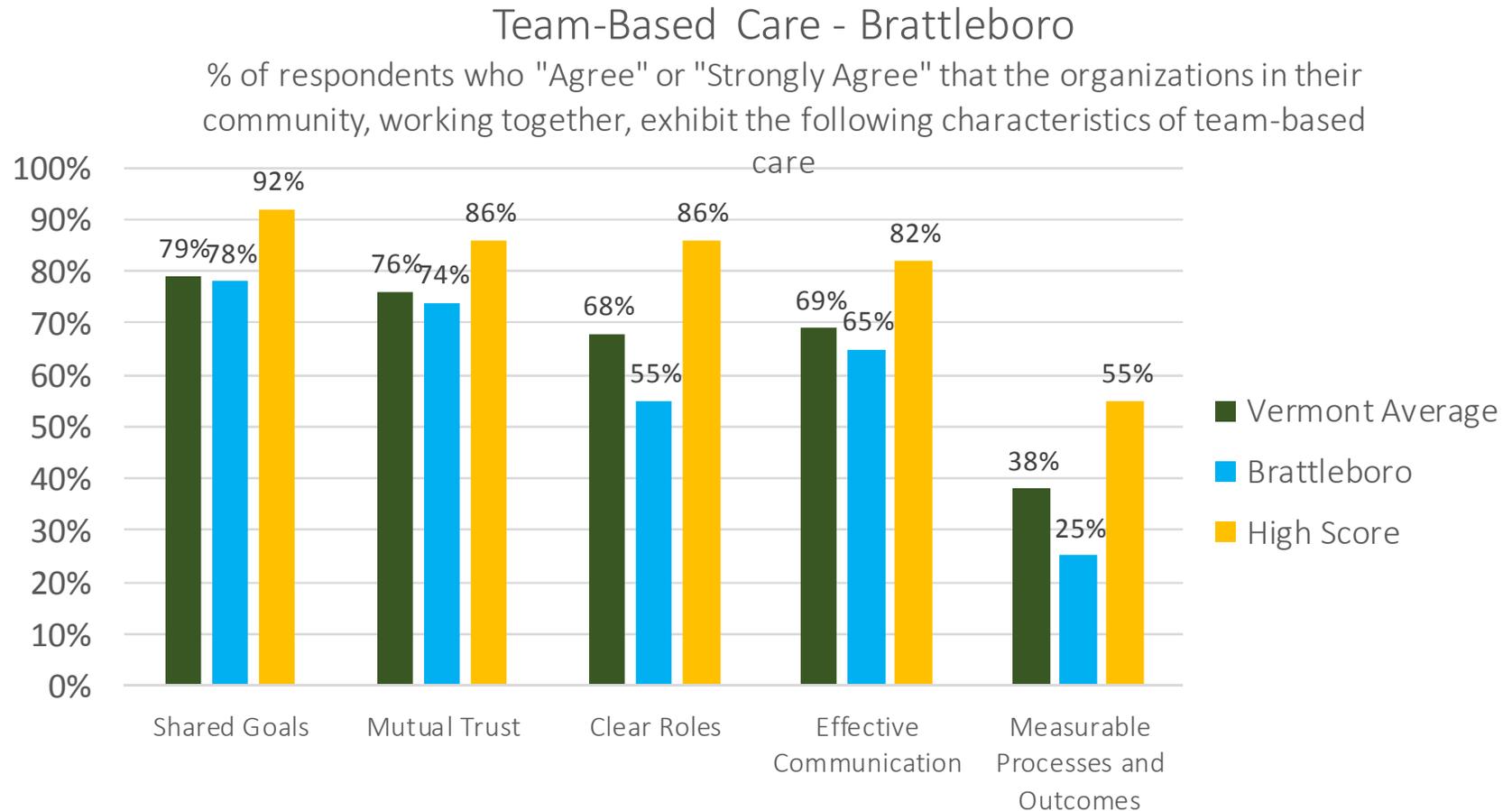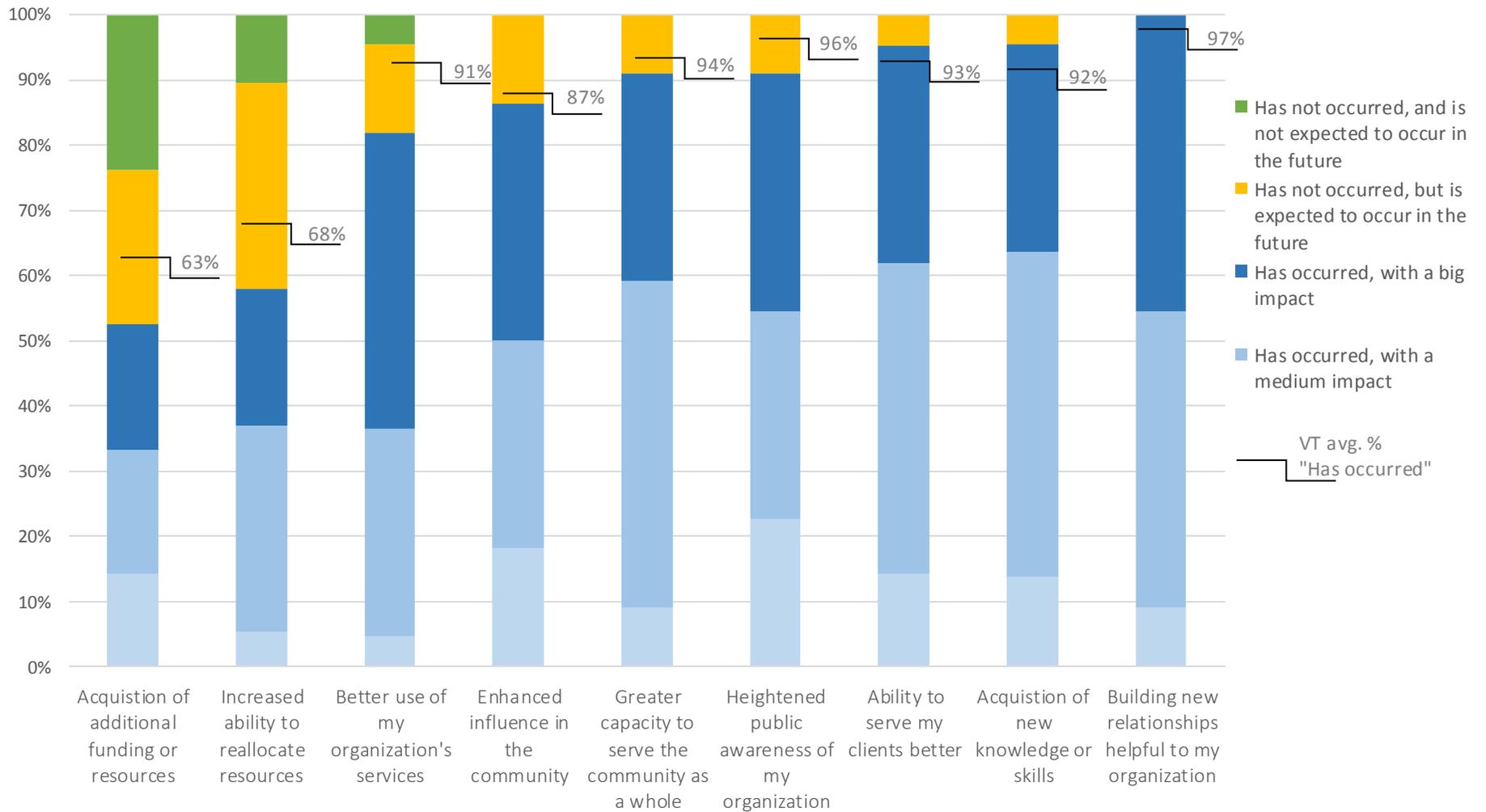802 656 8210 TEL   802 656 8368 FAX

Perceptions of "Teamness" in the Brattleboro HSA

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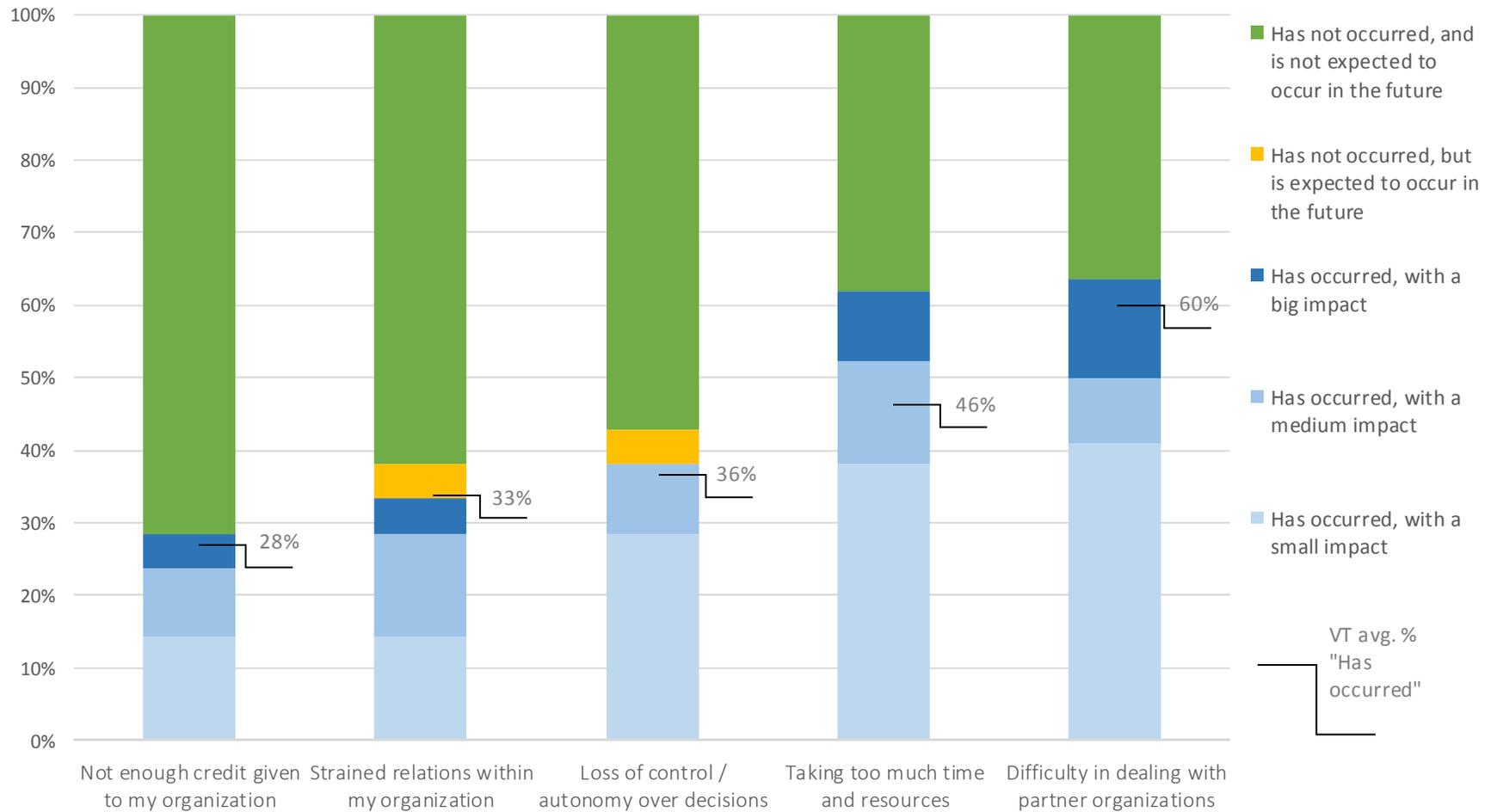
We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care - Brattleboro
% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care

Characteristic	Vermont Average	Brattleboro	High Score
Shared Goals	79%	78%	92%
Mutual Trust	76%	74%	86%
Clear Roles	68%	55%	86%
Effective Communication	69%	65%	82%
Measurable Processes and Outcomes	38%	25%	55%

Benefits of Working Together in the Brattleboro HSA

Drawbacks of Working Together in the Brattleboro HSA

![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine]

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Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways—sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

Q7 [Edit Question ▼] [Move] [Copy] [Delete]

Below is a list of organizations in your community that provide either direct health services, or social and economic services that help individuals and families care for themselves and, by extension, their health.

Check each of the ways your organization has worked with the organization listed.

(Please note that there will be no value judgement assigned to whether or not organizations work together in these particular ways. In some cases, these type of interactions may be useful to your organization's mission and in some cases they may not. In the final report, this is the one question where organization names may be reported in order to map functional relationships in your community.)

	Our organizations share information	Our organizations share resources (joint funding, shared equipment, personnel, facilities, etc.)	My organization sends referrals to this organization	My organization receives referrals from this organization
Alzheimer's Association of Vermont	☐	☐	☐	☐
APS Healthcare	☐	☐	☐	☐
Bayada Home Health Care	☐	☐	☐	☐

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

- Like any picture, a network graph shows a single point in time. It can't tell you how or why the relationships it represents formed. It doesn't show whether the connections it shows are formal or informal, durable or tenuous, friendly or tense. It won't answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency. And it doesn't offer instructions for how to change the shape of the network, should you want to.

Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

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Brattleboro HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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Brattleboro HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Youth Services
Serenity House
Senior Solutions
Health Care and Rehabilitation Services (HCRS)
Turning Point
Children's Integrated Services
Brattleboro Retreat
Vermont Agency of Human Services
Brattleboro Memorial Hospital - Tobacco Treatment Coordinator
Vermont Chronic Care Initiative (VCCI)
Brattleboro Food Co-op
Vermont Department of Health (VDH)
Habit OPCO
Brattleboro Memorial Hospital - Just So Pediatrics
Grace Cottage Hospital
Fit and Healthy Kids Coalition
Bill Pelz-Walsh, MD
AIDS Project of Southern Vermont
Brattleboro Memorial Hospital - Windam Family Practice
Blueprint CHT + Project Manager and Facilitator
Brattleboro Memorial Hospital - Post Acute Care
Helen Schepartz, LICSW, Clinical Social Work/Therapist
SASH
United Way
Craig Goldberg, MD
Brattleboro Area Prevention Coalition (BAPC)
Keene YMCA
Brattleboro Primary Care
RSVP
Hunger Free Vermont
Maple Leaf Farm
Visiting Nurse and Hospice of Vermont and New Hampshire (VNAVNH)
Halifax Elementary School
BUHS School Nurses
Southern Vermont AHEC
Post Oil / Farm to School
VT Wellness Education

Brattleboro HSA

Referrals Network

Node color indicates Degree Centrality
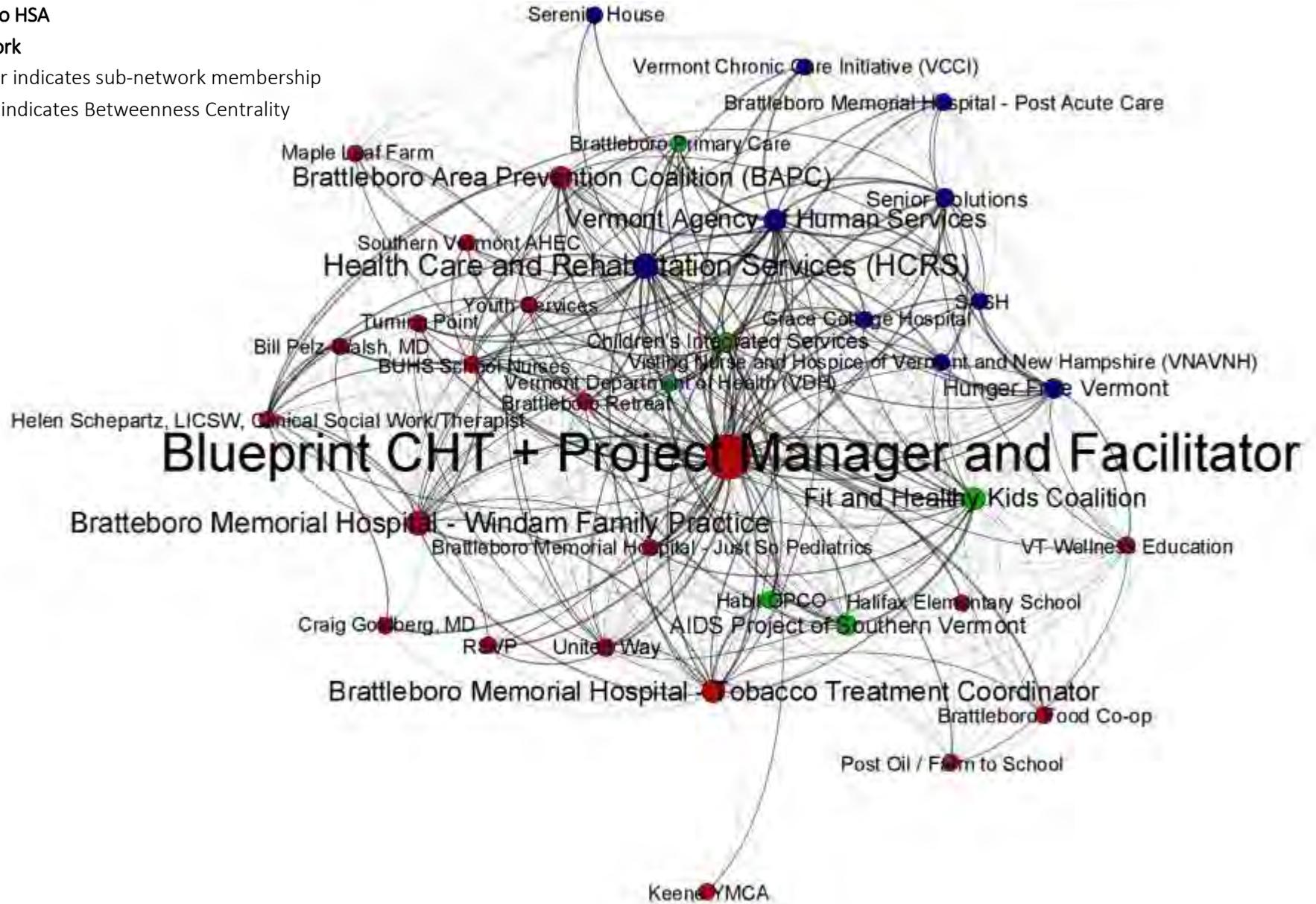
Node size indicates Betweenness Centrality

Brattleboro HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality

Brattleboro Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	37	The network contains 37 nodes (organizations)
Average Degree	9.5	Nodes in the network average about 9.5 connections each
Average Shortest Path Length	1.5	The average distance between any two randomly selected nodes in the network is about 1.5 connections
Graph Density	0.26	Of all possible connections in the network, about 26% are present
Modularity	.1	This measure of the how readily a network dissolves into communities or sub-networks is very low, indicating that the sub-networks that exist in the Brattleboro HSA are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Brattleboro, these nodes are **AHS, Brattleboro Memorial Hospital—Windham Family Practice,** and **Health Care and Rehabilitation Services.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Brattleboro's Network Graphs

These are preliminary observations based on the graphs alone—the Brattleboro community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. The Blueprint CHT plays a central role in the Brattleboro network, and is especially central in the information sharing network.

2. The Brattleboro resources network is sparsely connected.

3. Health Care and Rehabilitation Services (HSCRS) plays a central role in the network overall, based on its prominence in the resources and referrals network. HCRS' prominence, combined with the centrality of the Brattleboro Area Prevention Coalition and the Brattleboro Memorial Hospital Tobacco Treatment Coordinator suggest that substance abuse is a focus of the Brattleboro network overall.

4. In the Brattleboro HSA, the sub-networks appear to coalesce around population served. One sub-network serves elders (green), one small sub-network's most prominent nodes are organizations serving children (blue), and the largest sub-network combines many of the services of the Brattleboro Memorial Hospital with organizations focused on mental health and substance abuse (red).

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

The Brattleboro community provided feedback following a presentation of these findings at the Brattleboro Blueprint Community Planning Group on June 17, 2014. The following are key observations.

1. Members of the Brattleboro community observed that the Blueprint was relatively new to their community, and so the structure of working relationships related to Blueprint activity is evolving rapidly.

2. There is an interest in the development of standard, state-wide measurements for community health improvement work that the Brattleboro community could adopt for their own "measurement of processes and outcomes" (a hallmark of team-based care that only 25% of survey respondents "Agreed" or "Strongly Agreed" that their community was achieving).

3. One member of the group expressed surprise that AHS did not play a more central role in the networks, and would have expected that AHS be the most central organization throughout.

4. The group was surprised that the Brattleboro Retreat did not have a more central role.

5. There is an expectation in the community that mental health and substance abuse providers will be more central in future measurements of the network, on account of the Hub & Spoke program. Similarly, SASH is expected to be more prominent based on work over the past year (since the survey was administered).

6. The group reflected that ties between organizations have become formalized enough that staff turnover would not be expected to sever connections between organizations, however the roles and prominence of organizations in the network may be altered. For instance, the departure of the leader of the Brattleboro Area Prevention Coalition's is expected to have a visible impact.

7. Organizations the group would like to see added to future surveys include the Vermont Department of Health (VDH) and Morningside Shelter. The group expressed interest in being consulted on list development for any future survey.

Vermont Blueprint for Health Community Health Network Study

Burlington HSA

June 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.
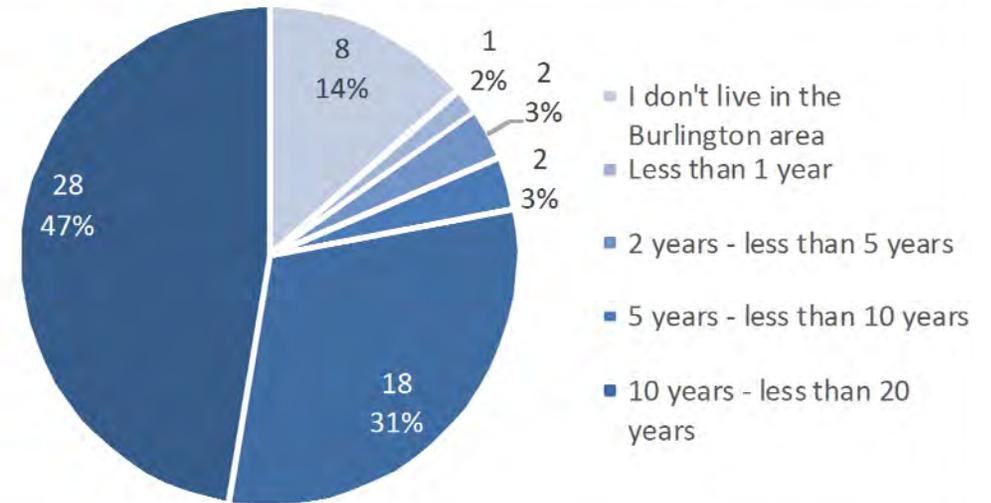
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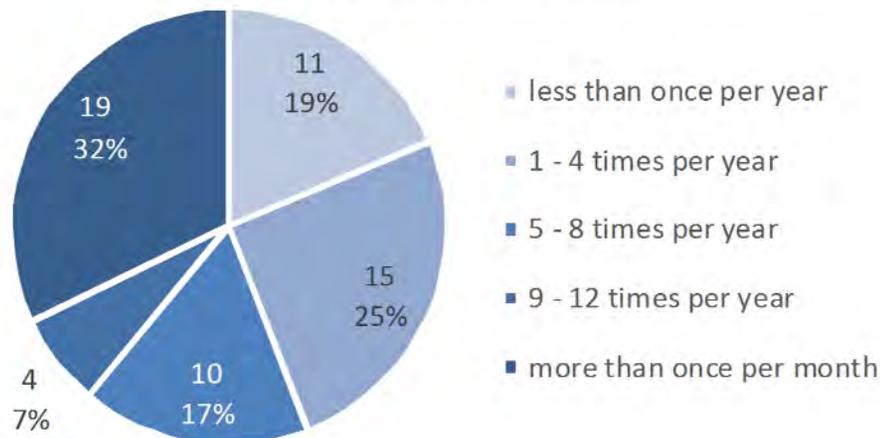
Burlington HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Burlington	113	59	52%
Vermont	763	422	55%

How long have you lived in the Burlington area?

- I don't live in the Burlington area
- Less than 1 year
- 2 years - less than 5 years
- 5 years - less than 10 years
- 10 years - less than 20 years

8 14%
1 2%
2 3%
2 3%
28 47%
18 31%

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community?

- less than once per year
- 1 - 4 times per year
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11 19%
19 32%
15 25%
10 17%
4 7%

What is your role within your organization?
Multiple responses allowed, n=59

3

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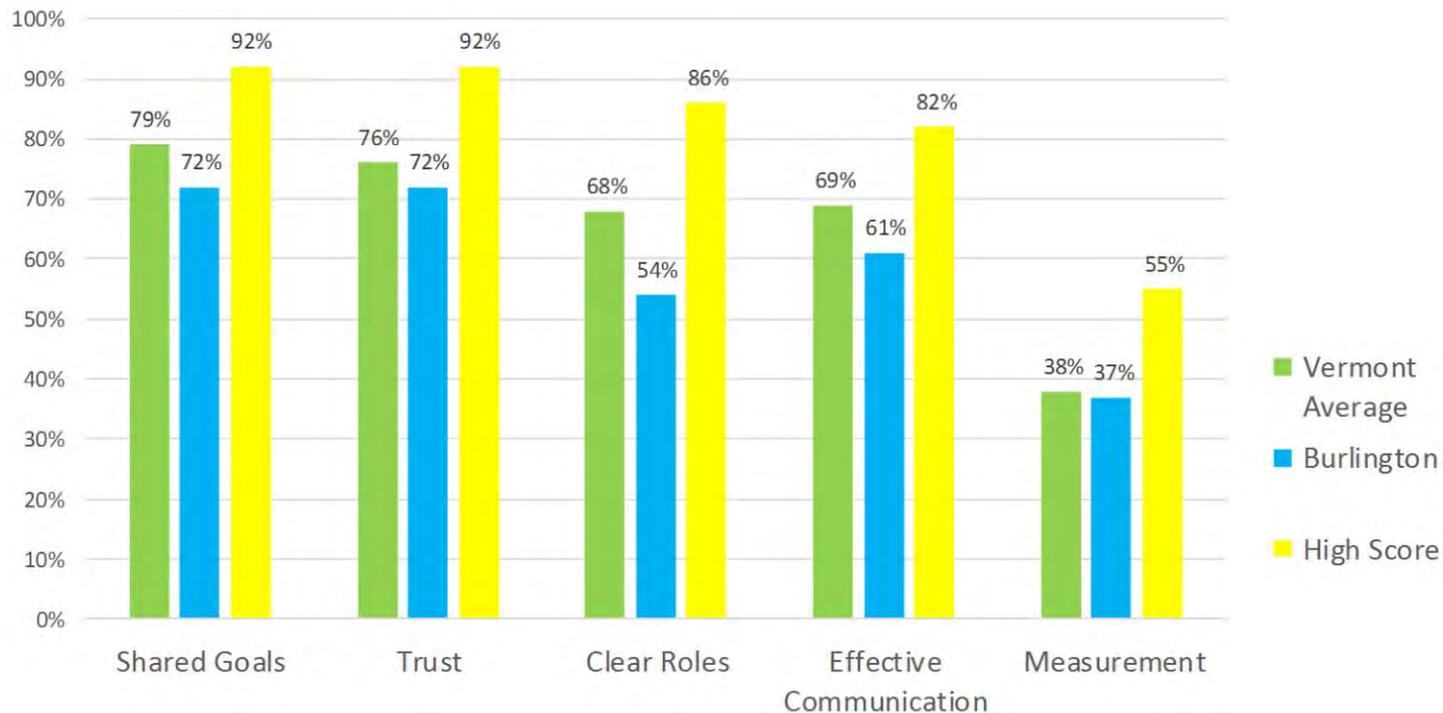802 656 8210 TEL   802 656 8368 FAX
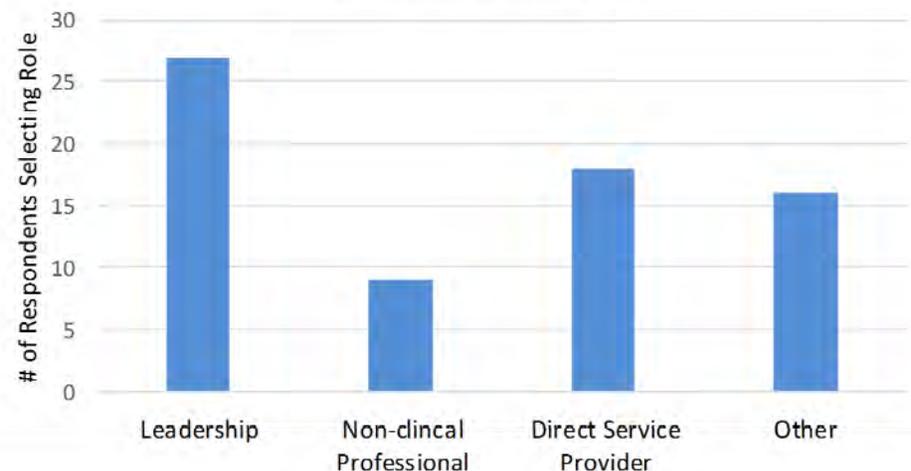
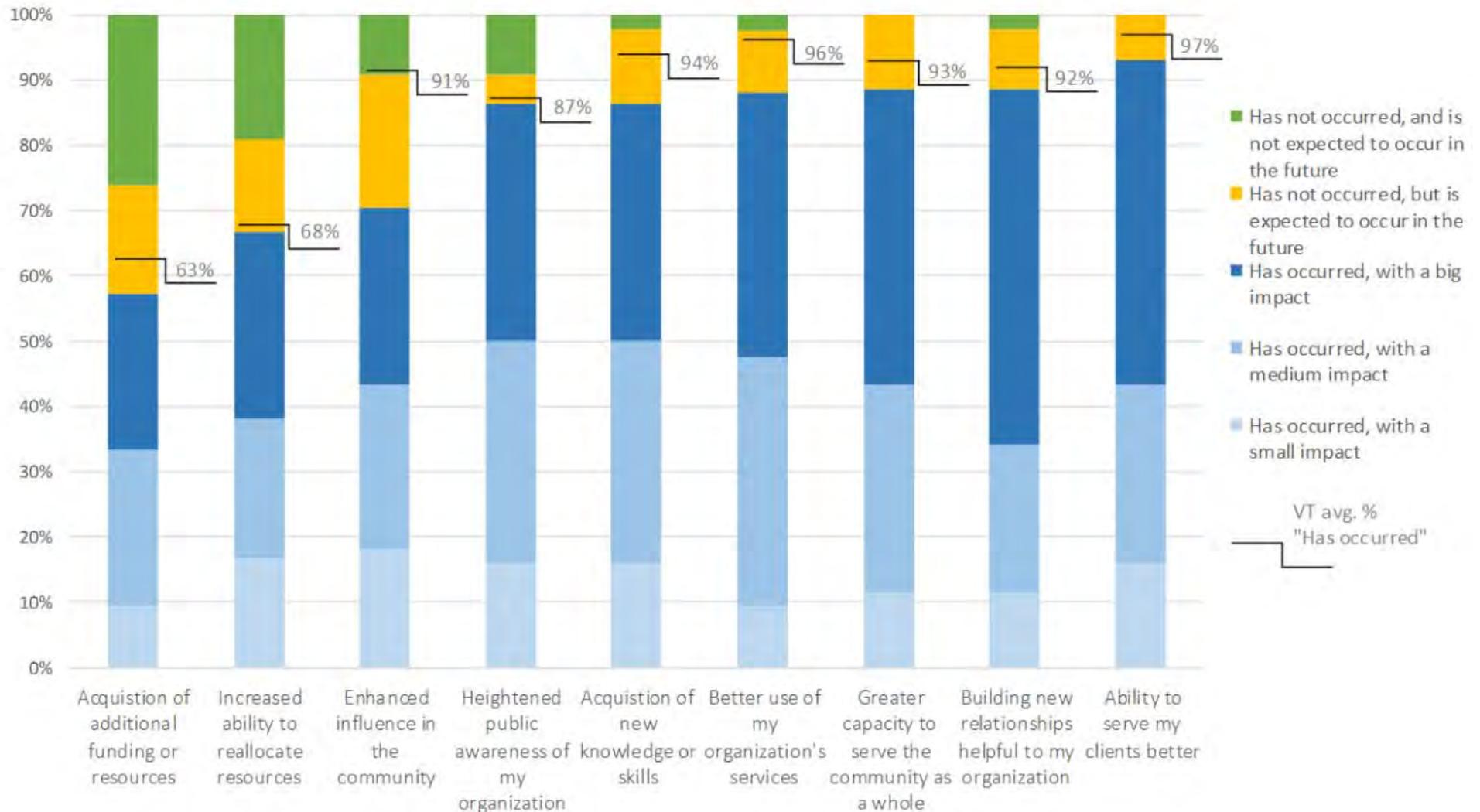# Perceptions of "Teamness" in the Burlington HSA

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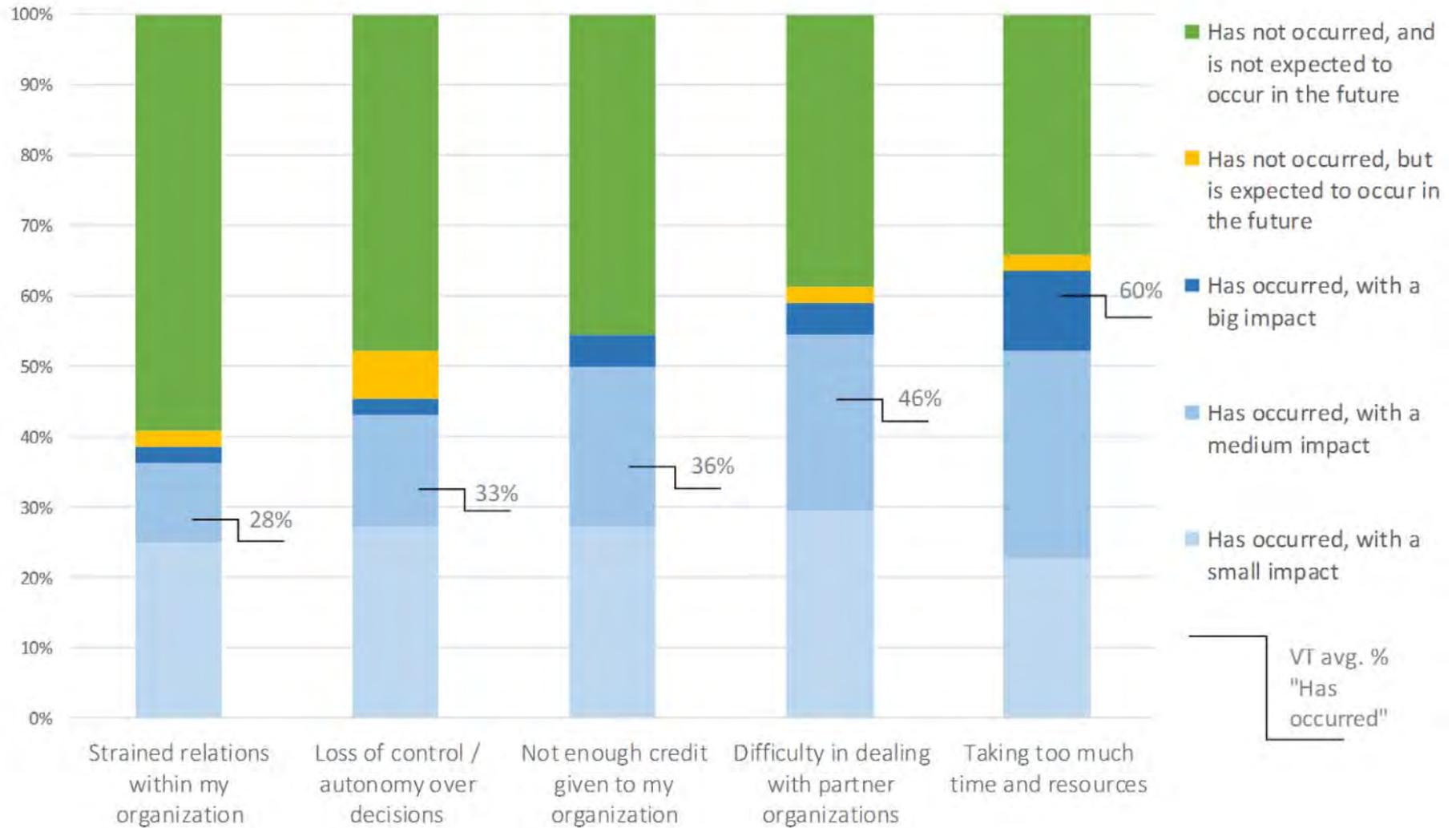
Percent of Respondents Who "Agree" or "Strongly Agree" That Their Community Network Exhibits the Following Qualities

Legend:
- Vermont Average
- Burlington
- High Score

Shared Goals: Vermont Average 79%, Burlington 72%, High Score 92%
Trust: Vermont Average 76%, Burlington 72%, High Score 92%
Clear Roles: Vermont Average 68%, Burlington 54%, High Score 86%
Effective Communication: Vermont Average 69%, Burlington 61%, High Score 82%
Measurement: Vermont Average 38%, Burlington 37%, High Score 55%

Benefits of Working Together in the Burlington HSA

Drawbacks of Working Together in the Burlington HSA

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What can network analysis tell me?

Screenshot of network analysis question:

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

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Burlington HSA Data Caveat

- The Burlington HSA's data is partly compromised by the omission of several key organizations from the original survey. Organizations that come after "Veteran's Administration" alphabetically were left off the survey. Respondents were not able to indicate the ways their organizations connected with the organizations in the table to the right.

- Surveys were sent to representatives of these organizations. The table indicates who among them responded—those organizations do appear in the Burlington maps but are almost certainly less central to those maps than they should be because we only know about their connections out (out degree) not connections in (in degree).

- Respondents did have an opportunity to write-in organizations not on the list, and several of the organizations are mentioned. See the table for the number of write-ins each organization received.

- The main impact that this error will have on network measurements is reducing the network size and average degree (average number of connections per node)

- This error is unlikely to have significantly impacted graph density measures

Organization	Responded?	# Of Write-Ins
Vermont Managed Care	Y	
Visiting Nurse Association (VNA)		4
Vermont 211	Y	
Vermont Association for the Blind and Visually Impaired		
Vermont Center for Independent Living		
Vermont Department of Health (VDH)		
Vermont Economic Services		
Vermont Family Network		
VTAARP		
Wellness Coop	Y	
Winooski Coalition for Safe and Peaceful Communities	Y	1
Winooski Family Health	Y	
The Winooski Housing Authority		1
YMCA		2

Network Glossary

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Edge

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Burlington HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Hagan, Rinehart & Connolly Pediatricians

Essex Pediatrics

Fletcher Allen Health Care - University Pediatrics

Practice of Danielle Robillard D'Amico PsyD

UVM - ILEHP (Interdisciplinary Leadership Education for Health Professionals)

Timberlane Pediatrics and Timberlane Pediatrics North

Children with Special Health Needs

Champlain Center for Natural Medicine

Integrated Arts Academy

Ottercreek Counseling   Tooth Tutor Program   Fletcher Allen Health Care - OB

LaLeche   UVM - Nutrition Department

Fletcher Allen Health Care - Psychiatry

Children's Integrated Services   Fletcher Allen Health Care - Cardiology

Alderbrook Family Medicine   Fletcher Allen Health Care - Volunteer Services   Vermont Managed Care

Howard Center - Child, Youth and Family Services/School Services

Refugee Resettlement   Mountain View Natural Medicine   Fletcher Allen Health Care - Pain Clinic

Association of Africans Living in VT   Winooski Family Health

Reach Up   Fletcher Allen Health Care - Seneca Center   Fletcher Allen Health Care - Endocrinology

Head Start at CVOEO (Champlain Valley Office of Economic Opportunity)   VCCI (Vermont Chronic Care Initiative)

Fletcher Allen Health Care - Given Burlington

Fletcher Allen Health Care - Hinesburg Family Practice

Spectrum   ACT1   Fletcher Allen Health Care - Milton Family Practice

Department of Corrections   Hunger Free VT   Fletcher Allen Health Care - Given Essex   Fletcher Allen Health Care - PT

Fletcher Allen Health Care - Community Health Improvement and Adult Outreach

Fletcher Allen Health Care - South Burlington Family Practice

Colchester Family Practice

Fletcher Allen Health Care - Given Williston

Fletcher Allen Health Care - Blueprint Community Health Team

Community Health Centers of Burlington - Dental Care Services   Evergreen Family Health

Maple Leaf Farm   Counseling Connection   Fletcher Allen Health Care - Aesculapius Medical Center

Winooski Coalition for a Safe and Peaceful Community   Champlain Housing Trust   Goodhealth Primary Care

Salvation Army   Hannaford - Nutrition Programming

Thomas Chittenden Health Center   Practice of Gene Moore MD

Three Squares VT   Richmond Family Medicine   Charlotte Family Health Center

Vermont 211/United Way   COTS

Howard Center   Fletcher Allen Health Care   Burlington Primary Care Health Partners

Milton Community Youth Coalition   Fletcher Allen Health Care - Rehab Physiatry

Cathedral Square   Birchwood Terrace

Wellness Coop   CCTA   Northwestern Counseling and Support Services

Parents and Adults Celebrating Children and Teens   Practice of Chris Herbert MD

Burlington Partnership for a Health Community   Bayada

RSVP   Burlington Housing Authority

Community Health Centers of Burlington

Grand Isle County Clean Team   CVAA (area agency on aging)

Meals on Wheels

Burlington Health and Rehabilitation

Heineberg Senior Center

Long Trail PT

Elena Ramirez   ALS Association

Adams Center   Laura Mann Center

CY (Connecting Youth in Chittenden South)   Starr Farm Nursing Facility

Albany College of Pharmacy   Choices for Care   Green Mountain Nursing Home

SASH (Support and Services at Home)

American Cancer Society

Chittenden East Community Partnership   Alzheimer's Association

Charlotte Senior Center

Veterans Administration

* Unconnected nodes are placed artificially close to the network (overriding the algorithm) in order to fit on the page

Burlington HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Fletcher Allen Health Care - Cardiology
Fletcher Allen Health Care - Given Burlington
Thomas Chittenden Health Center
Fletcher Allen Health Care - South Burlington Family Practice
Fletcher Allen Health Care - Given Essex
Fletcher Allen Health Care - Given Williston
Fletcher Allen Health Care - Hinesburg Family Practice
Fletcher Allen Health Care - Aesculapius Medical Center
Evergreen Family Health
Tooth Tutor Program
Fletcher Allen Health Care - Endocrinology
Richmond Family Medicine
Practice of Chris Herbert MD
Laura Mann Center
Fletcher Allen Health Care - OB
Fletcher Allen Health Care - Rehab Physiatry
Fletcher Allen Health Care - PT
Fletcher Allen Health Care - Volunteer Services
Fletcher Allen Health Care / VT Blueprint for Health Community Health Team and other Blueprint staff including Project Manager
Mountain View Natural Medicine
Wellness Coop
Practice of Gene Moore MD
Charlotte Family Health Center
Winooski Family Health
Goodhealth Primary Care
Timberlane Pediatrics and Timberlane Pediatrics North
American Cancer Society
Essex Pediatrics
Fletcher Allen Health Care - Milton Family Practice
Hagan, Rinehart & Connory Pediatricians
Fletcher Allen Health Care - Pain Clinic
Alderbrook Family Medicine
Champlain Center for Natural Medicine
Elena Ramirez
Fletcher Allen Health Care - Community Health Improvement and Adult Outreach
Fletcher Allen Health Care - Seneca Center
Grand Isle County Clean Team
Association of Africans Living in VT
Integrated Arts Academy
Colchester Family Practice
Fletcher Allen Health Care - Psychiatry
Long Trail PT
Maple Leaf Farm
Fletcher Allen Health Care - University Pediatrics
UVM - ILEHP (Interdisciplinary Leadership Education for Health Professionals)
Salvation Army
Burlington Primary Care Health Partners
Children with Special Health Needs
Chittenden East Community Partnership
Community Health Centers of Burlington - Dental Care Services
Albany College of Pharmacy
Hunger Free VT
Vermont Managed Care
Fletcher Allen Health Care
Children's Integrated Services
Community Health Centers of Burlington
Charlotte Senior Center
Howard Center
RSVP
Parents and Adults Celebrating Children and Teens
Burlington Health and Rehabilitation
Winooski Coalition for a Safe and Peaceful Community
ACT 1
Starr Farm Nursing Facility
CY (Connecting Youth in Chittenden South)
Counseling Connection
Burlington Partnership for a Health Community
Spectrum
Howard Center - Child, Youth and Family Services/School Services
Birchwood Terrace
Cathedral Square
Practice of Danielle Robillard D'Amico PsyD
Milton Community Youth Coalition
Bayada
SASH (Support and Services at Home)
Ottercreek Counseling
Northwestern Counseling and Support Services
Refugee Resettlement
Burlington Housing Authority
LaLeche
ALS Association
Champlain Housing Trust
Hannaford - Nutrition Programming
Alzheimer's Association
Green Mountain Nursing Home
Meals on Wheels
Heineberg Senior Center
Reach Up
VCCI (Vermont Chronic Care Initiative)
Veterans Administration
Head Start at CVOEO (Champlain Valley Office of Economic Opportunity)
Three Squares VT
Department of Corrections
Adam Center
CVAA (area agency on aging)
CCTA
Choices for Care
UVM - Nutrition Department
CCTS
Vermont 211 United Way

* Unconnected nodes are placed artificially close to the network (overriding the algorithm) in order to fit on the page

Burlington HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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Burlington HSA
Full Network
Node color indicates sub-network membership
Node size indicates Betweenness Centrality

Burlington Network Measures & Key Player Analysis

Network Measures:

Measure	#	Notes / Explanation
Network Size	100	The network contains 100 nodes (organizations)
Average Degree	14.8	Nodes in the network average about 15 connections each
Average Shortest Path Length	1.7	The average distance between any two randomly selected nodes in the network is a little less than 2 connections
Graph Density	0.15	Of all possible connections in the network, about 15% are present
Modularity	0.14	This measure of the how readily a network dissolves into communities or sub-networks is on the high end for Vermont HSAs, but low in general, indicating that the sub-networks that exist in Burlington are densely interconnected.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Burlington's Network Graphs

These are preliminary observations based on the graphs alone—the Burlington community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. Fletcher Allen Health Care's Community Health Improvement and Adult Outreach department AND the Blueprint Community Health Team based at Fletcher Allen are both very central in the Burlington network. While they have similar sets of connections, they don't overlap completely.

2. Burlington's three sub-networks appear to have formed based on types of service and population served. One sub-network is made up primarily of the hospital, hospital departments, and health care providers (Fletcher Allen outpatient departments and primary care providers are central). Another serves the elderly (CVAA and Cathedral Square are central) and the third sub-network appears to focus on underprivileged populations (COTS and Community Health Centers of Burlington are central).

3. The Burlington network is objectively different from other Blueprint for Health HSA networks—it is much, much bigger.

Next: Reflection and Evolution

The following questions may help communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

Feedback on this report was provided by the Burlington HSA's Blueprint leadership and two leaders of community social service organizations. A larger group will provide feedback on July 10, 2014.

1. The Burlington list is missing some important organizations including the United Way, the Chittenden County Regional Planning Commission (CCRPC) and The Champlain Valley Office of Economic Opportunity (CVOEO).

2. It was suggested that the Vermont Department of Health (VDH) be broken into its departments/services. It was also suggested that the Howard Center be divided so as to include the Howard Center Street Outreach Team as a node.

3. VDH, which was among the organizations on the list but omitted from the survey, is assumed to have a very central role in the Burlington network.

4. The size of the Burlington network creates unique challenges—the main one being that it is difficult to create a list that is inclusive of all the organizations involved while also being manageable for respondents (encouraging completion of the survey).

5. One solution that was suggested is breaking the network into two or more networks—one containing clinical and direct service connections (connections directly related to patients, referrals and case management) and another network of connections around service planning and leadership.

Vermont Blueprint for Health Community Health Network Study

Middlebury HSA

May 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."

Middlebury HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Middlebury	60	30	50%
Vermont	763	422	55%

How long have you lived in the Middlebury area?
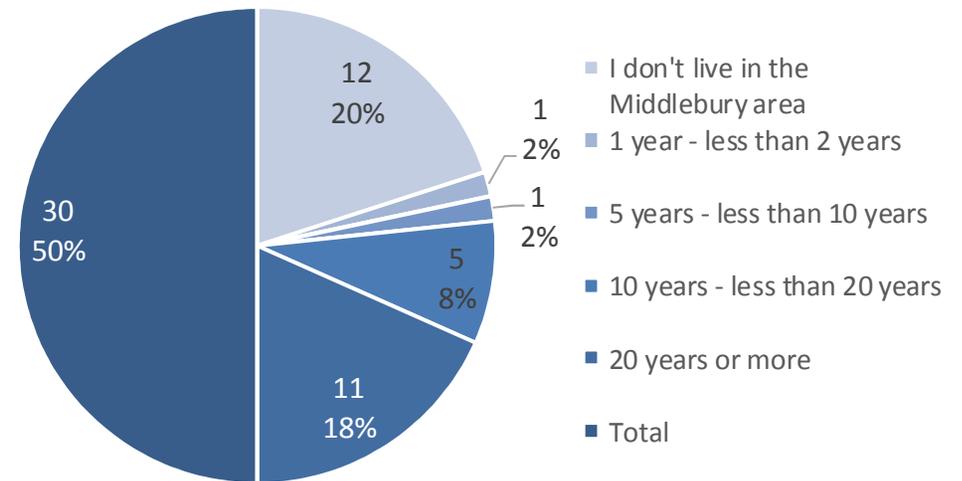
- I don't live in the Middlebury area
- 1 year - less than 2 years
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more
- Total

12 20%
1 2%
1 2%
5 8%
11 18%
30 50%

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community?

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

4 13%
3 10%
10 34%
3 10%
10 33%

What is your role within your organization?
*Multiple responses allowed, n=30

3

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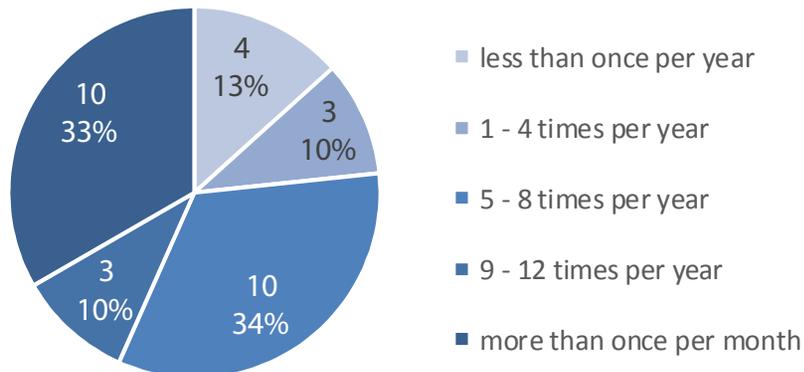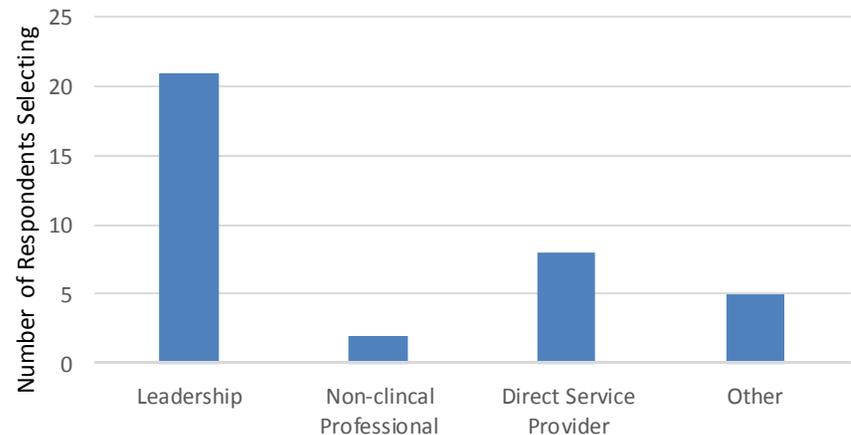
Perceptions of "Teamness" in the Middlebury HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care - Middlebury
% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care

	Shared Goals	Mutual Trust	Clear Roles	Effective Communication	Measurable Processes and Outcomes
Vermont Average	79%	76%	68%	69%	38%
Middlebury	78%	74%	55%	65%	25%
High Score	92%	86%	86%	82%	55%
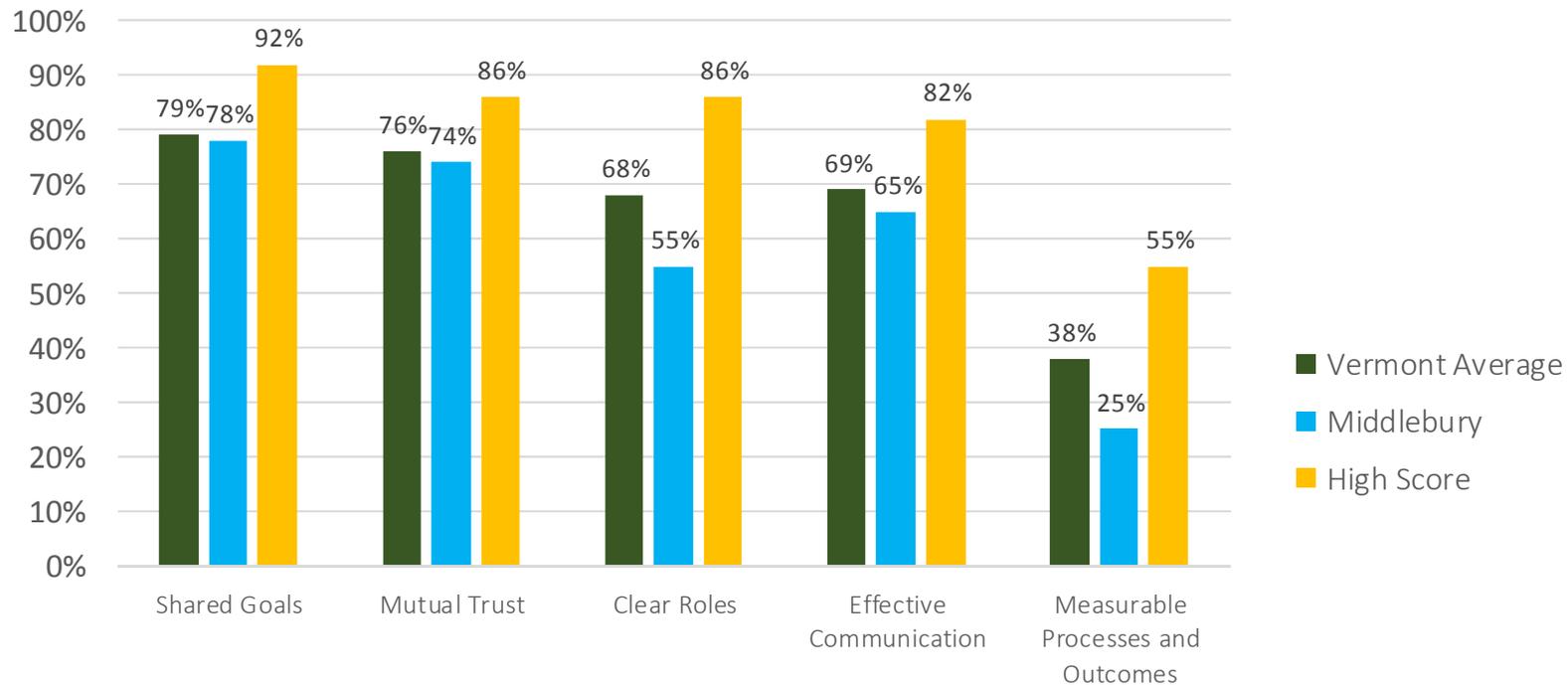
Benefits of Working Together in the Middlebury HSA

Drawbacks of Working Together in the Middlebury HSA

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Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways—sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

> **Q7** [Edit Question ▼] [Move] [Copy] [Delete]
>
> **Below is a list of organizations in your community that provide either direct health services, or social and economic services that help individuals and families care for themselves and, by extension, their health.**
>
> **Check each of the ways your organization has worked with the organization listed.**
>
> **(Please note that there will be no value judgement assigned to whether or not organizations work together in these particular ways. In some cases, these type of interactions may be useful to your organization's mission and in some cases they may not. In the final report, this is the one question where organization names may be reported in order to map functional relationships in your community.)**

	Our organizations share information	Our organizations share resources (joint funding, shared equipment, personnel, facilities, etc.)	My organization sends referrals to this organization	My organization receives referrals from this organization
Alzheimer's Association of Vermont	☐	☐	☐	☐
APS Healthcare	☐	☐	☐	☐
Bayada Home Health Care	☐	☐	☐	☐

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

- Like any picture, a network graph shows a single point in time. It can't tell you how or why the relationships it represents formed. It doesn't show whether the connections it shows are formal or informal, durable or tenuous, friendly or tense. It won't answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency. And it doesn't offer instructions for how to change the shape of the network, should you want to.

Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

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Middlebury HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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Middlebury HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
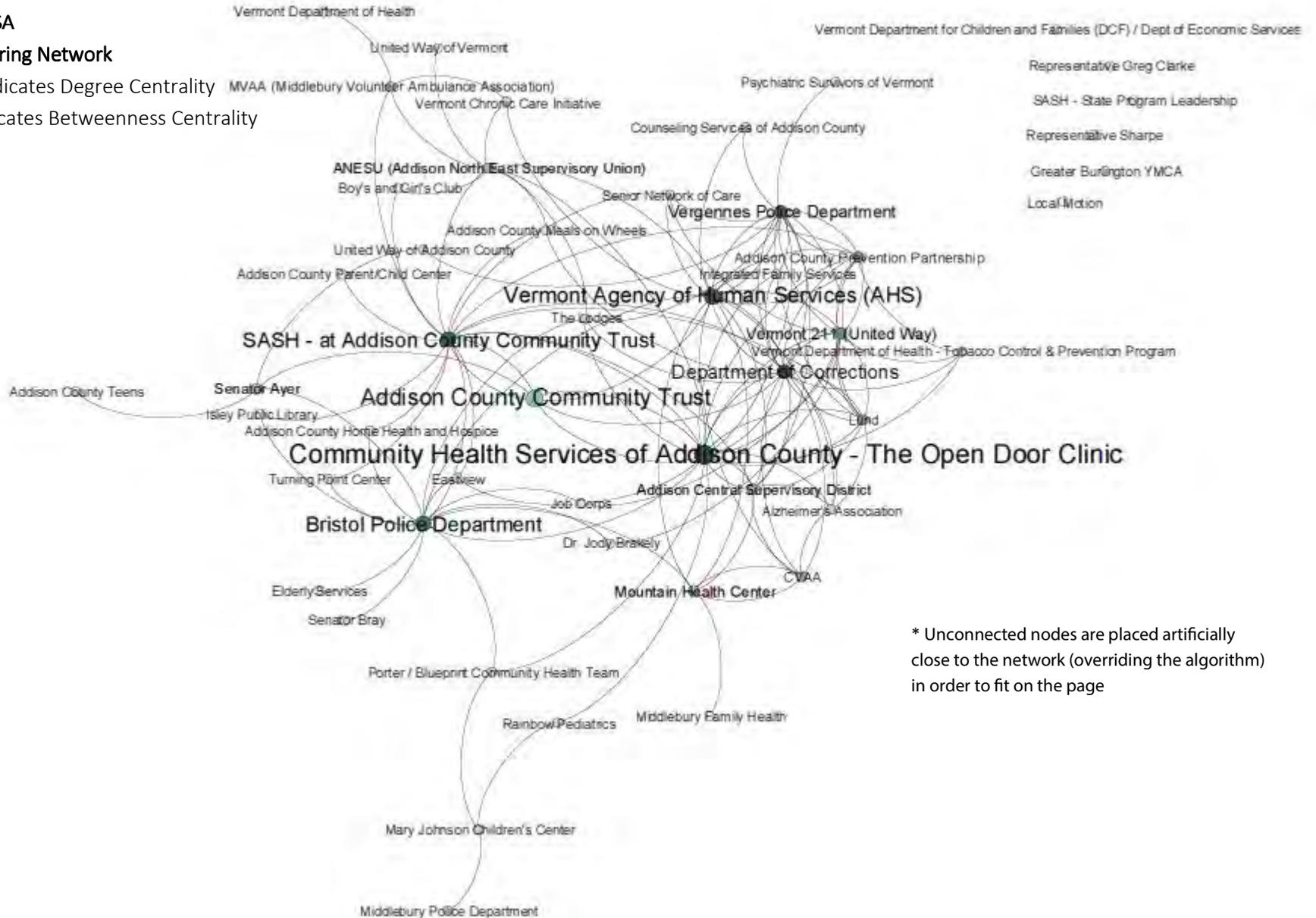
* Unconnected nodes are placed artificially close to the network (overriding the algorithm) in order to fit on the page

Middlebury HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine]

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Middlebury HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality
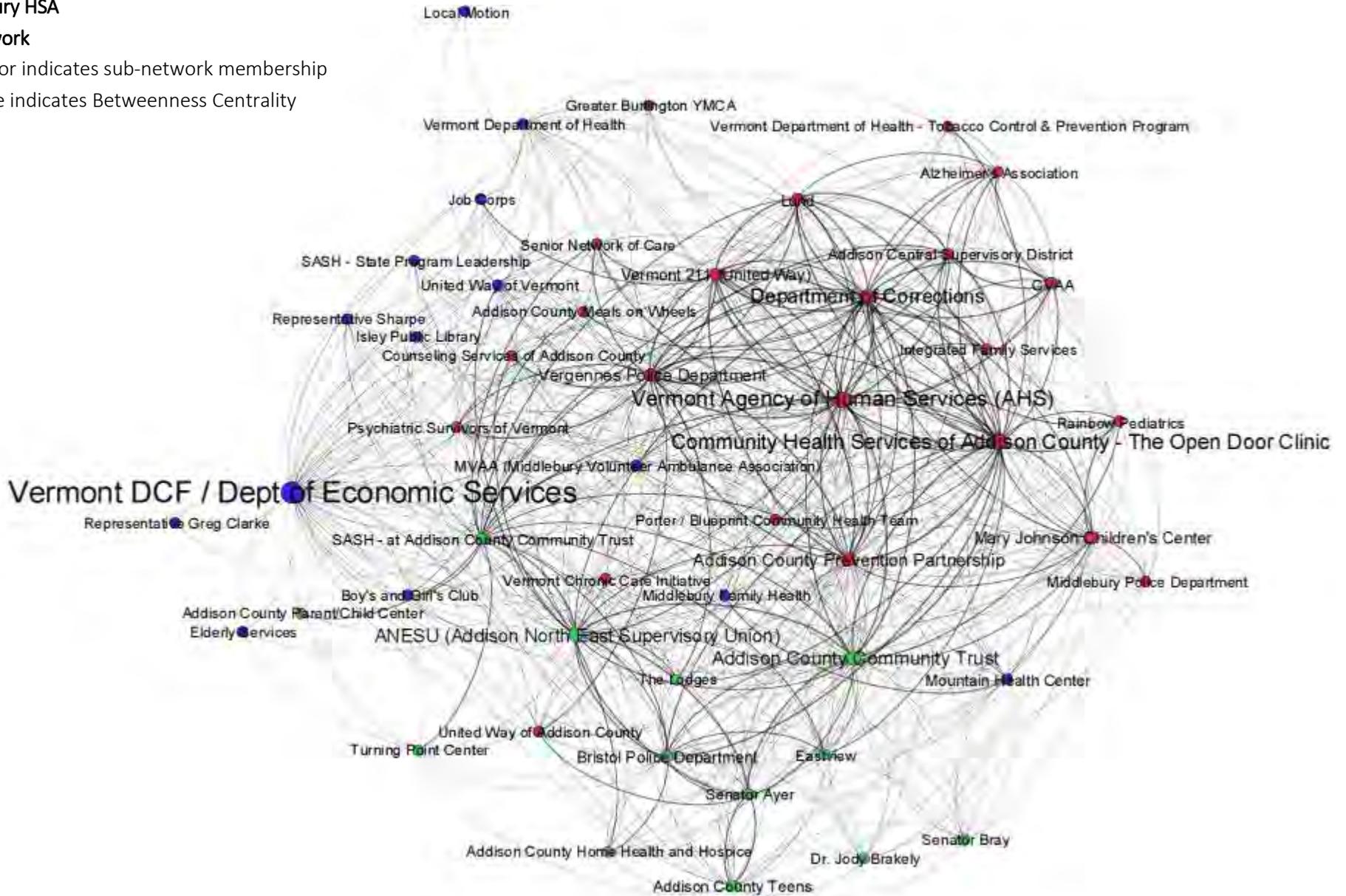
Middlebury Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	50	The network contains 50 nodes (organizations)
Average Degree	12.2	Nodes in the network average about 12 connections each
Average Shortest Path Length	1.8	The average distance between any two randomly selected nodes in the network is a little less than 2 connections
Graph Density	0.25	Of all possible connections in the network, about 25% are present
Modularity	0.16	This measure of the how readily a network dissolves into communities or sub-networks is low, indicating that the sub-networks that exist in the Middlebury HSA are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Middlebury, these nodes are **SASH at Addison County Community Trust, Agency of Human Services (AHS), and Department of Children and Families (DCF) - Economic Services Division.** However, their removal causes relatively minimal

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Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Middlebury's Network Graphs

These are preliminary observations based on the graphs alone—the Middlebury community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. For a community of its size, Middlebury has a large network including many organizations

2. Middlebury's sub-networks seem to have formed, at least in part, based on the geographic location of the organizations

3. The Blueprint Community Health Team does not play a central role in the Middlebury network

4. The Department of Corrections (DOC) and town police departments are included in the Middlebury network and the DOC plays a moderately central role.

5. The Open Door Clinic's centrality suggests that there is strong community support behind this program and its work to provide healthcare to uninsured and underinsured people.

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

The Middlebury community provided feedback following a presentation of these findings at the Middlebury CHT Meeting May 21, 2014. The following are key observations.

1. Members of the Middlebury community observed that the Blueprint was new to their community and that the collaborations were just beginning—these network graphs are a baseline.

2. Concern was expressed that DCF economic services was at the center of the network — it was suggested that it would be better to have prevention services in that place instead.

3. One healthcare provider said that "a lot of the people I see are already in the system" and that the resources the "system" has offered them are maxed out.

4. The group expressed interest in looking at other HSAs graphs and statistics for comparison purpose, and was curious about what the ideal density (and other measures) might be.

5. One participant expressed an interest in connecting the network measurements to the Results Based Accountability process that many social services organizations are using.

6. The group indicated that transportation services, despite not being represented on the list/graph are an important and active part of the network.

7. A participant raised the idea of creating a list of all of the services (health, social, economic) available in the community and what they do. She also expressed interest in working to identify where there was overlaps in these services and where there are gaps.

Vermont Blueprint for Health Community Health Network Study
Morrisville HSA

May 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."

Morrisville HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Morrisville	43	28	65%
Vermont	763	422	55%
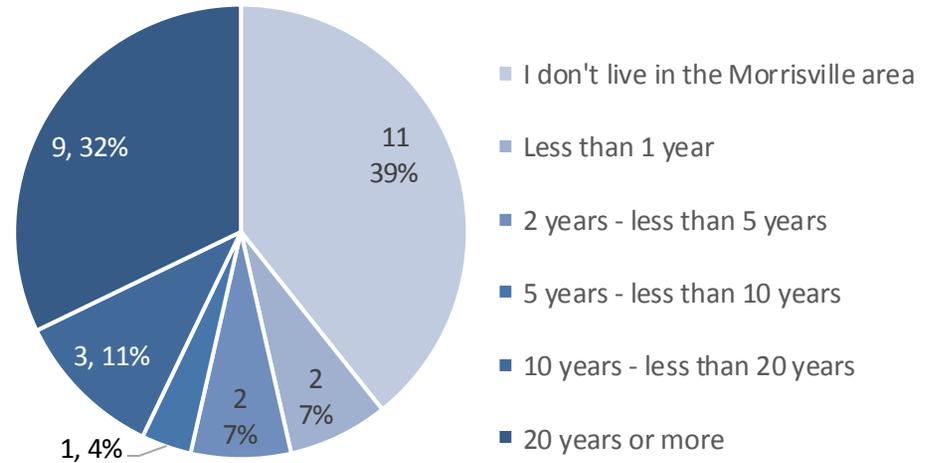
How Long Have you Lived in the Morrisville Area?

- I don't live in the Morrisville area
- Less than 1 year
- 2 years - less than 5 years
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more

11, 39% · 2, 7% · 2, 7% · 1, 4% · 3, 11% · 9, 32%

How often do you attend community meetings aimed at improving the health and wellbeing of your community?

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

4, 15% · 4, 15% · 2, 7% · 3, 11% · 14, 52%

What is your role within your organization?
*Multiple responses allowed, n=28

# of Respondents Selecting Role

Leadership: 10
Non-clinical Professional: 5
Direct Service Provider: 11
Other: 7

3
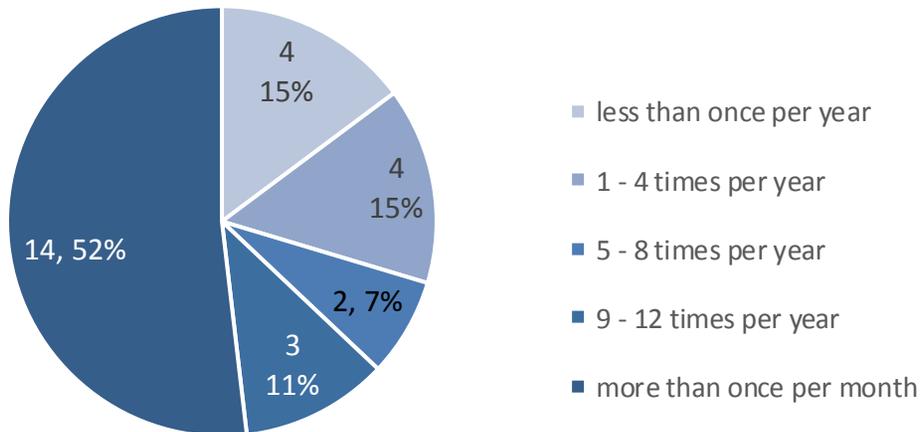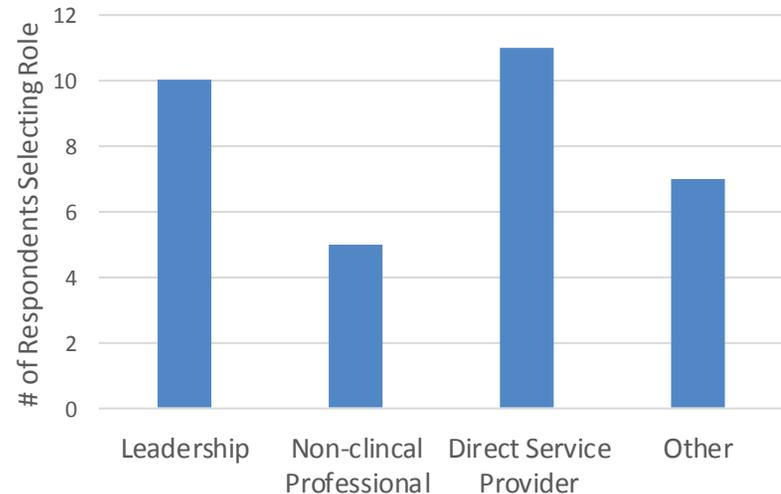
Perceptions of "Teamness" in the Morrisville HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Percentage of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care
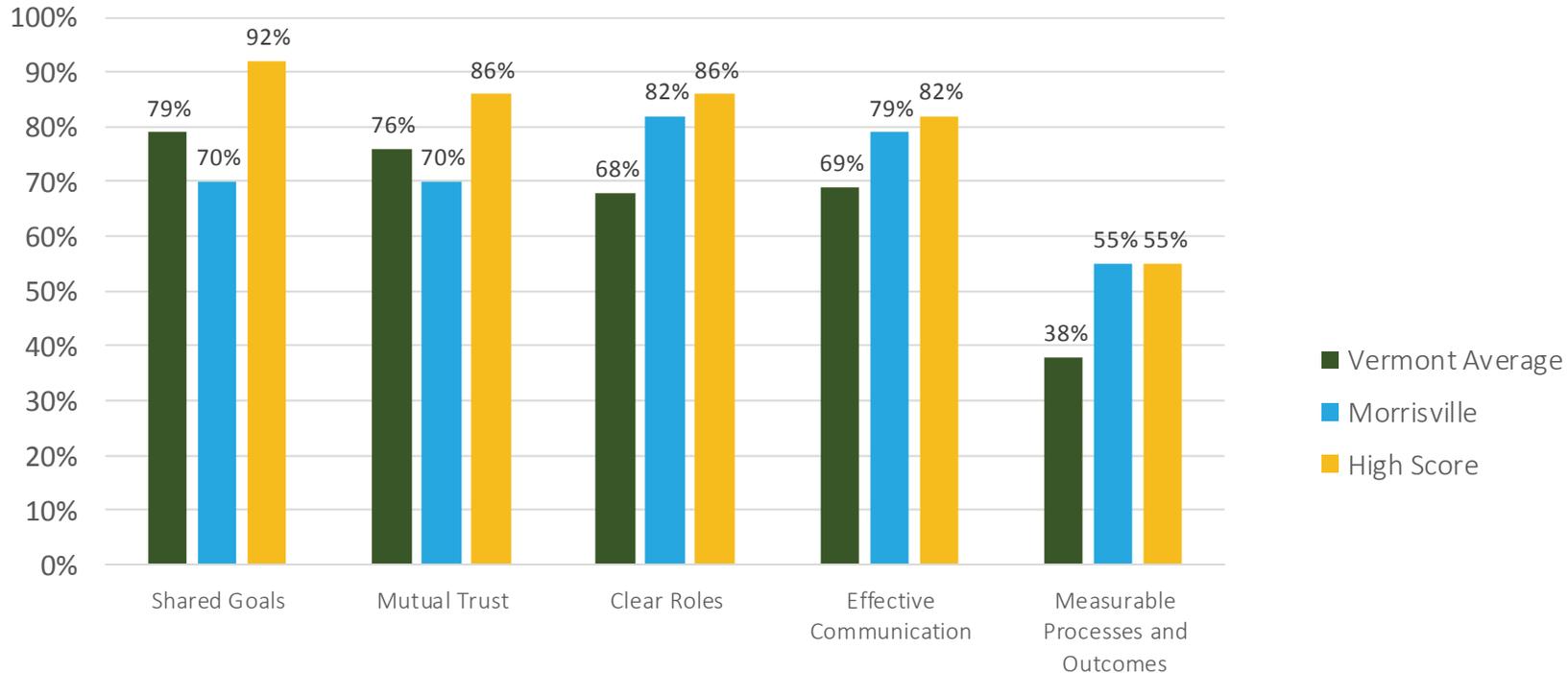
Benefits of Working Together in the Morrisville HSA

Drawbacks of Working Together in the Morrisville HSA

![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine]

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Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways—sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

- Like any picture, a network graph shows a single point in time. It can't tell you how or why the relationships it represents formed. It doesn't show whether the connections it shows are formal or informal, durable or tenuous, friendly or tense. It won't answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency. And it doesn't offer instructions for how to change the shape of the network, should you want to.

Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

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Morrisville HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
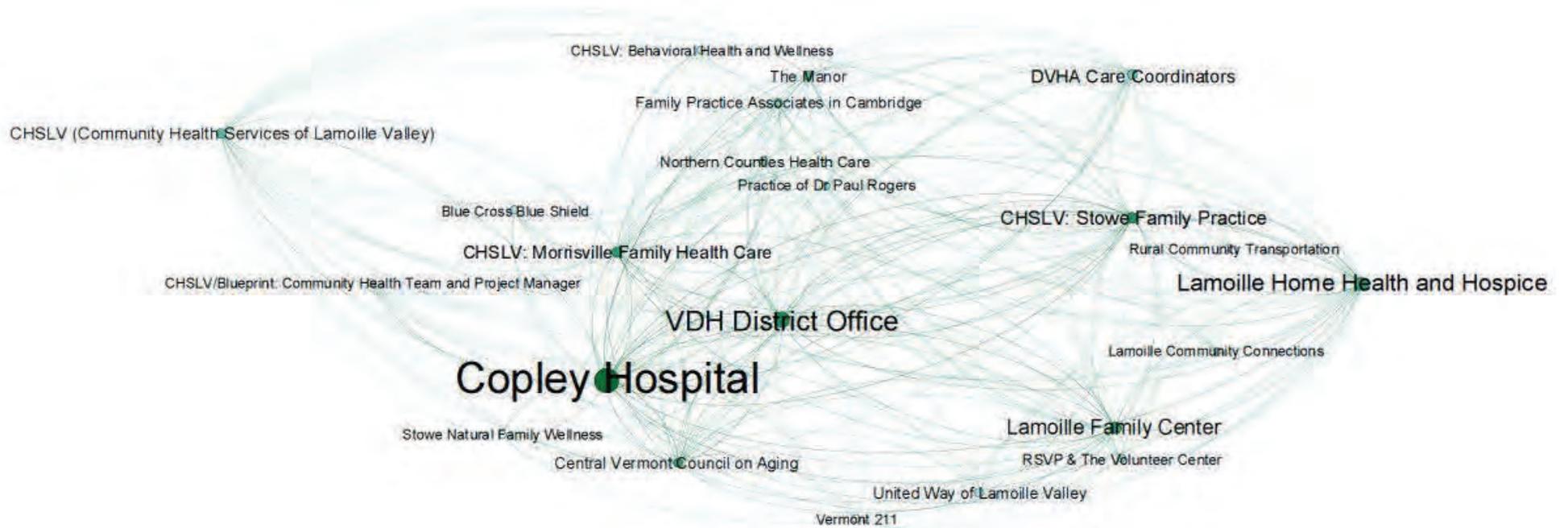
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Morrisville HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Vermont 211

United Way of Lamoille Valley

Blue Cross Blue Shield

RSVP & The Volunteer Center

Rural Community Transportation
Central Vermont Council on Aging

DVHA (Department of Vermont Health Access) Care Coordinators

Stowe Natural Family Wellness

Copley Hospital

Lamoille Home Health and Hospice

Lamoille Community Connections

CHSLV/Blueprint Community Health Team and other Blueprint staff including Project Manager

Lamoille Family Center

Family Practice Associates in Cambridge

VDH (Vermont Department of Health) District Office

Practice of Dr Paul Rogers

Northern Counties Health Care

CHSLV (Community Health Services of Lamoille Valley)

CHSLV: Morrisville Family Health Care

The Manor

CHSLV: Stowe Family Practice

CHSLV: Behavioral Health and Wellness

Morrisville HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
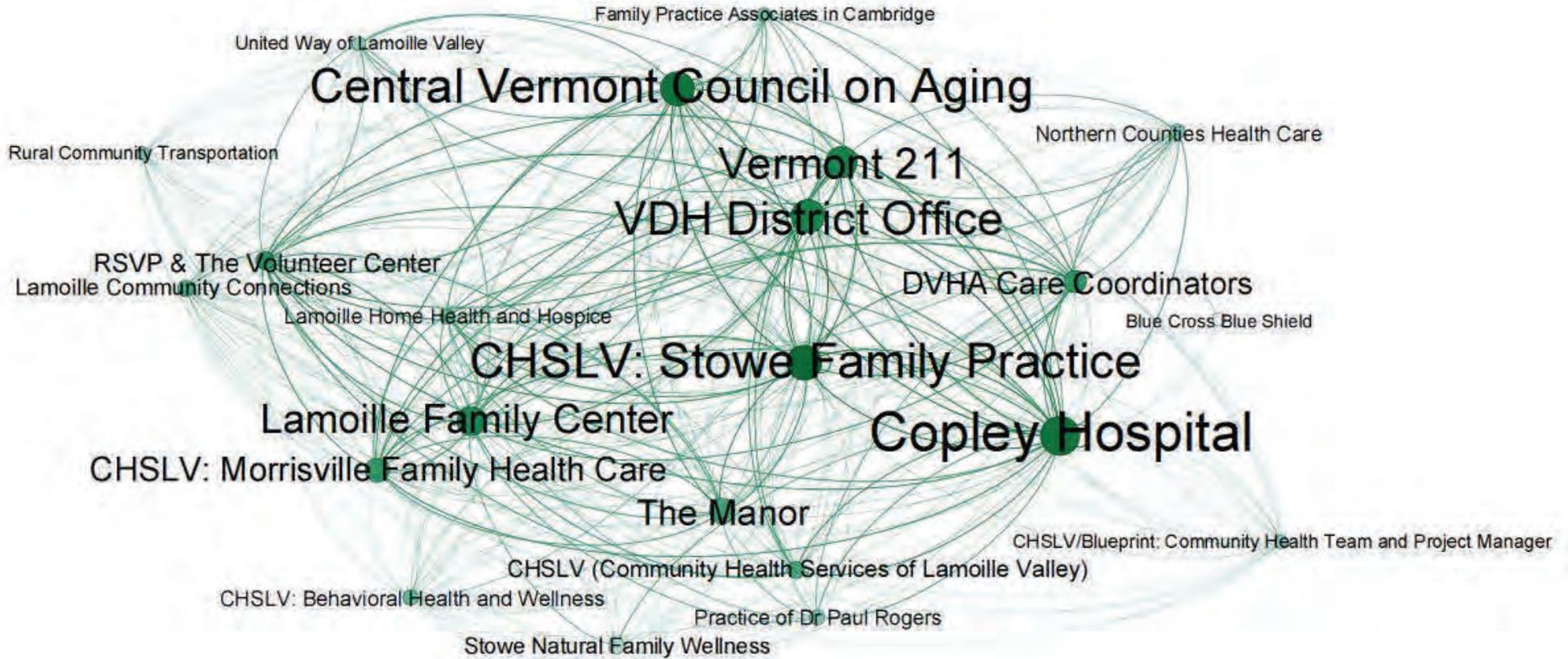
Morrisville HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality
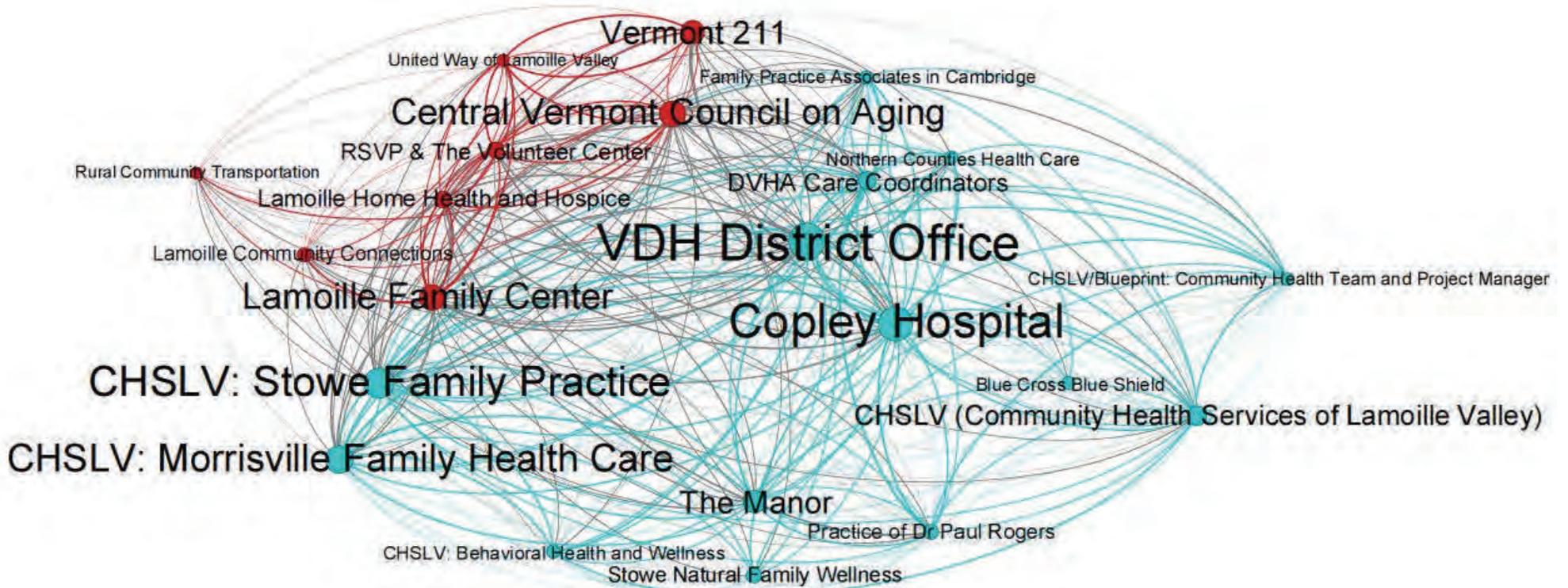
Morrisville Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	22	The network contains 22 nodes (organizations)
Average Degree	15.9	Nodes in the network average about 16 connections each
Average Shortest Path Length	1.3	The average distance between any two randomly selected nodes in the network is a little more than one connection
Graph Density	0.76	Of all possible connections in the network, about 76% are present
Modularity	.05	This measure of the how readily a network dissolves into communities or sub-networks is very low, indicating that the sub-networks that exist in the Morrisville HSA are

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Morrisville, these nodes are **Community Health Services of Lamoille Valley (CHSLV), CHSLV—Morrisville Family Health Care, and Central Vermont Council on Aging.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Morrisville's Network Graphs

These are preliminary observations based on the graphs alone—the Morrisville community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. Copley Hospital is the sole organization at the center of the information sharing network. Copley Hospital is also the most central organization in the resources sharing network, with the VDH District Office having a strong though slightly less central presence.

2. The dense referrals network includes a mix of types of organizations at the center—Copley Hospital and VDH are still central, but are joined by CHSLV's primary care offices, The Central Vermont Council on Aging, Lamoille Family Center, The Manor and Vermont 211.

3. The full network resembles the referrals network, with a large and diverse group of organizations playing central roles. This indicates a high degree of power sharing and cooperation in the Morrisville network overall

4. Elder care organizations play an especially central role in the Morrisville network.

5. The Morrisville network is a very dense network—a high proportion of all possible connections are present.

6. The CHT plays a peripheral role in the network of connections between organizations, possibly indicating a role of facilitator and convener more than intermediary. Another likely explanation for their place in the network is that seamless integration of CHT members into Blueprint practices prevents recognition of the program itself as an actor (e.g. referrals originating with CHT staff may be attributed to the practices).

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

The Morrisville community provided feedback following a presentation of these findings at the CHT meeting May 6, 2014. Additionally, VCHIP interviewed the Project Manager/Facilitator in the Morrisville area.

1. Copley Hospital's is uniquely central in the Morrisville Information Sharing Network—no other organization approaches it. One possible explanation for this is Copley's quarterly newsletter, which contains valuable information for network members.

2. The centrality of Copley Hospital in the referrals network is attributed to joint discharge planning with Copley community providers.

3. Cambridge is on the periphery of the network, represented by Family Practice Associates in Cambridge. A representative of Cambridge said that the Blueprint and CHT meetings bring Cambridge into Lamoille County and that she brings connections to these organizations back to Cambridge (note that in network analysis this brokerage role is formally known as "liaison").

4. Organizations to add to future surveys include AHS (including DCF, the Economic Services Division and Reach Up), Community Action, Adult Day/Out and About, Meals-on-Wheels, the Howard Nichols Center, Greensboro Long Term Care and Nursing, CHSLV Dental and CHSLV Neurology, the Laraway School, the Court Diversion program, Probation and Parole, the YIT Grant, schools, school nurses, wellness programs in schools, and special ed in schools. Also consider including Bright Horizons, though it is part of Lamoille Family Center which is already represented.

5. Morrisville is one of the few HSAs where 211 plays a very central role. It is common practice in this area to refer patients to 211.

6. The absence of youth services in the network reflects the reality in the community—the group mentioned that there is no Boys & Girl's Club and no YMCA.

7. The group did not express any concern about the peripheral role the CHT plays in the Morrisville network. Many members of the Morrisville CHT blend seamlessly into the practices and the administration of the Blueprint work in the community is mainly as "orchestrators" working "behind-the-scenes."

Vermont Blueprint for Health Community Health Network Study
Newport HSA

April 2014

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Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."

Newport HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Newport	**38**	**23**	**61%**
Vermont	**763**	**422**	**55%**

How long have you lived in the Newport area?
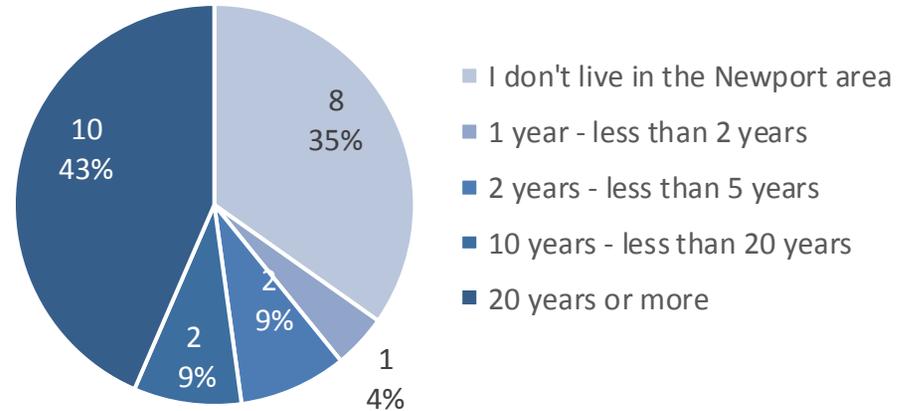
- I don't live in the Newport area
- 1 year - less than 2 years
- 2 years - less than 5 years
- 10 years - less than 20 years
- 20 years or more

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community?

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

What is your role within your organization?
*Multiple responses allowed, n=23

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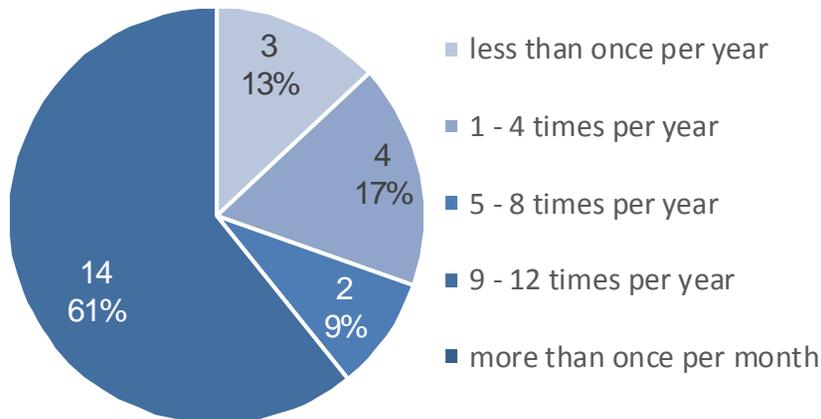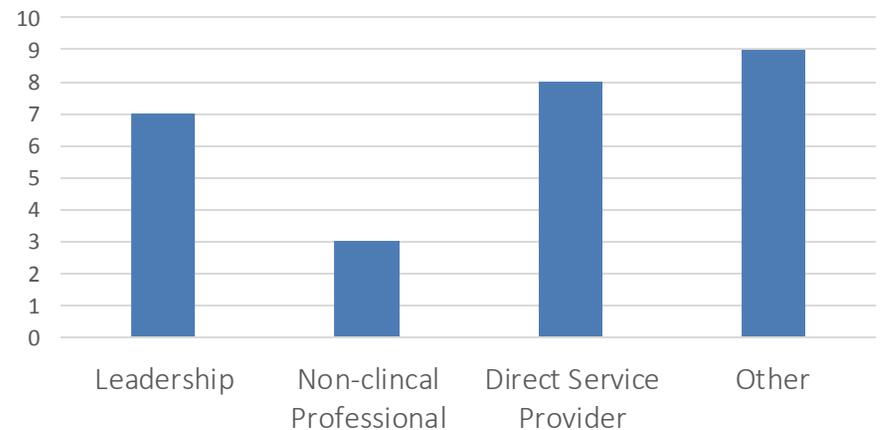
Perceptions of "Teamness" in the Newport HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care

% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care

Bar chart showing percentages by category for Vermont Average, Newport, and High Score:

Category	Vermont Average	Newport	High Score
Shared Goals	79%	81%	92%
Mutual Trust	76%	80%	86%
Clear Roles	68%	86%	86%
Effective Communication	69%	76%	82%
Measurable Processes and Outcomes	38%	43%	55%

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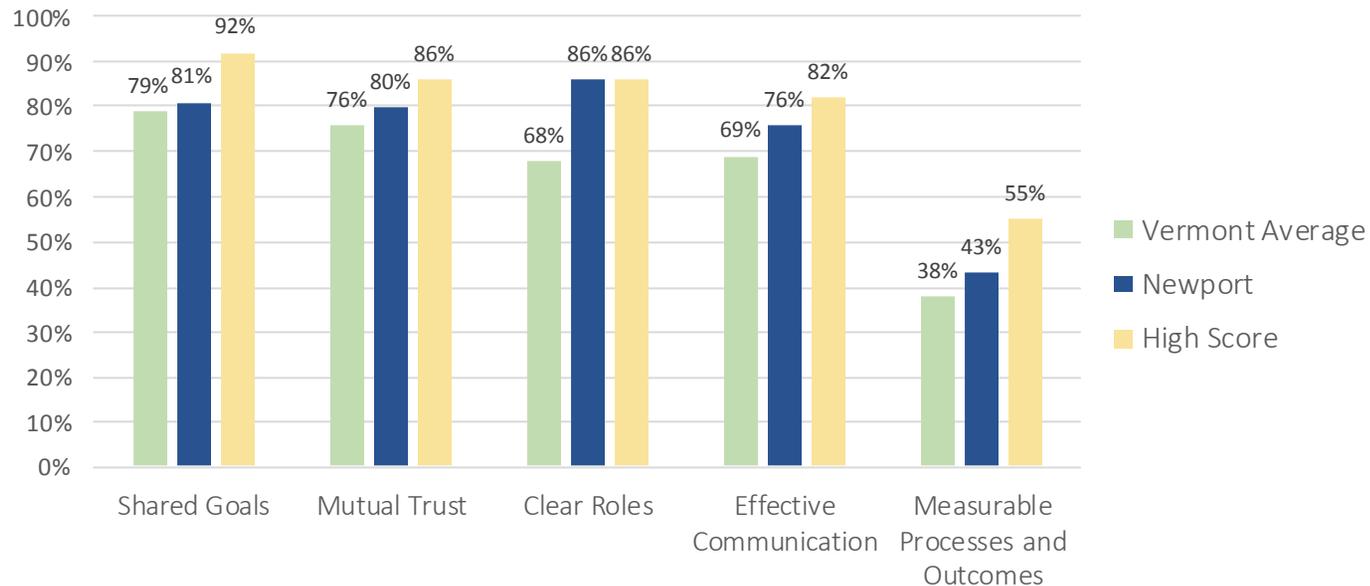
Benefits of Working Together in the Newport HSA
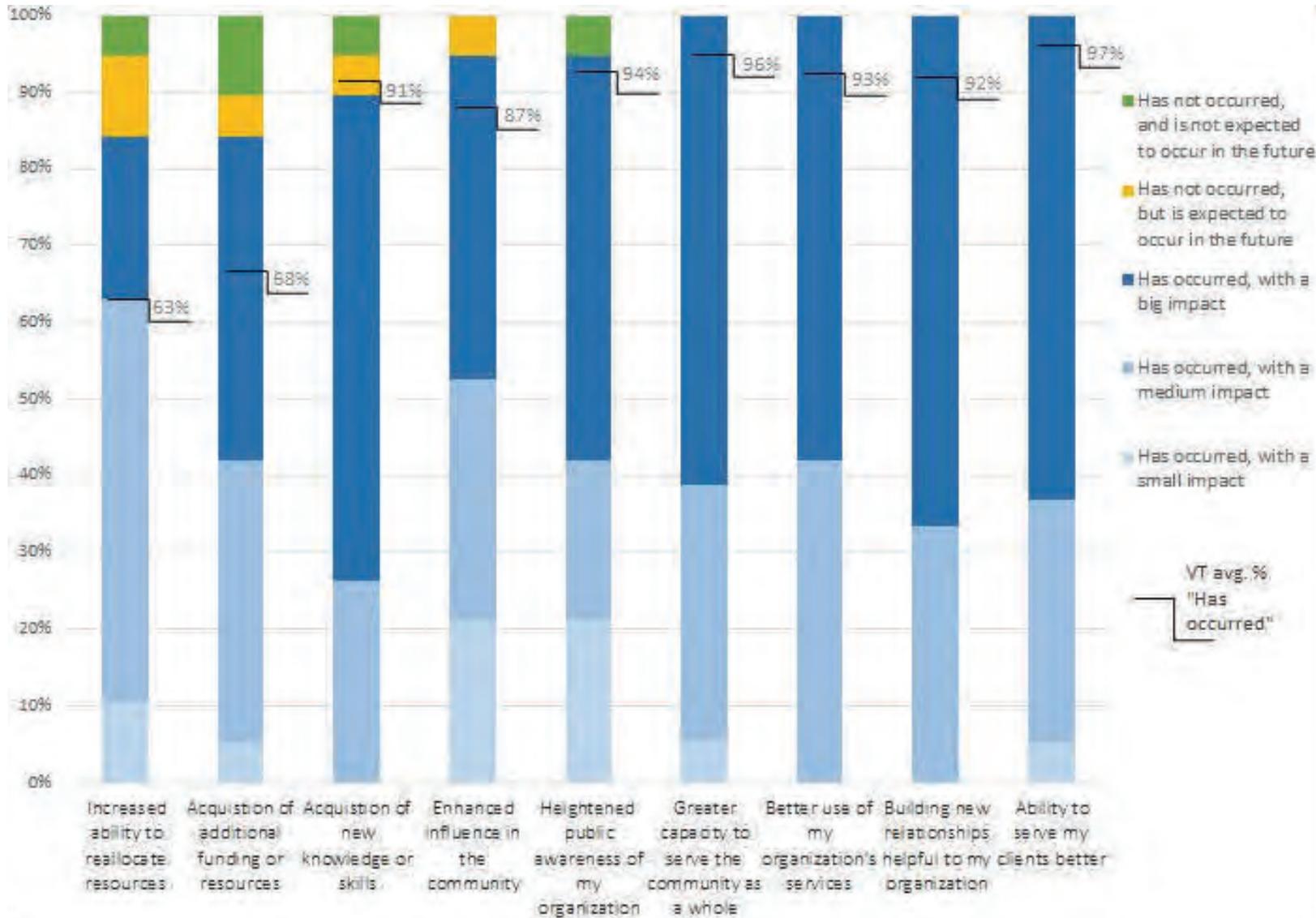
Drawbacks of Working Together in the Newport HSA

Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways—sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

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Screenshot of network analysis question:

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What are the limitations of a network graph (and this study in particular)? What can't it tell me?

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Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

Newport HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
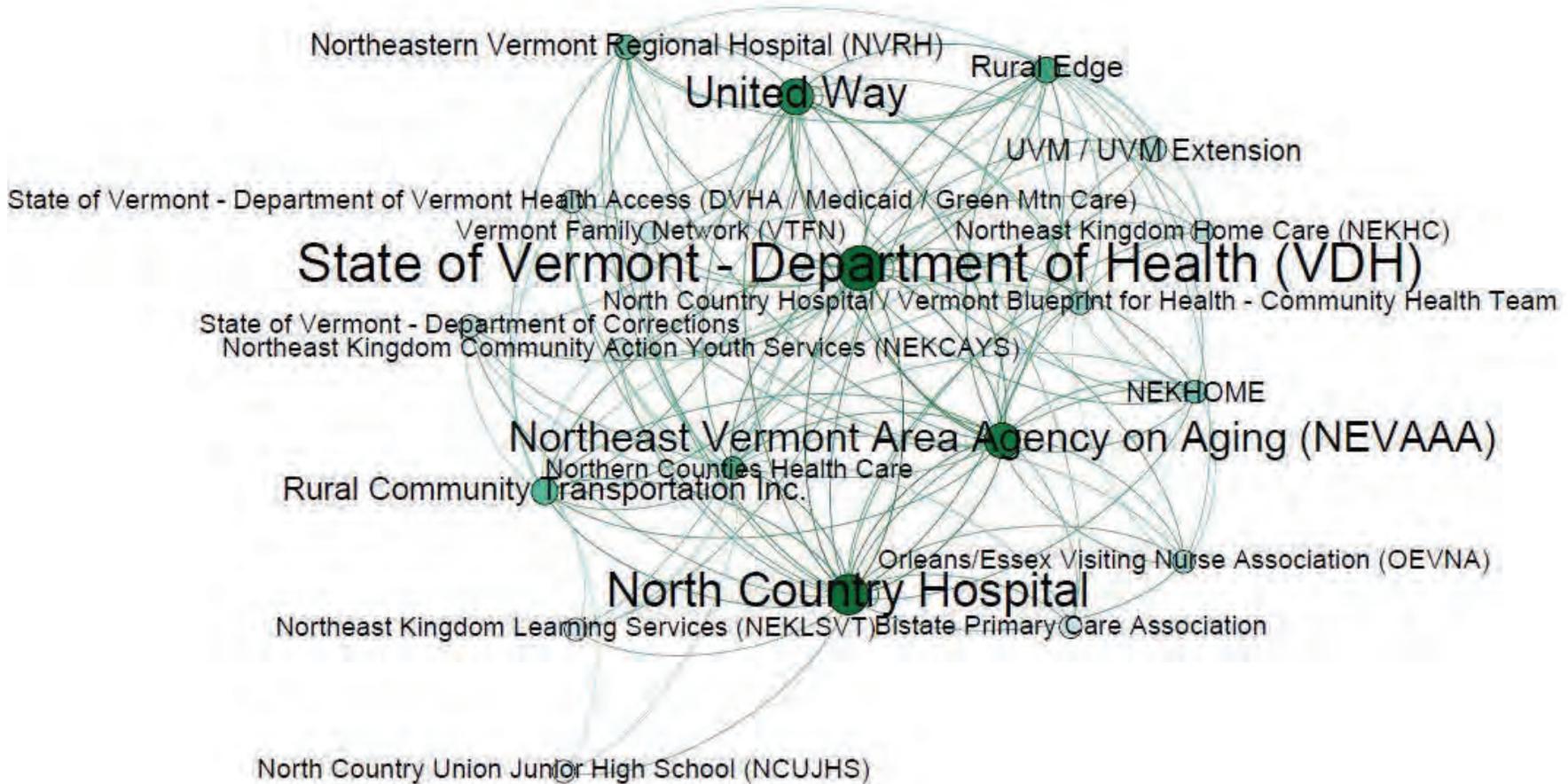
Newport HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine](logo)

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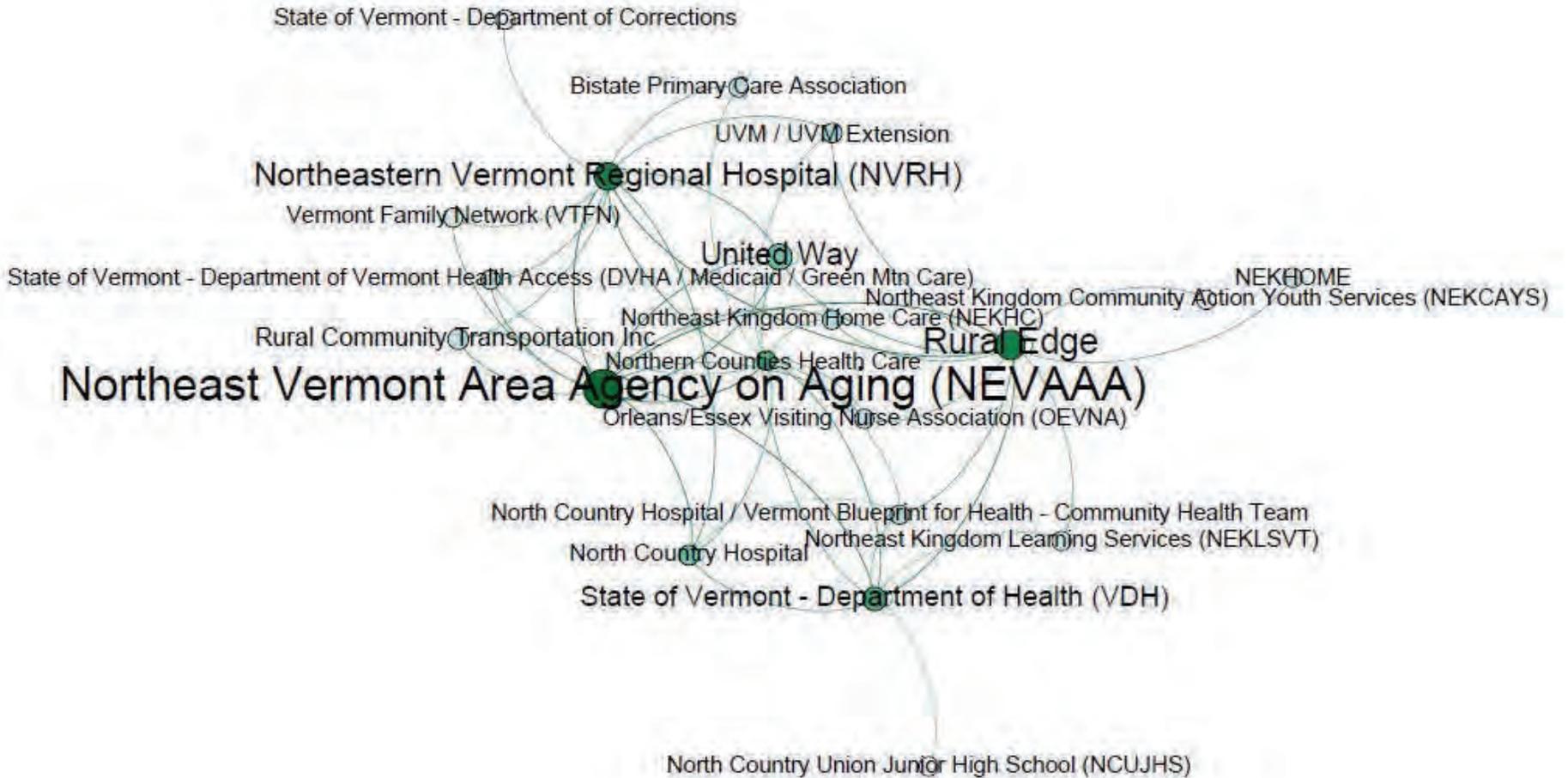
Newport HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
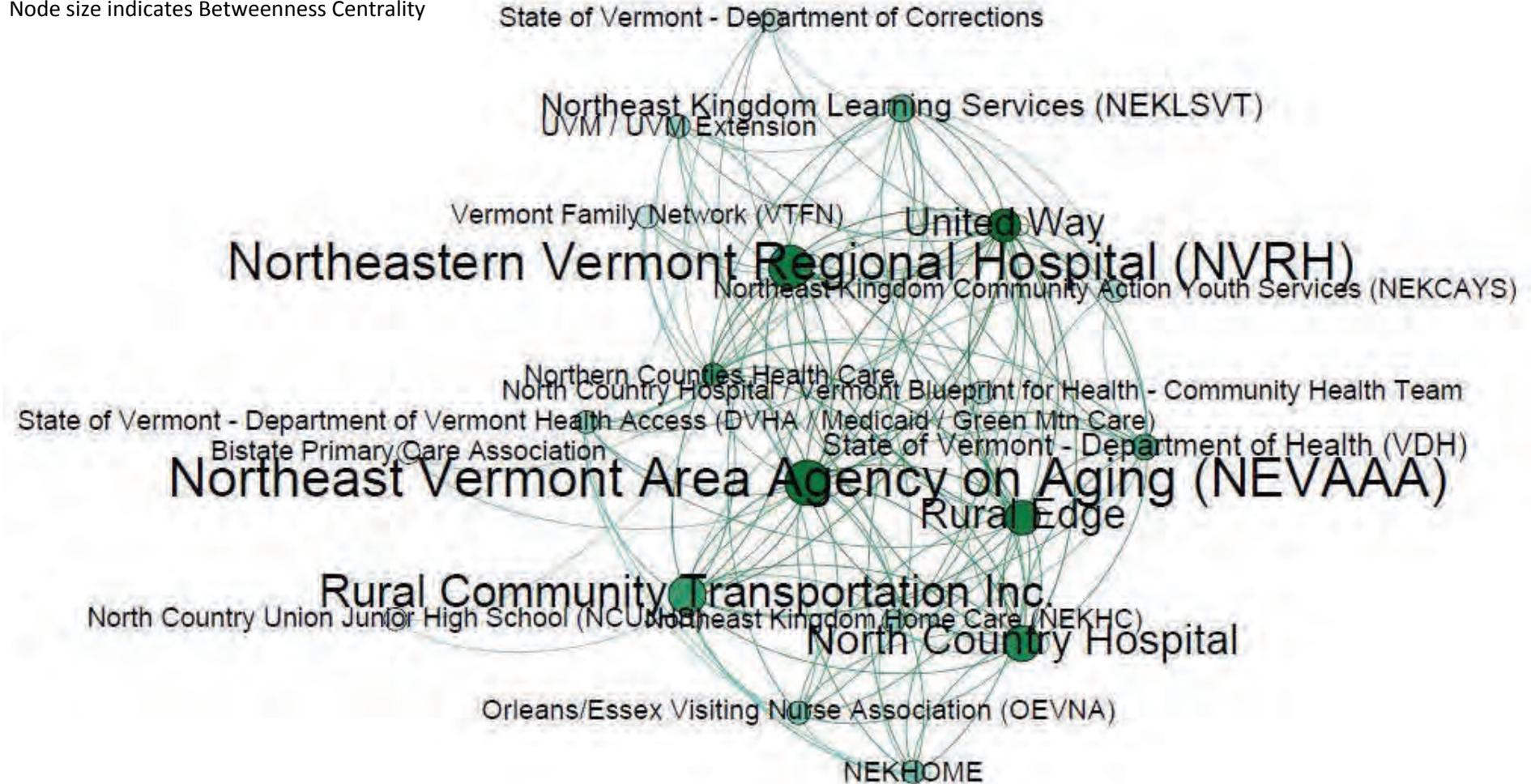
Newport HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality
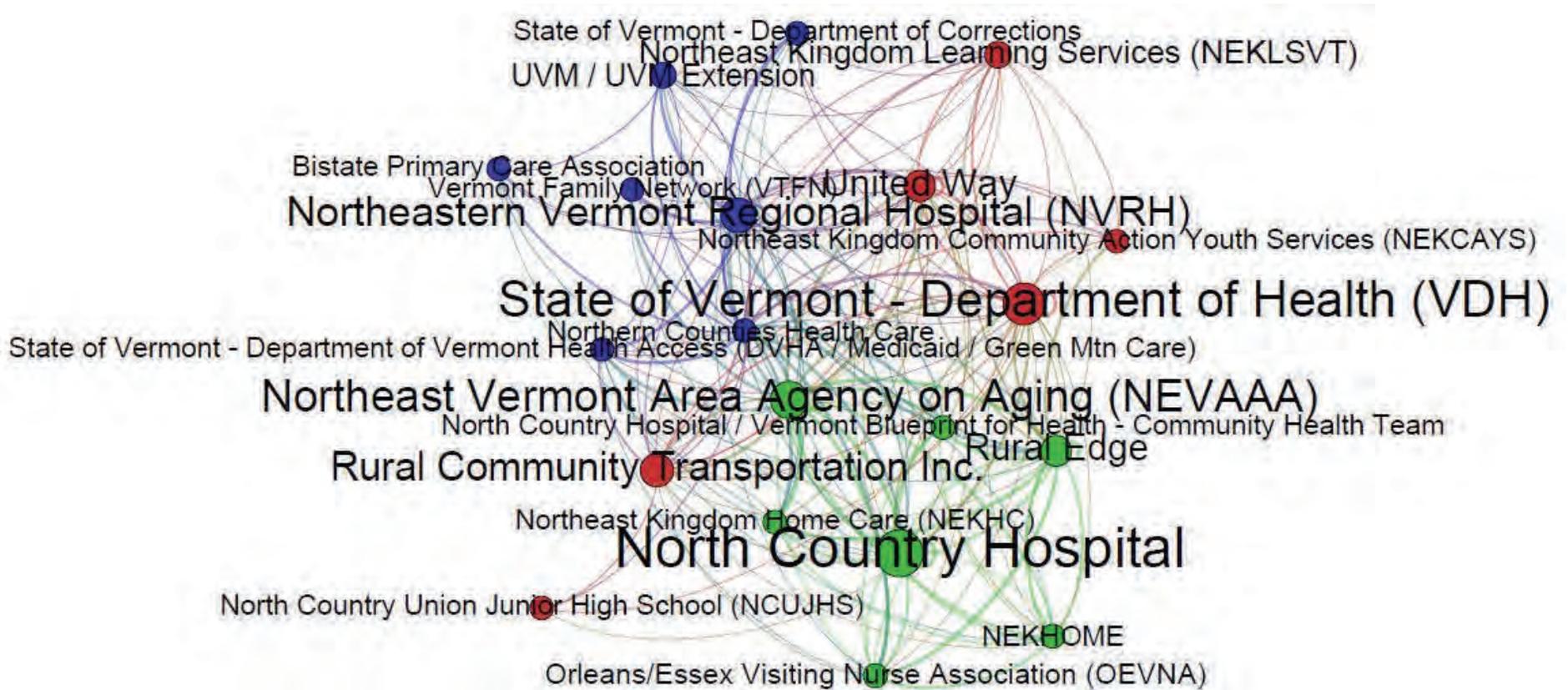
Newport Network Measures & Key Player Analysis

Network Measures:

Measure	#	Notes / Explanation
Network Size	20	The network contains 20 nodes (organizations)
Average Degree	8.05	Nodes in the network average about 8 connections each
Average Shortest Path Length	1.29	The average distance between any two randomly selected nodes in the network is a little more than one connection
Graph Density	0.42	Of all possible connections in the network, about 42% are present
Modularity	0.08	This measure of the how readily a network dissolves into communities or sub-networks is very low relative to other HSAs in the state

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Newport, these nodes are **North Country Hospital, VDH, and Northern Counties Health Care.** Their removal would cause significant disruption to the network—more than the removal of key players in other HSAs, likely due to this network's smaller size.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Newport's Network Graphs

These are preliminary observations based on the graphs alone—the Newport community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. Despite being located in the St. Johnsbury HSA, Northeastern Vermont Regional Hospital (NVRH) has a strong presence in each type of network, indicating its importance to the population of the Newport HSA.

2. The Newport Housing Authority and the Newport Area Visiting Nurses and Hospice, while not identified as "Key Players" (perhaps due to a redundancy of connections with the Blueprint CHT) have strong central roles in all graphs.

3. Rural Community Transportation Inc. is among the more central organizations in the Newport HSA, a positive sign that the Newport network is working to address the issue of transportation to/from health services that is present across the state.

Next: Reflection and Evolution

The following questions may help communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

The Newport community provided feedback following a presentation of these findings at an Extended CHT meeting on April 15, 2014. The following are key observations.

1. In considering the study, the group wanted to be clear that the network depicted is not new. The working group where the presentation was given had been created in 2011 and various coalitions addressing similar topics had coalesced and disbanded over the past 15 years.

2. One of the first things meeting members noticed in the graphs was the centrality of NVRH in the Resources, Referrals, and Full networks. A member of the group suggested this might be due to the fact that NVRH has several primary care providers who prescribe suboxone while NCH has no providers who prescribe the drug. It was also mentioned that NVRH is not bigger nor does it over more specialized services, but may have a greater market share of OB services.

3. The geography of the Newport HSA is such that a cluster of services naturally form in the Island Pond area, which is not fully represented in the graphs.

4. The meeting members provided a long list of organizations to add to the list for the next survey, including community mental health services, The American Foundation for Suicide Prevention, VCCI, Health ONE, Northeast Kingdom Learning Service, BAART Hub & Spoke. (This is a very preliminary list, to be reviewed, added to and edited later).

5. There is an expectation that BAART Hub & Spoke services will be central in future network graphs, as Hub & Spoke is implemented in the community.

Vermont Blueprint for Health Community Health Network Study Randolph HSA

June 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."

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Randolph HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Randolph	50	25	50%
Vermont	763	422	55%

How long have you lived in the Randolph area?

- I don't live in the Randolph area
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more

5 20%
4 16%
1 4%
15 60%

How often do you attend meetings aimed at improving the health and wellbeing of your community?

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

2 8%
5 20%
3 12%
10 40%
5 20%

What is your role within your organization?
*Multiple responses allowed, n=25

Leadership | Non-clinical Professional | Direct Service Provider | Other

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Perceptions of "Teamness" in the Randolph HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care - Randolph
% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care

Characteristic	Vermont Average	Randolph	High Score
Shared Goals	79%	71%	92%
Mutual Trust	76%	75%	86%
Clear Roles	68%	58%	86%
Effective Communication	69%	59%	82%
Measurable Processes and Outcomes	38%	26%	55%
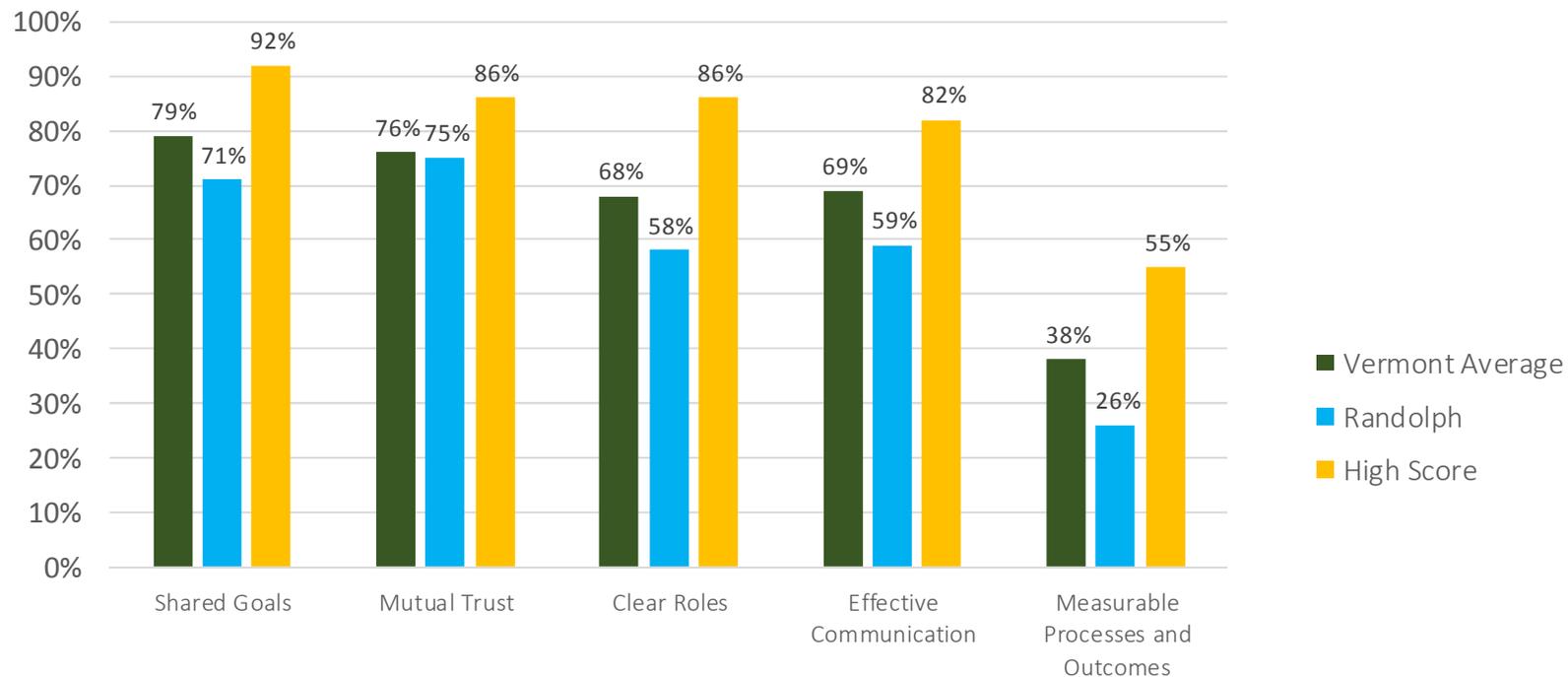
Benefits of Working Together in the Randolph HSA

Drawbacks of Working Together in the Randolph HSA

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Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways—sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

Q7 [Edit Question ▼] [Move] [Copy] [Delete]

Below is a list of organizations in your community that provide either direct health services, or social and economic services that help individuals and families care for themselves and, by extension, their health.

Check each of the ways your organization has worked with the organization listed.

(Please note that there will be no value judgement assigned to whether or not organizations work together in these particular ways. In some cases, these type of interactions may be useful to your organization's mission and in some cases they may not. In the final report, this is the one question where organization names may be reported in order to map functional relationships in your community.)

	Our organizations share information	Our organizations share resources (joint funding, shared equipment, personnel, facilities, etc.)	My organization sends referrals to this organization	My organization receives referrals from this organization
Alzheimer's Association of Vermont	☐	☐	☐	☐
APS Healthcare	☐	☐	☐	☐
Bayada Home Health Care	☐	☐	☐	☐

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

- Like any picture, a network graph shows a single point in time. It can't tell you how or why the relationships it represents formed. It doesn't show whether the connections it shows are formal or informal, durable or tenuous, friendly or tense. It won't answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency. And it doesn't offer instructions for how to change the shape of the network, should you want to.

Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

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Randolph HSA

Information Sharing Network

Node color indicates Degree Centrality

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Randolph HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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Randolph HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine](logo)

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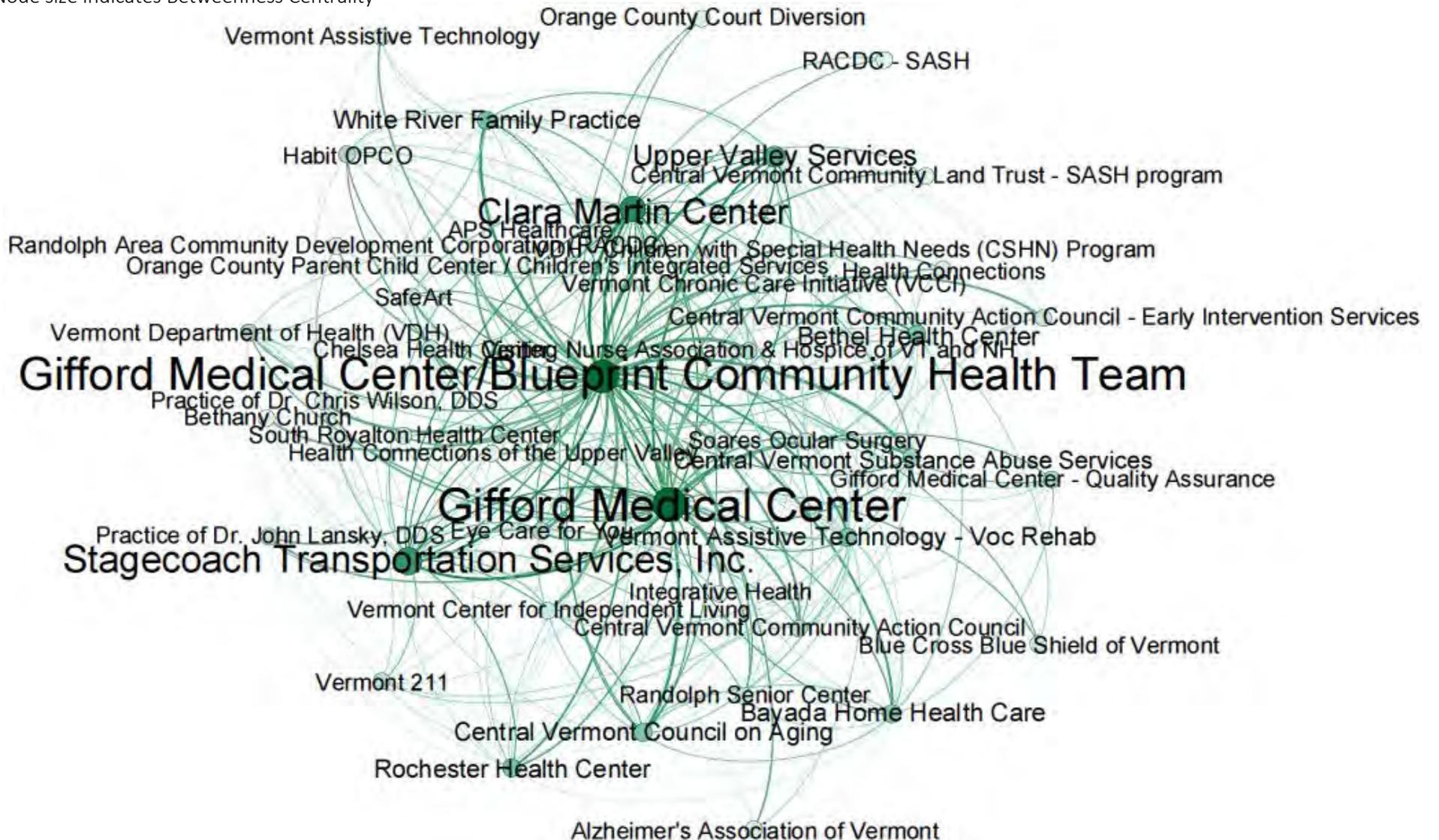
Randolph HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality
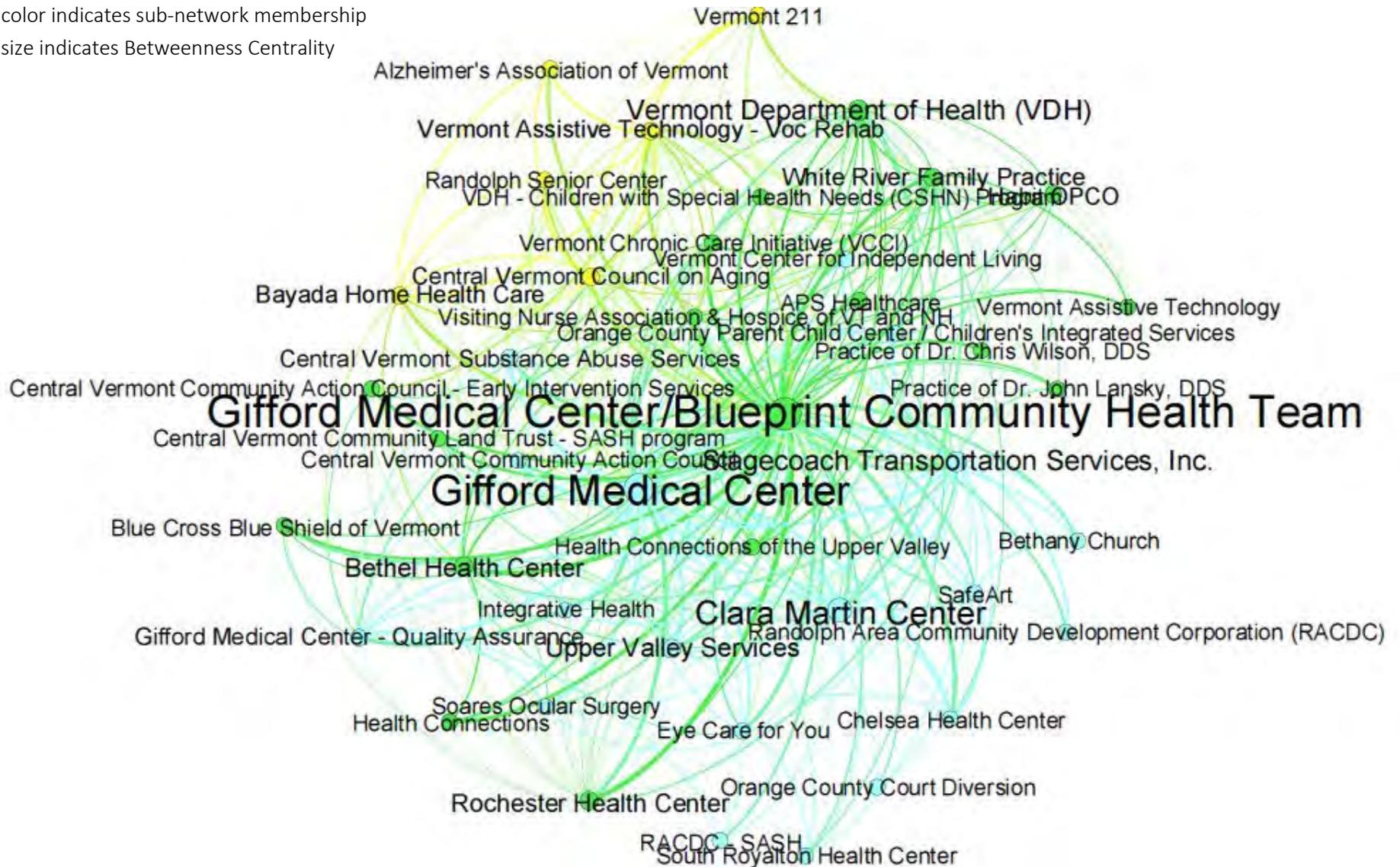
Randolph Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	43	The network contains 43 nodes (organizations)
Average Degree	8.7	Nodes in the network average about 9 connections each
Average Shortest Path Length	1.5	The average distance between any two randomly selected nodes in the network is about one and a half connections
Graph Density	0.21	Of all possible connections in the network, about 21% are present
Modularity	.13	This measure of the how readily a network dissolves into communities or sub-networks is moderate relative to other Vermont HSAs. However, in every HSA the sub-networks are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Morrisville, these nodes are **Clara Martin Center, Gifford Medical Center—Blueprint CHT, and Rochester Health Center.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Randolph's Network Graphs

These are preliminary observations based on the graphs alone—the Randolph community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. Sub-networks in the Randolph HSA appear to have formed in part based on population served—one sub-network is focused on elder care.

2. The Gifford resources network is especially sparse relative to other resources networks in the state.

3. The Gifford referrals network is dense.

4. A transportation service (Stagecoach Transportation Services) is well-connected in the Randolph network, indicating work towards removing a barrier to medical services that is present in many HSAs.

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Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

The Randolph HSA's Blueprint leadership provided feedback on this report in a meeting on Friday June 13, 2014.

1. Blueprint leadership in the Randolph HSA are interested in measuring network activity and effectiveness in a way that is consistent with other HSAs. They asked "What are they looking for at the state level? . . . What's important? What are the payers looking for?"

2. The strength of the relationships-based benefits is not surprising to the Randolph leadership, who describe their network's work to date as focused on information sharing vs. instituting any specific improvement processes.

3. Randolph leadership is interested in knowing what the high scoring HSAs are for each measure, so they can reach out for tips.

4. Despite the central presence of a transportation service in the Randolph network, residents of the area continue to face transportation-related barriers to care. What is available via Stagecoach Transportation is not enough. Blueprint leadership says that 25% of referrals to the CHT are transportation related and they also experience lots of cancellations due to transportation.

5. Randolph leadership is interested in how effective the network is in reaching the Rochester area, which is relatively isolated and missing many of the resources that are available in other towns in the HSA.

6. Leadership would support combining the Randolph and White River networks in the next study (they are officially one HSA) if that is recommended by the researcher and Blueprint.

Vermont Blueprint for Health Community Health Network Study
Rutland HSA

April 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."
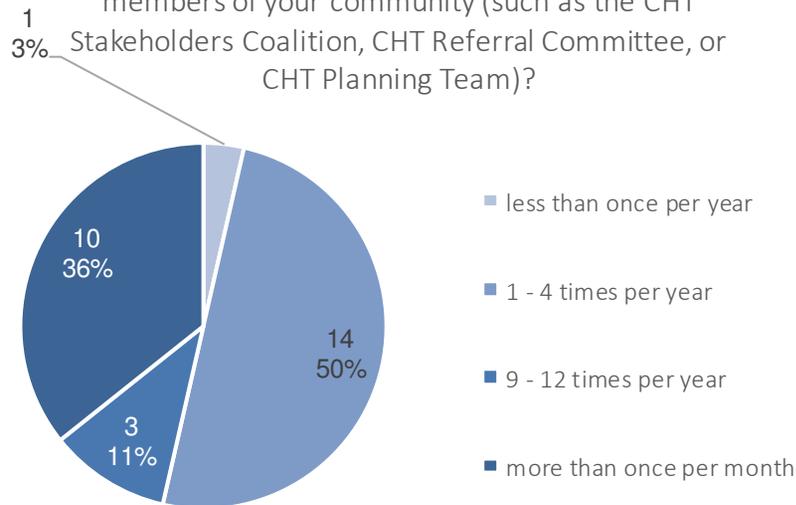
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Rutland HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Rutland	54	28	52%
Vermont	763	422	55%

How long have you lived in the Rutland area?
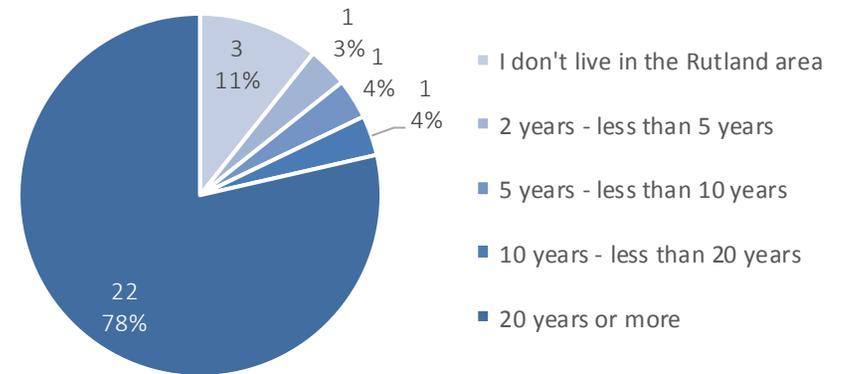
- I don't live in the Rutland area
- 2 years - less than 5 years
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community (such as the CHT Stakeholders Coalition, CHT Referral Committee, or CHT Planning Team)?

- less than once per year
- 1 - 4 times per year
- 9 - 12 times per year
- more than once per month

What is your role within your organization?
*Multiple responses allowed, n=28

3

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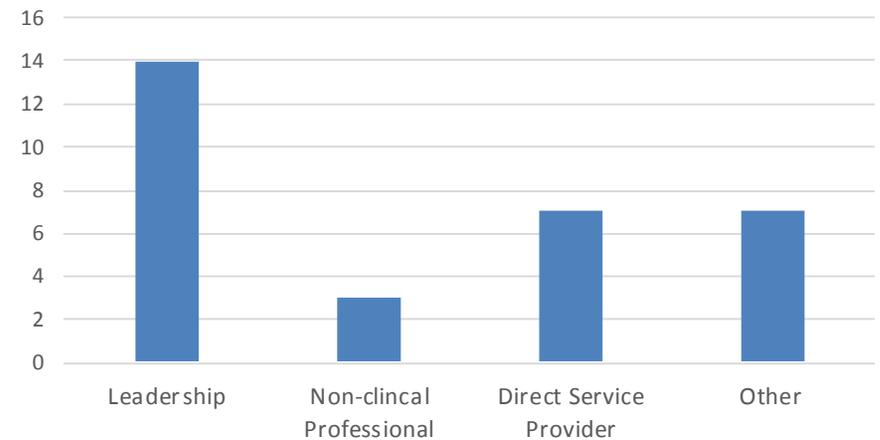
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We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Percent of Respondents Who "Agree" or "Strongly Agree" That Their Community Network Exhibits These Qualities of Team-Based Care
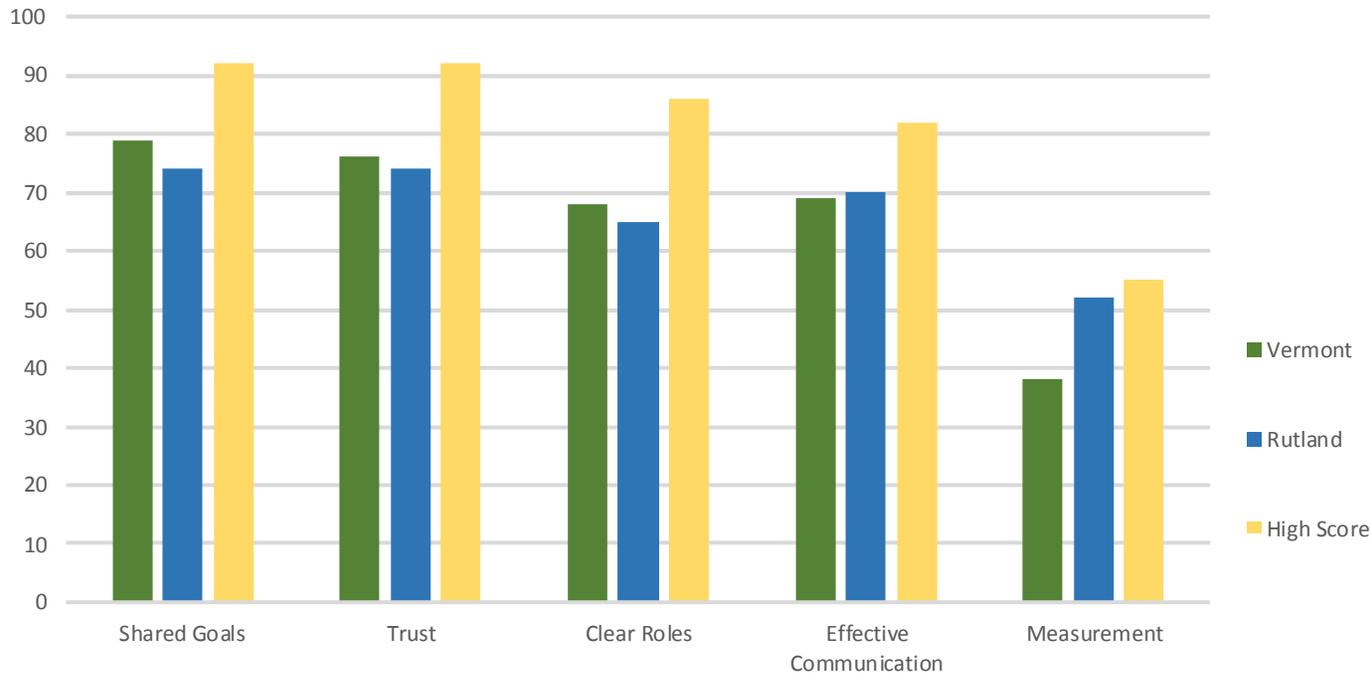
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What can network analysis tell me?

Screenshot of network analysis question:

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	Our organizations share information	Our organizations share resources (joint funding, shared equipment, personnel, facilities, etc.)	My organization sends referrals to this organization	My organization receives referrals from this organization
Alzheimer's Association of Vermont	☐	☐	☐	☐
APS Healthcare	☐	☐	☐	☐
Bayada Home Health Care	☐	☐	☐	☐

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

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The "nodes" on these graphs are the dots that represent organizations

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The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

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A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

Rutland HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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Rutland HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Rutland County Housing Coalition
BROC (Community Action in Southwestern Vermont)

Vermont Adaptive Ski and Sports
CCV(Community College of Vermont)

Rutland United Neighbors
Department of Corrections
Proctor High School   Castleton Cares
Mountain ViewCare, Genesis

Stafford Technical Center
211 Vermont
Division for the Blind and Visually Impaired
Interage
Vermont Psychiatric Survivors
Rutland City Police Department   BCBS VT   RSVP
Boys and Girls Club
Mentor Connector
Veterans Affairs   Dodge House
Open Door Mission
Vermont Cares

Rutland Mental Health
Marble Valley Transit
Fair HavenConcerned   Choices for Care

Vermont Agency of Human Services
Southern Vermont Area Health Education Center

Rutland Mental Health - Rutland Area Prevention Coalition

Rutland City School District
Vocational Rehab   Rutland County Parent Child Center   Rutland County Women's Network and Shelter
Bayada
Vermont Center for Independent Living
Southwestern Vermont Council on Aging
Castleton Senior Center

Rutland Housing Authority

Prevent Child Abuse Vermont   Vermont Department of Health (VDH)   The Pines at Rutland

Rutland Area Visiting Nurses and Hospice

Vermont Achievement Center   RRMC - Emergency Department   RRMC - Community Education
Rutland Community Cupboard   Rutland Regional Medical Center (RRMC)   United Way of Rutland County
RRMC - Case Management, Utilization, and Social Work   Vermont Chronic Care Initiative (VCCI)
Rutland Free Clinic

RRMC/Blueprint Community Health Team

Recovery House   CHCRR (Community Health Centers of the Rutland Region)
Michael Dorr   Practice of Jennifer Fauntleroy, MD
Practice of Beverly Roseberry, MD
Practice of Drs. Peter and Lisa Hogenkamp
Marble Valley Healthworks

* Unconnected nodes are placed artificially
close to the network (overriding the algorithm)
in order to fit on the page

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Rutland HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Rutland HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality

Rutland Network Measures & Key Player Analysis

Network Measures:

Measure	#	Notes / Explanation
Network Size	60	The network contains 60 nodes (organizations)
Average Degree	7.72	Nodes in the network average about 8 connections each
Average Shortest Path Length	1.64	The average distance between any two randomly selected nodes in the network is a little more than one and a half connections
Graph Density	0.13	Of all possible connections in the network, about 13% are present
Modularity	0.14	This measure of the how readily a network dissolves into communities or sub-networks is on the high end for Vermont HSAs, but low in general, indicating that the sub-networks that exist in Rutland are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Rutland, these nodes are **Community College of VT, RRMC—Blueprint Community Health Team, and the Southern Vermont Area Health Education Center.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Rutland's Network Graphs

These are preliminary observations based on the graphs alone—the Rutland community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. The Blueprint Community Health Team has a prominent role in all of the graphs—information, resources, and referrals.

2. Rutland appears to have a very inclusive network, including multiple representatives of all the expected types of organizations/ services as well as some not seen in every network—for instance an adaptive ski and sports program, a youth center, a mentoring program, and various volunteer services.

3. The Police Department and Department of Corrections are well-represented in the network, a positive sign given the costs to the community of providing health care and other services to the population involved with these entities.

4. The Rutland Housing Authority and the Rutland Area Visiting Nurses and Hospice, while not identified as "Key Players" (perhaps due to a redundancy of connections with the Blueprint CHT) have strong central roles in all graphs.

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

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5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

The Rutland community provided feedback following a presentation of these findings at the CHT Stakeholder Advisory on April 21, 2014.

1. Members of the Rutland community, while initially surprised that CCV was identified as a "Key Player," observed that they participate actively in this network by providing learning opportunities and partnering with Creative Workforce Solutions.

2. The group was surprised that Community Health Centers of the Rutland Region (CHCRR) was not more central, and guessed that the reason might be non-response (i.e. the connections shown are only connections in). However, it was then suggested that there were "more issues with CHCRR . . . connections are still being built."

3. SASH partners and Hub & Spoke are not included in this network. The group wants them added to the list for the next survey, and expects they will play a central role because they are new and active members of the network.

4. The Rutland group indicated that the list of organizations was fairly complete (excepting SASH and Hub & Spoke) and that they were more concerned about encouraging respondents to complete the survey by keeping the list of organizations as short as possible than about adding organizations (again, excepting SASH and Hub & Spoke).

5. It was mentioned that VCHIP was not included in the survey, though they are a big part of Blueprint implementation in the community

6. An AHS representative at the meeting said that, within AHS, every current initiative is encouraging connection with the Blueprint..

7. In Rutland, pediatrics has just become part of the Blueprint. With this in mind, the group speculated that the VNA may be central in the network because it is the Children's Integrated Services provider for the area. There was a more general question asked about how connected youth organizations are.

8. It was pointed out that substance abuse organizations tend to be at the edges of the network, and it was asked whether this was OK or whether it would be better for them to be closer.

9. Rutland meeting members were interested in being able to compare and contrast their network graphs with network graphs from other HSAs.

Vermont Blueprint for Health Community Health Network Study

Springfield HSA

June 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."

Springfield HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Springfield	87	42	48%
Vermont	763	422	55%

How long have you lived in the Springfield area?
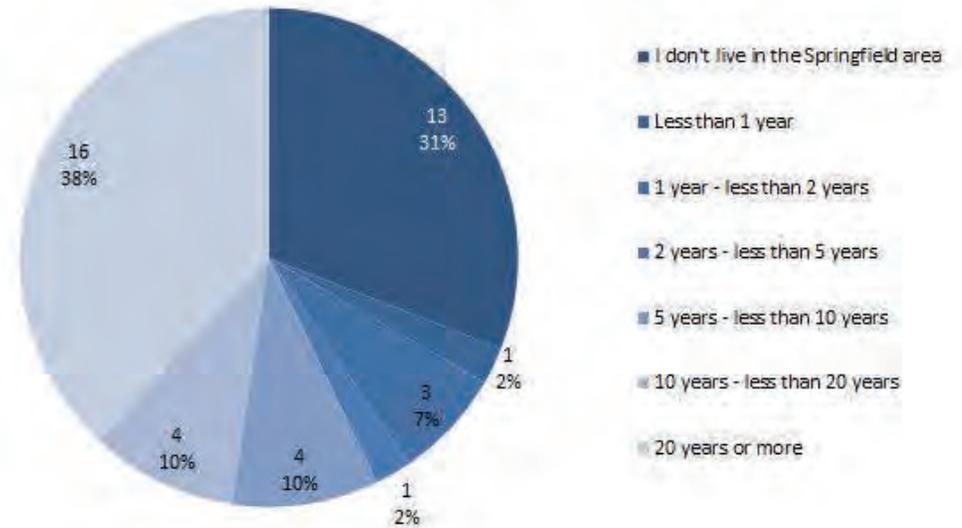
- I don't live in the Springfield area
- Less than 1 year
- 1 year - less than 2 years
- 2 years - less than 5 years
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more

13 — 31%
16 — 38%
1 — 2%
3 — 7%
1 — 2%
4 — 10%
4 — 10%

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community?

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

2 — 5%
7 — 17%
15 — 36%
6 — 14%
12 — 28%

What is your role within your organization?
*Multiple responses allowed, n=42

Leadership — 10
Non-clinical Professional — 3
Direct Service Provider — 19
Other — 14

3
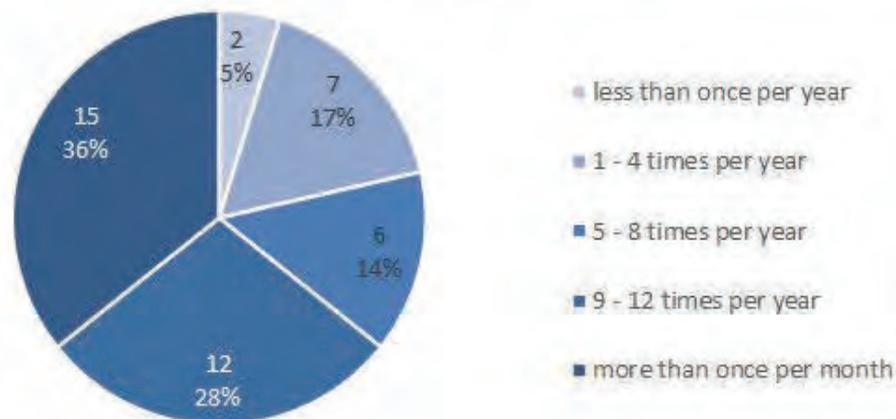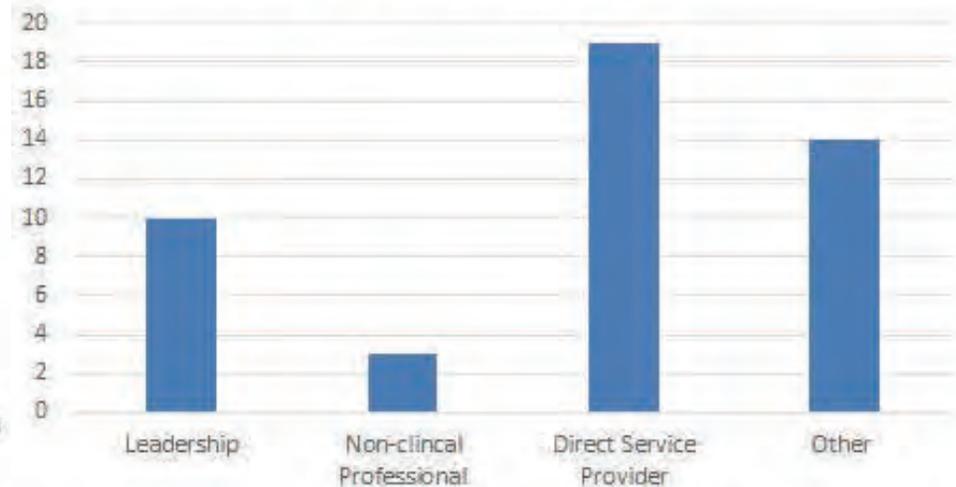
Perceptions of "Teamness" in the Springfield HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Chart Area — % of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care

Characteristic	Vermont Average	Springfield	High Score
Shared Goals	79%	79%	92%
Mutual Trust	76%	80%	86%
Clear Roles	68%	65%	86%
Effective Communication	69%	70%	82%
Measurable Processes and Outcomes	38%	52%	55%

Benefits of Working Together in the Springfield HSA

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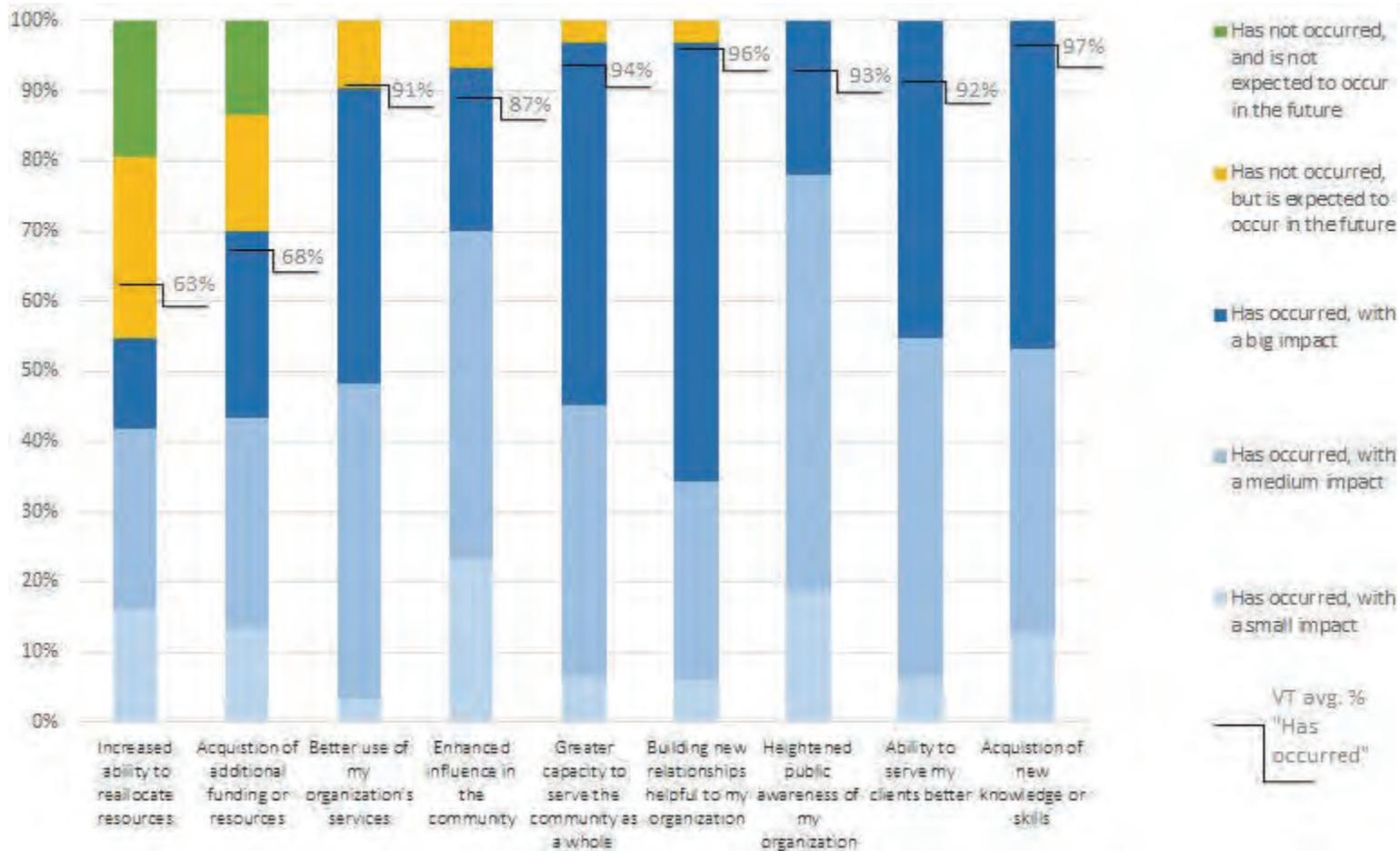
Drawbacks of Working Together in the Springfield HSA

Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways—sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

Q7 [Edit Question ▼] [Move] [Copy] [Delete]

Below is a list of organizations in your community that provide either direct health services, or social and economic services that help individuals and families care for themselves and, by extension, their health.

Check each of the ways your organization has worked with the organization listed.

(Please note that there will be no value judgement assigned to whether or not organizations work together in these particular ways. In some cases, these type of interactions may be useful to your organization's mission and in some cases they may not. In the final report, this is the one question where organization names may be reported in order to map functional relationships in your community.)

	Our organizations share information	Our organizations share resources (joint funding, shared equipment, personnel, facilities, etc.)	My organization sends referrals to this organization	My organization receives referrals from this organization
Alzheimer's Association of Vermont	☐	☐	☐	☐
APS Healthcare	☐	☐	☐	☐
Bayada Home Health Care	☐	☐	☐	☐

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

- Like any picture, a network graph shows a single point in time. It can't tell you how or why the relationships it represents formed. It doesn't show whether the connections it shows are formal or informal, durable or tenuous, friendly or tense. It won't answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency. And it doesn't offer instructions for how to change the shape of the network, should you want to.

Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine](logo)

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Springfield HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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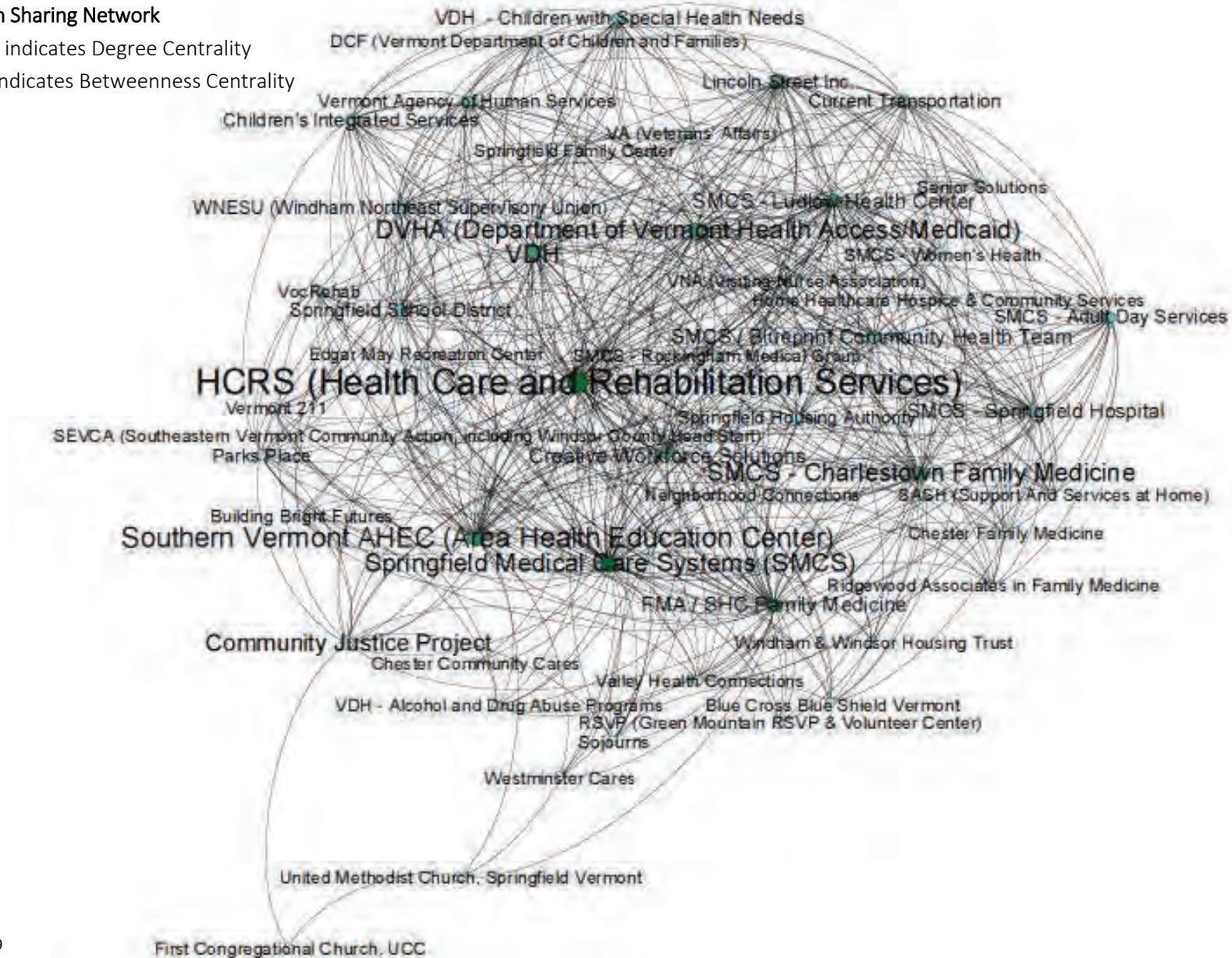
Springfield HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

* Unconnected nodes are placed artificially close
to the network (overriding the algorithm) in
order to fit on the page

VCHIP

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UNIVERSITY OF VERMONT COLLEGE OF MEDICINE

Springfield HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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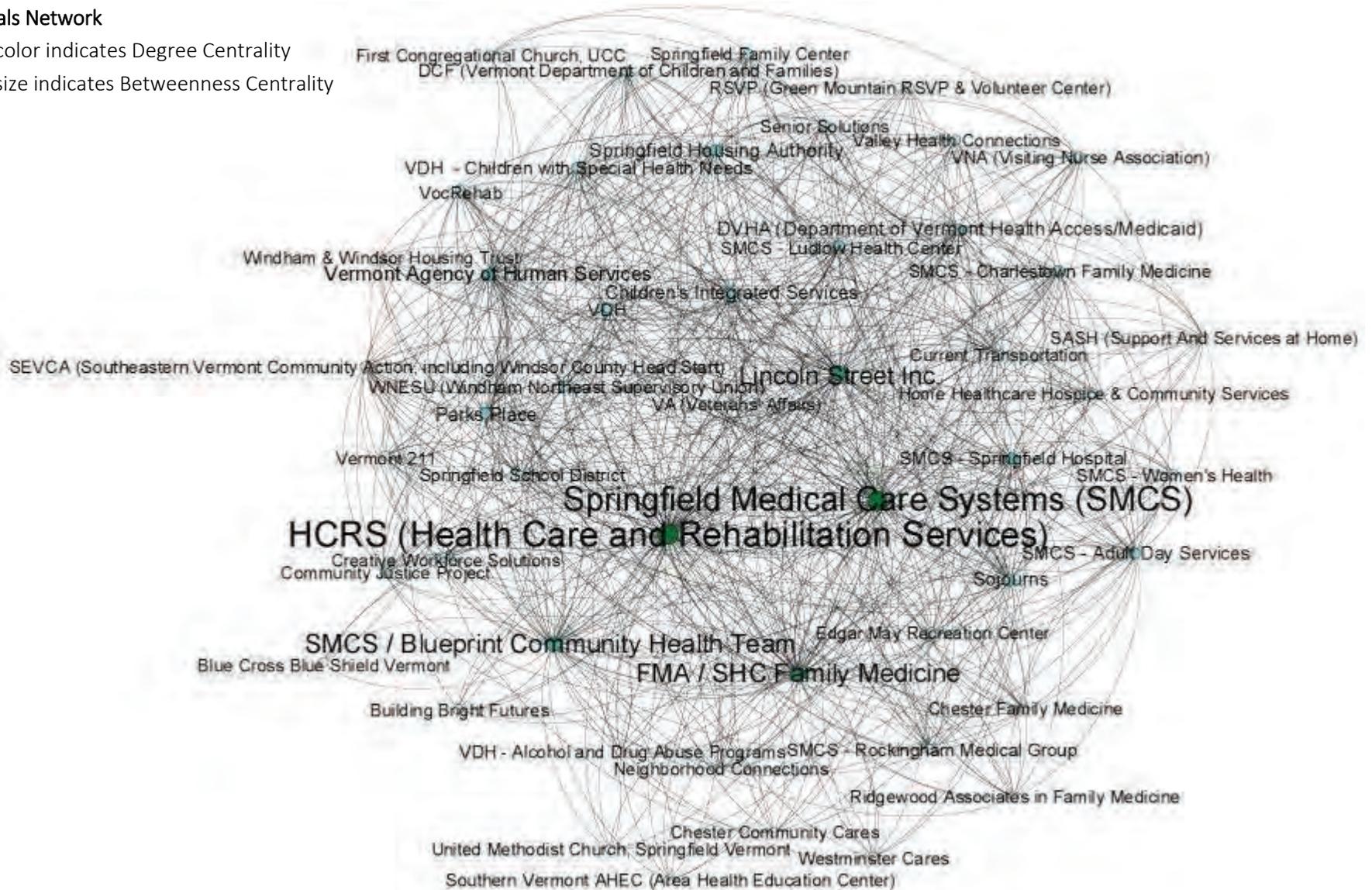
Springfield HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality
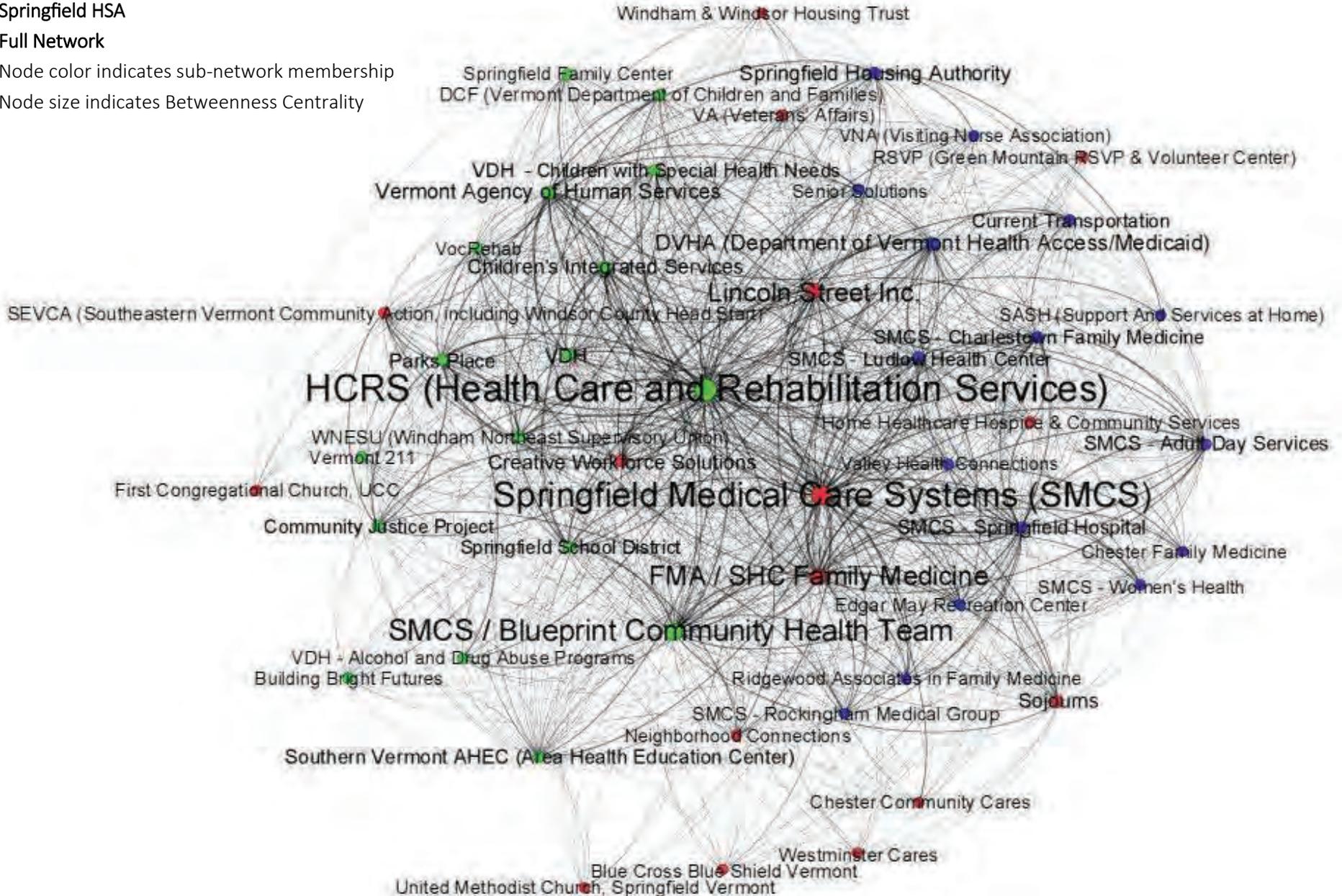
Springfield Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	49	The network contains 49 nodes (organizations)
Average Degree	19	Nodes in the network average 19 connections each
Average Shortest Path Length	1.6	The average distance between any two randomly selected nodes in the network is about one and a half connections
Graph Density	0.4	Of all possible connections in the network, about 40% are present
Modularity	0.1	This measure of the how readily a network dissolves into communities or sub-networks is low to moderate relative to other HSAs, the sub-networks that exist in the Springfield HSA are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Springfield, these nodes are **FMA/SHC Family Medicine, Health Care and Rehabilitation Services, and Springfield Medical Care Systems.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Springfield's Network Graphs

These are preliminary observations based on the graphs alone—the Springfield community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. Springfield has a very large network for a community of its size (relative to other HSAs in the state).

2. Springfield's sub-networks appear to have formed in part based on population served—the green sub-network includes most of the services for children that are present in the network (schools, Children's Integrated Services, Building Bright Futures and others).

3. Health Care and Rehabilitation Services is clearly the most central organization across all Springfield graphs. With this in mind, a question for the community is whether mental health and substance abuse treatment is the top priority for the Springfield network and whether those needs are adequately met.

4. Several churches are included in the Springfield network. A question for the community is how their inclusion helps the network. Faith-based organizations are not included in most networks—is this a missed opportunity?

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Vermont Blueprint for Health Community Health Network Study

St. Albans HSA

July 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."

St. Albans HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
St. Albans	38	26	68%
Vermont	763	422	55%

How long have you lived in the St. Albans area?

- I don't live in the St. Albans area
- Less than 1 year
- 2 years - less than 5 years
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more

10 / 38%
11 / 42%
2 / 8%
1 / 4%
1 / 4%
1 / 4%

How often do you attend meetings aimed at improving the health and wellbeing of your community?

3 / 11%
2 / 8%
1 / 4%
13 / 50%
7 / 27%

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

What is your role within your organization?
*Multiple responses allowed, n=26

| Leadership | Non-clincal Professional | Direct Service Provider | Other |

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Perceptions of "Teamness" in the St. Albans HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care - St. Albans

% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care
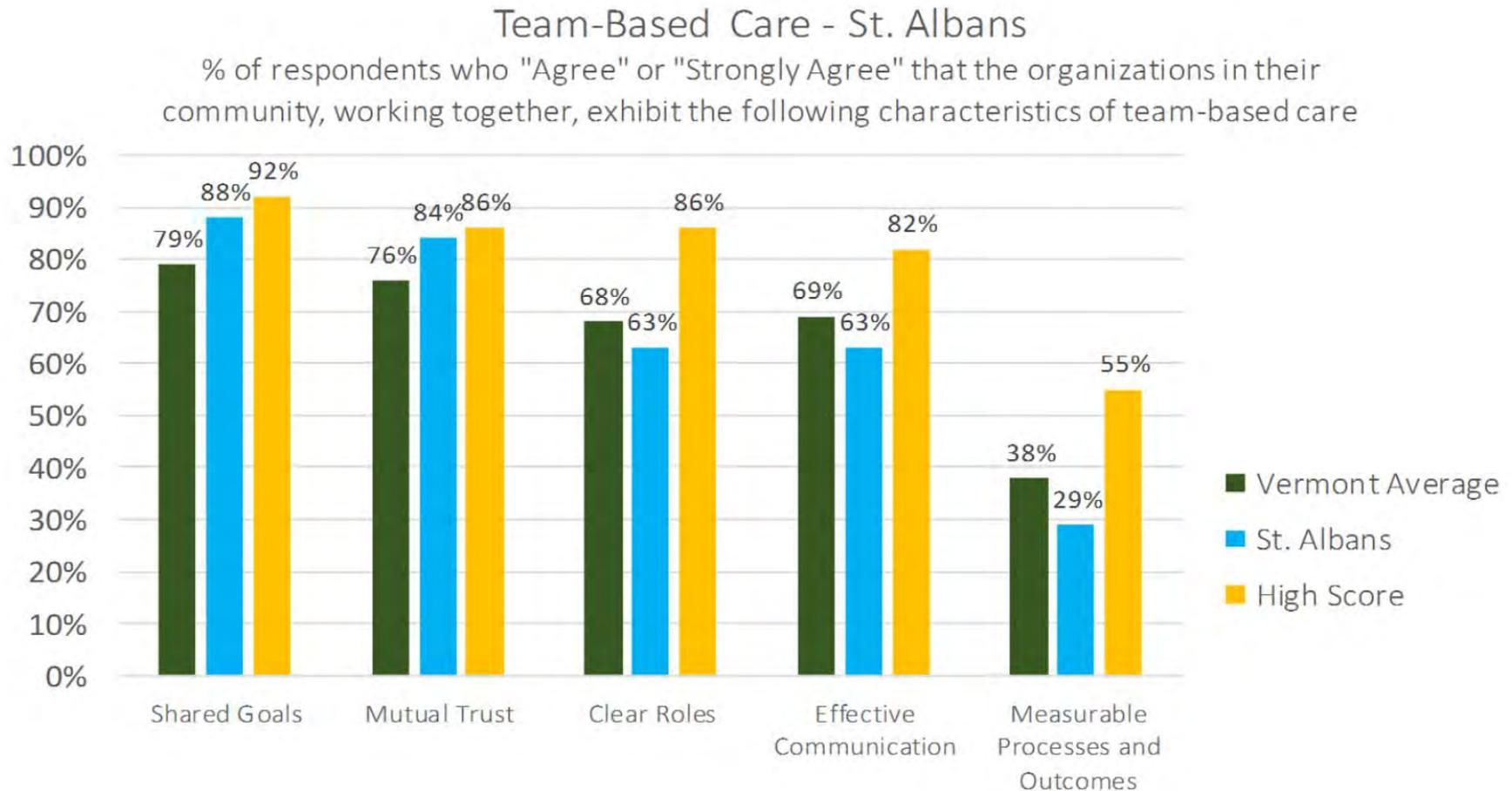
Benefits of Working Together in the St. Albans HSA

Drawbacks of Working Together in the St. Albans HSA

![VCHIP - Vermont Child Health Improvement Program, UNIVERSITY OF VERMONT COLLEGE OF MEDICINE]

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Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways— sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

- Like any picture, a network graph shows a single point in time. It can't tell you how or why the relationships it represents formed. It doesn't show whether the connections it shows are formal or informal, durable or tenuous, friendly or tense. It won't answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency. And it doesn't offer instructions for how to change the shape of the network, should you want to.

Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

St. Albans HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

VCCI (Vermont Chronic Care Initiative) / DVHA (Vermont Department of Health Access) Care Coordinators

Northwestern Primary Care

St. Albans Primary Care

Northern Tier Center for Health (NOTCH)

Cathedral Square SASH

Community Health Team

Northwestern Georgia Health Center

Mousetrap Pediatrics

Northwestern Counseling and Support Services

The Howard Center

Cold Hollow Family Practice

Franklin County Home Health Agency

Franklin County Pediatrics

Champlain Valley Agency on Aging

Northwestern Medical Center

Champlain Valley AHEC

Vermont Agency of Human Services AHS District Office

Practice of Michael Corrigan, MD

Vermont Center for Independent Living

Practice of Mara Vijups, MD

Vermont Family Network

![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine](logo)

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St. Albans HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Champlain Valley AHEC

Cold Hollow Family Practice

Vermont Agency of Human Services AHS District Office

Northern Tier Center for Health (NOTCH)

VCCI (Vermont Chronic Care Initiative) / DVHA (Vermont Department of Health Access) Care Coordinators

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Northwestern Medical Center

Vermont Center for Independent Living

Franklin County Pediatrics

Cathedral Square SASH

Franklin County Home Health Agency

Practice of Mara Vijups, MD

St. Albans HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

St. Albans HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality
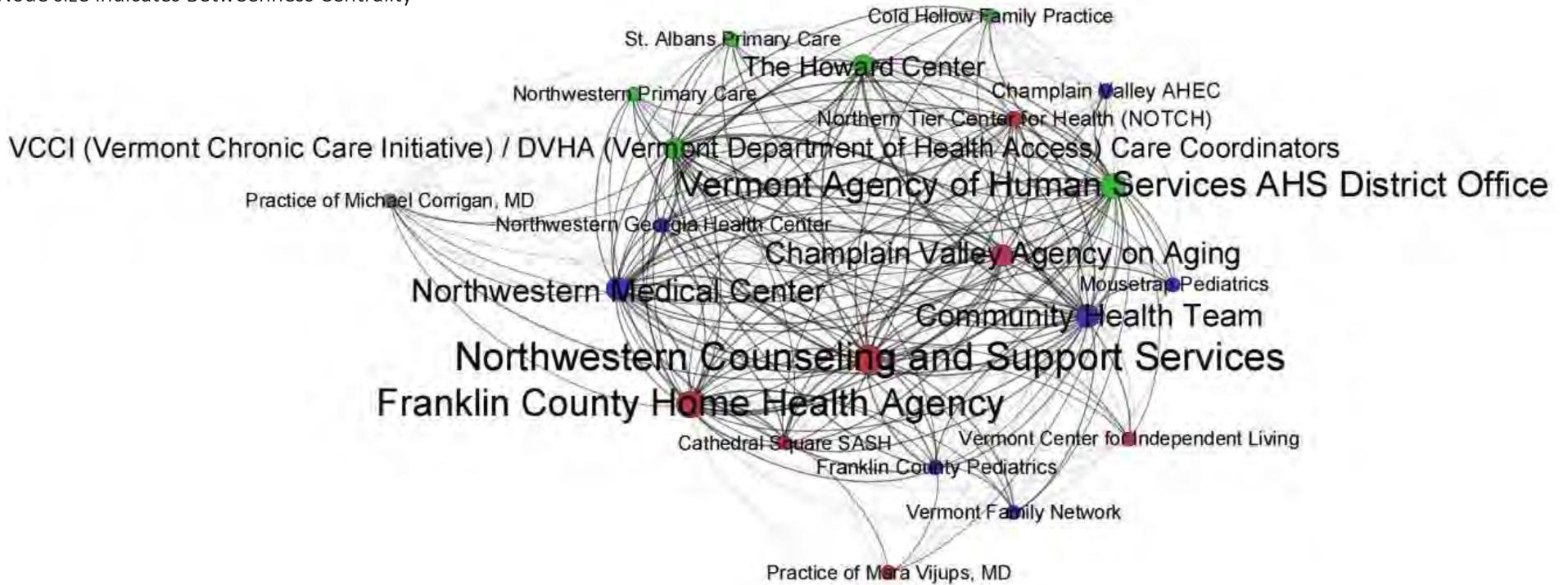
St. Albans Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	21	The network contains 21 nodes (organizations)
Average Degree	12.5	Nodes in the network average 12.5connections each
Average Shortest Path Length	1.4	The average distance between any two randomly selected nodes in the network is a little less than one and a half connections
Graph Density	0.62	Of all possible connections in the network, about 62% are present
Modularity	0.05	This measure of the how readily a network dissolves into communities or sub-networks is very low, indicating that the sub-networks that exist in the St. Albans HSA are

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In St. Albans, these nodes are **Franklin County Home Health**, **Northwestern Counseling and Support Services**, and the **AHS District Office.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of St. Albans's Network Graphs

These are preliminary observations based on the graphs alone—the St. Albans community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. The St. Albans HSA has several equally central organizations, suggesting a distribution of power

2. The Community Health Team does not play a central role in the St. Albans network, and may be considered more a part of the practices than its own independent entity

3. Mental health and substance abuse services are well represented in the St. Albans network

4. The St. Albans sub-networks are densely interconnected (and based on their modularity score, can just barely be identified as sub-networks at all)

5. The list of organizations in the St. Albans network is relatively short for a community of its size. Does this list represent a core group or the full network of organizations they interact with? Ask the group for feedback.

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Vermont Blueprint for Health Community Health Network Study

St. Johnsbury HSA

May 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

Survey Methodology: The survey list was generated by Project Managers in each Health Service Area, based on directions from the VCHIP Blueprint Evaluation Team to include representatives of the organizations they have engaged as part of their "extended community health team." HSA-specific surveys were emailed to these potential respondents using Survey Monkey. Participation were incentivized with a random drawing, and multiple follow-up emails were sent to non-respondents. Survey results for this HSA follow, and state-wide survey results can be found in-detail in the document "Vermont Blueprint for Health Community Health Network Study."

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St. Johnsbury HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
St. Johnsbury	74	40	54%
Vermont	763	422	55%

How long have you lived in the St. Johnsbury HSA?
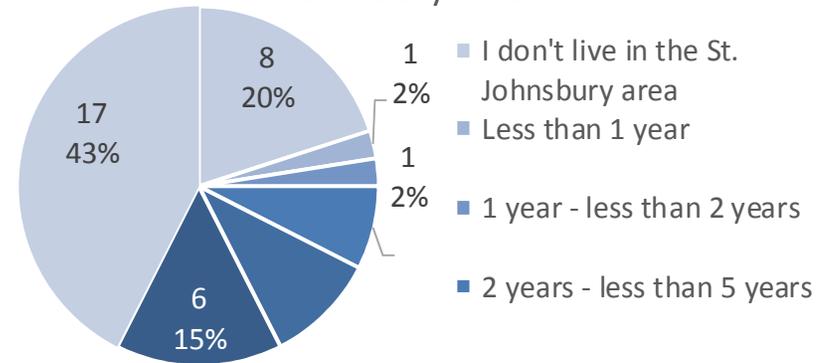
- I don't live in the St. Johnsbury area
- Less than 1 year
- 1 year - less than 2 years
- 2 years - less than 5 years

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community?

- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

What is your role within your organization?
*Multiple responses allowed, n=40

Number of respondents selecting

Leadership — 8
Non-clincal Professional — 5
Direct Service Provider — 18
Other — 14

3

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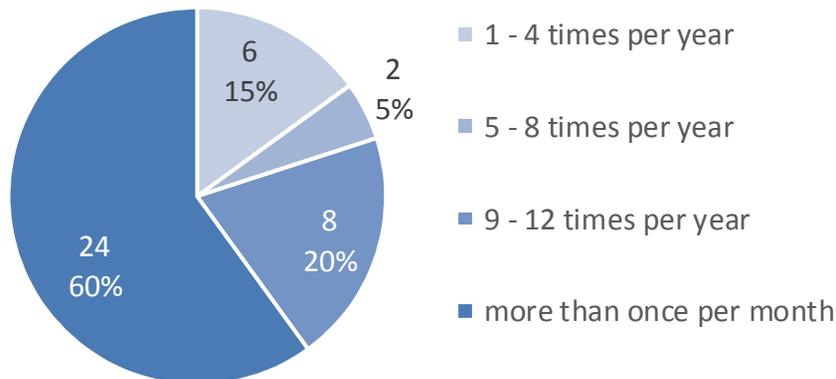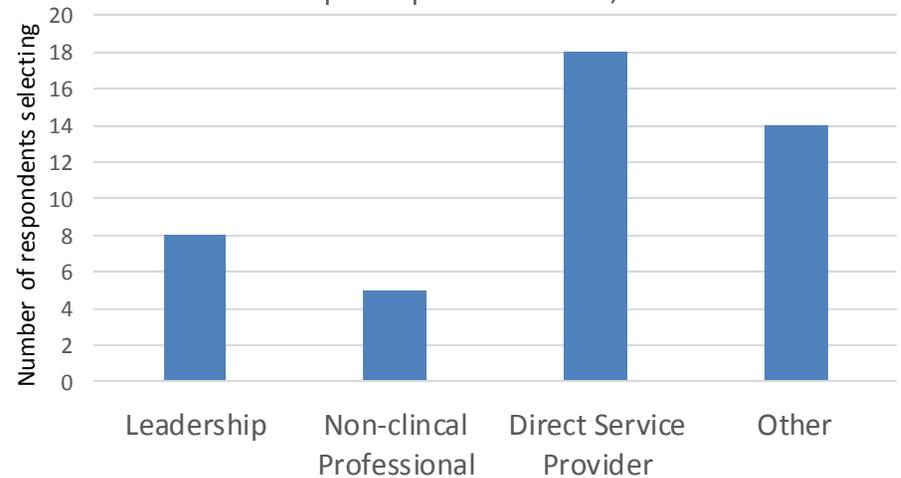
Perceptions of "Teamness" in the St. Johnsbury HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care – St. Johnsbury
% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care
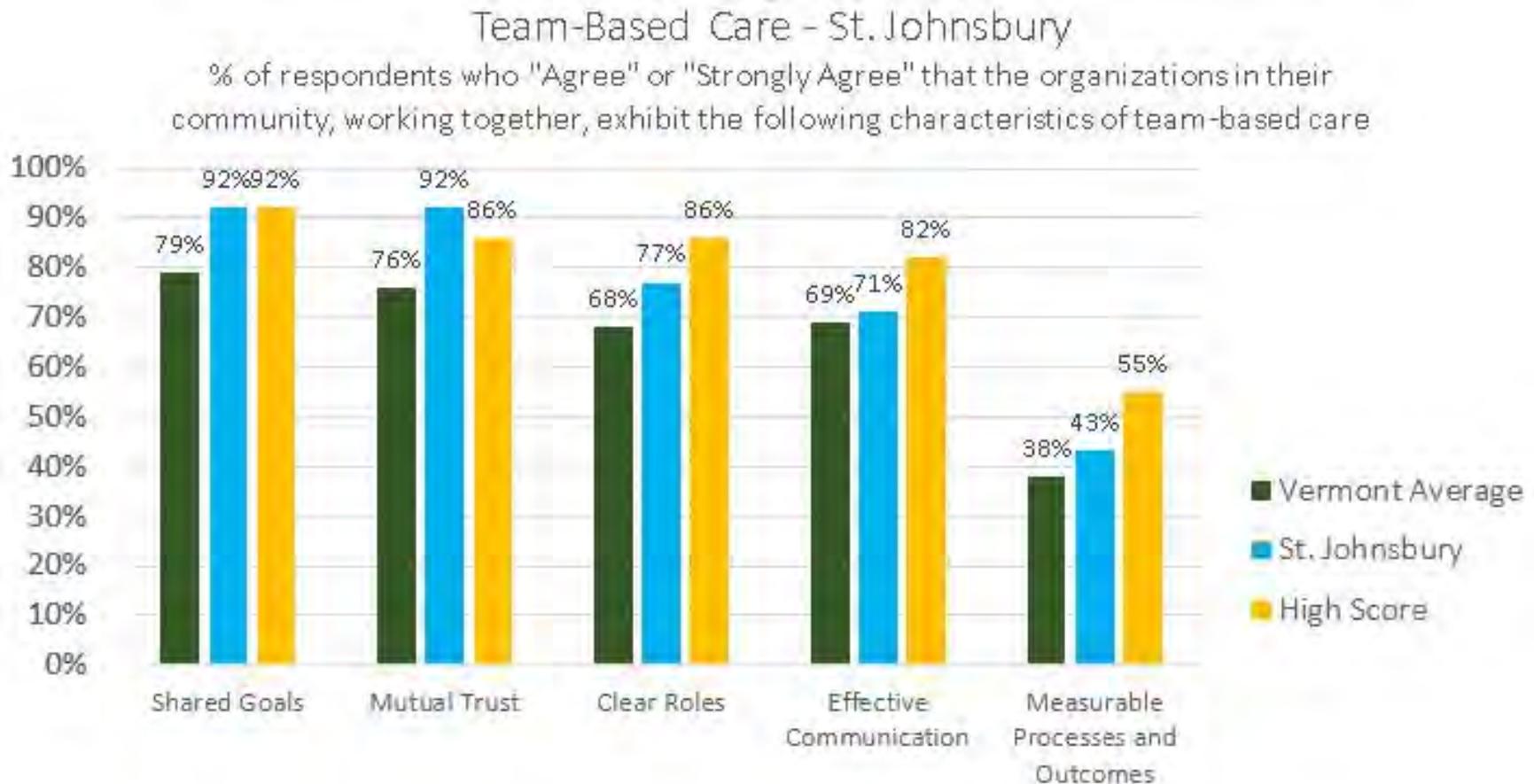
Benefits of Working Together in the St. Johnsbury HSA

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Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways— sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

- Like any picture, a network graph shows a single point in time. It can't tell you how or why the relationships it represents formed. It doesn't show whether the connections it shows are formal or informal, durable or tenuous, friendly or tense. It won't answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency. And it doesn't offer instructions for how to change the shape of the network, should you want to.

Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

St. Johnsbury HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
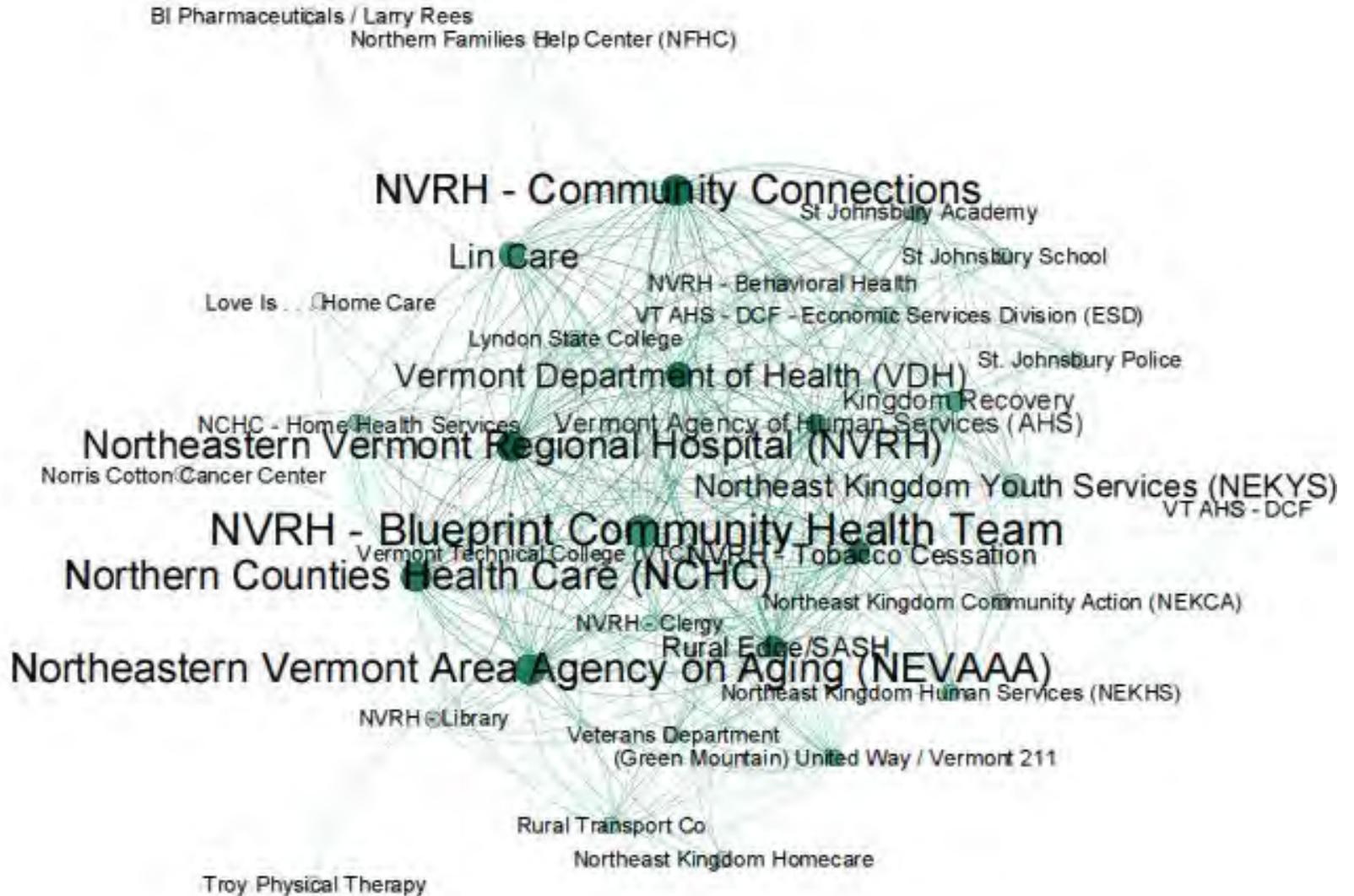
St. Johnsbury HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
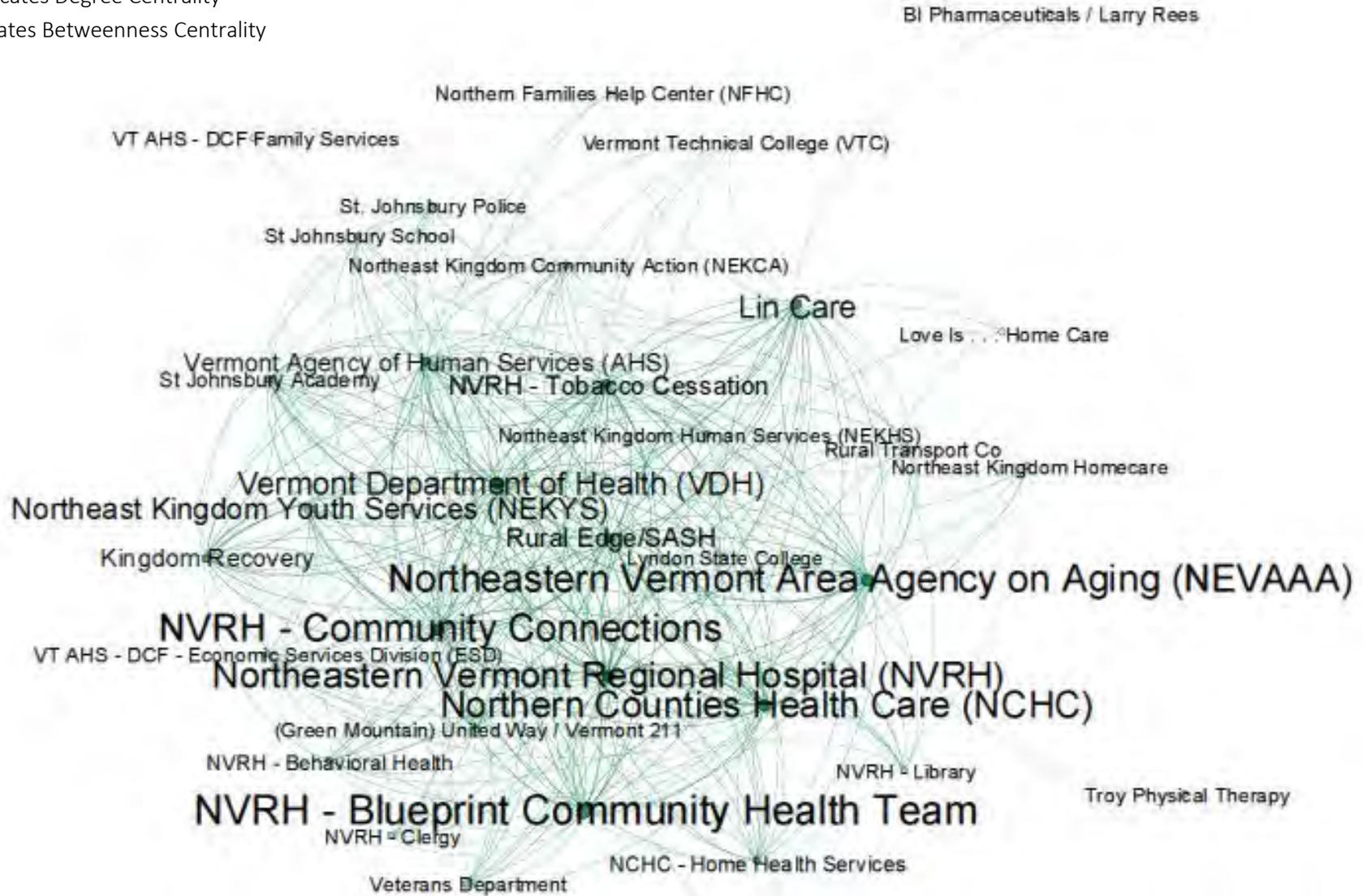
St. Johnsbury HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Vermont Child Health Improvement Program
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St. Johnsbury HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality

St. Johnsbury HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality
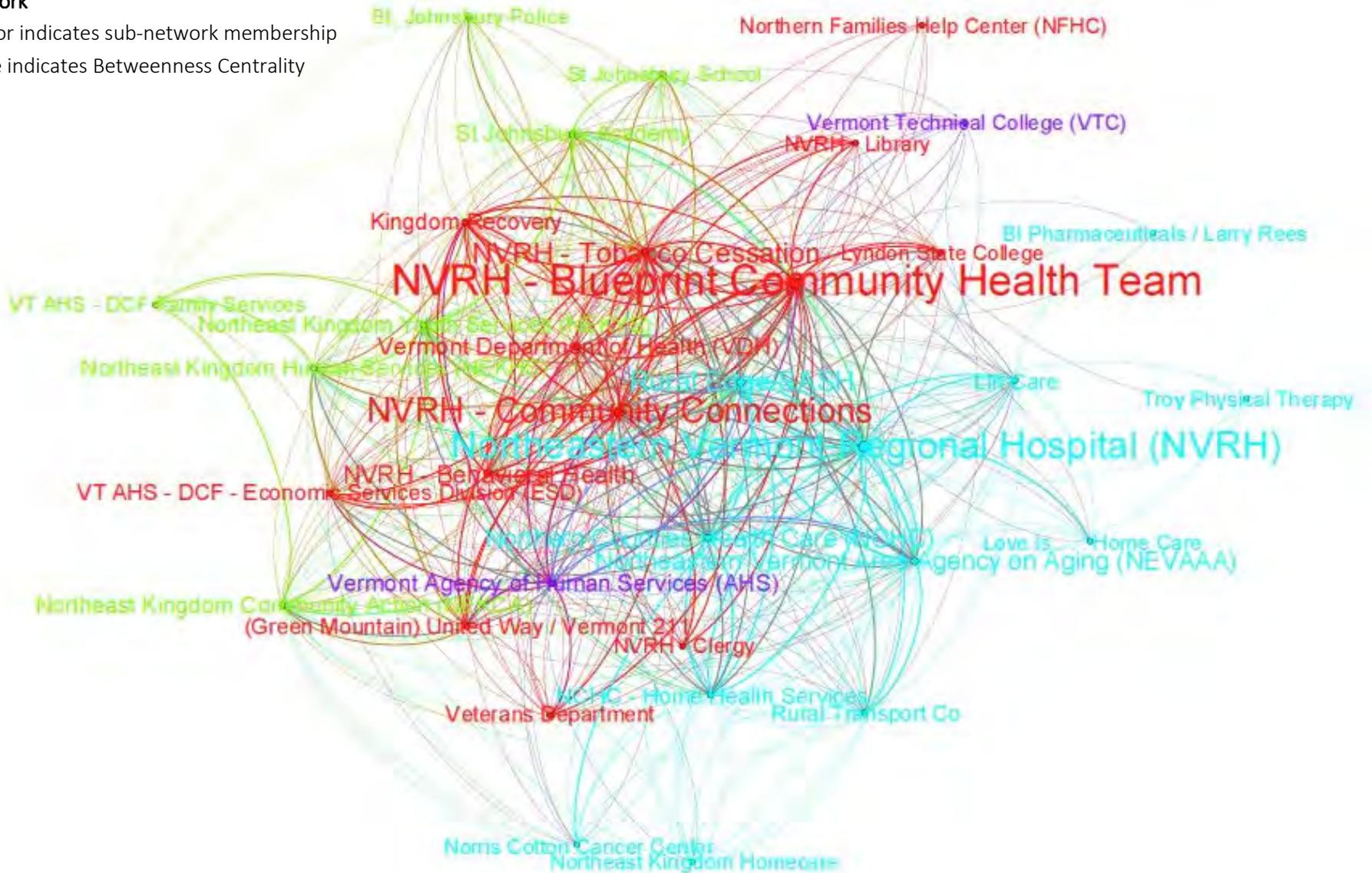
St. Johnsbury Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	34	The network contains 34 nodes (organizations)
Average Degree	15	Nodes in the network average 15 connections each
Average Shortest Path Length	1.6	The average distance between any two randomly selected nodes in the network is a little more than one and a half connections
Graph Density	0.47	Of all possible connections in the network, about 47% are present
Modularity	0.08	This measure of the how readily a network dissolves into communities or sub-networks is very low, indicating that the sub-networks that exist in the St. Johnsbury HAS are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In St. Johnsbury, these nodes are **Northeastern Vermont Regional Hospital, the Blueprint Community Health Team, and Lin Care.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of St. Johnsbury's Network Graphs

These are preliminary observations based on the graphs alone—the St. Johnsbury community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. The Blueprint Community Health Team has a prominent role in all of the graphs—information, resources, and referrals.

2. At least two of the sub-networks appear to have formed around a specific population—the green sub-network appears to serve primarily children, youth and families, while the blue network primarily serves elders.

3. The St. Johnsbury HSA has a sub-network located at the center of the overall network, a unique feature of this HSA.

4. The central sub-network includes Kingdom Recovery and NVRH—Behavioral Health, an indicator that the St. Johnsbury HSA is actively addressing mental health and substance abuse issues.

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Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

The St. Johnsbury community provided feedback following a presentation of these findings at the CHT meeting April 30, 2014. The following are key observations.

1. There is an expectation that BAART will become more central over the next year, as the Hub & Spoke program is fully implemented.

2. Likewise, SASH may move out from the center as new programs move in. When the program first started in the area, SASH effectively promoted their work and gained awareness quickly.

3. It is expected that BAART/Hub & Spoke will make connect to human services, the hospital, DCF, and Northern Counties Health Care.

4. Regarding the question of whether ties are based solely on personal connections or formalized—the group says that when there is turnover, new staff is sometimes hard to pull in to meetings and network participation, but "once they are here they stay."

5. The list of organizations feels mostly complete, one organization that should be added is the Department of Corrections (they don't attend meetings but are a strong player in the network).

6. In a post-meeting conversation, one meeting participant said she thinks that the reason the drawback "taking too much time and resources" is only experienced by about one-third of St. Johnsbury network members is that the meetings are at 8 a.m. and done before the workday gets busy.

Vermont Blueprint for Health Community Health Network Study
Upper Valley HSA

June 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

Methodology

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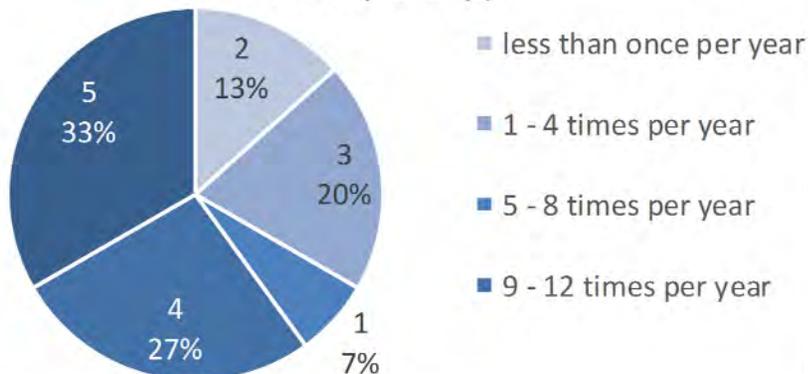
![VCHIP logo - Vermont Child Health Improvement Program, University of Vermont College of Medicine]

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Upper Valley HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Upper Valley	32	15	47%
Vermont	763	422	55%

How long have you lived in the Upper Valley area?
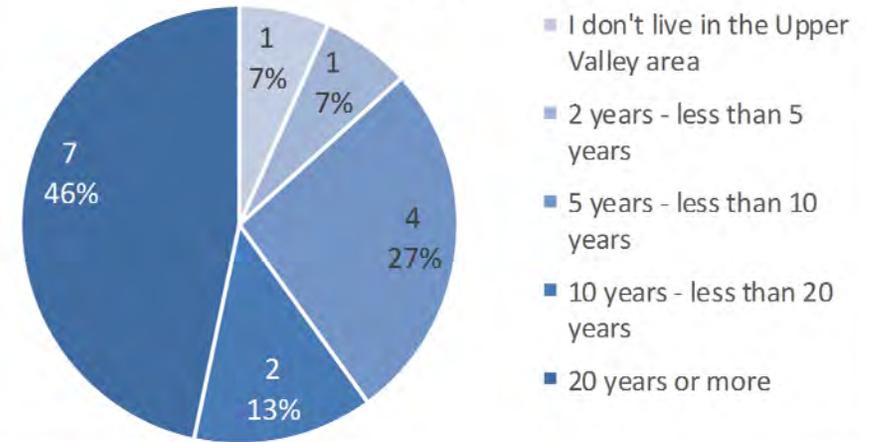
- 1 7%
- 1 7%
- 7 46%
- 4 27%
- 2 13%

Legend:
- I don't live in the Upper Valley area
- 2 years - less than 5 years
- 5 years - less than 10 years
- 10 years - less than 20 years
- 20 years or more

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community (such as the Community Health Team Core Advisory Group)?

- 2 13%
- 5 33%
- 3 20%
- 4 27%
- 1 7%

Legend:
- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year

What is your role within your organization?
*Multiple responses allowed, n=15

Role	Count
Leadership	5
Non-clincal Professional	4
Direct Service Provider	5
Other	3

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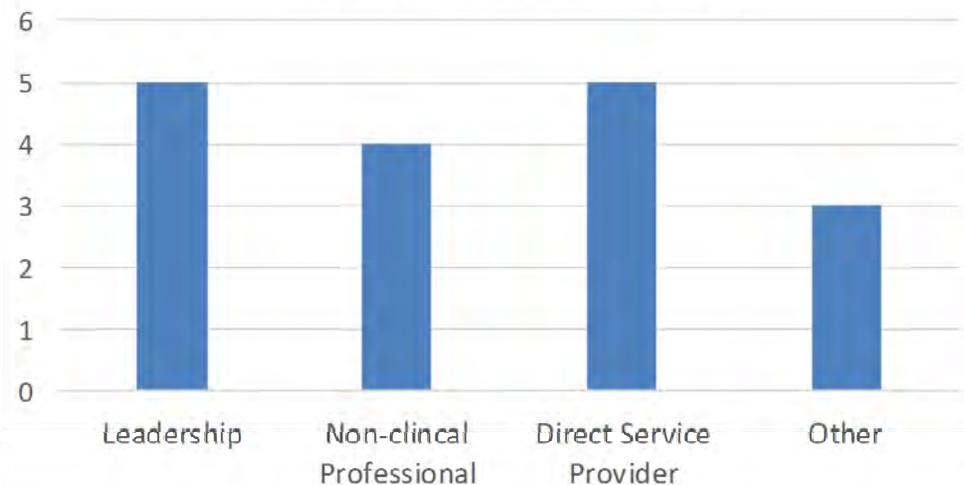
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We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care - Upper Valley
% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care
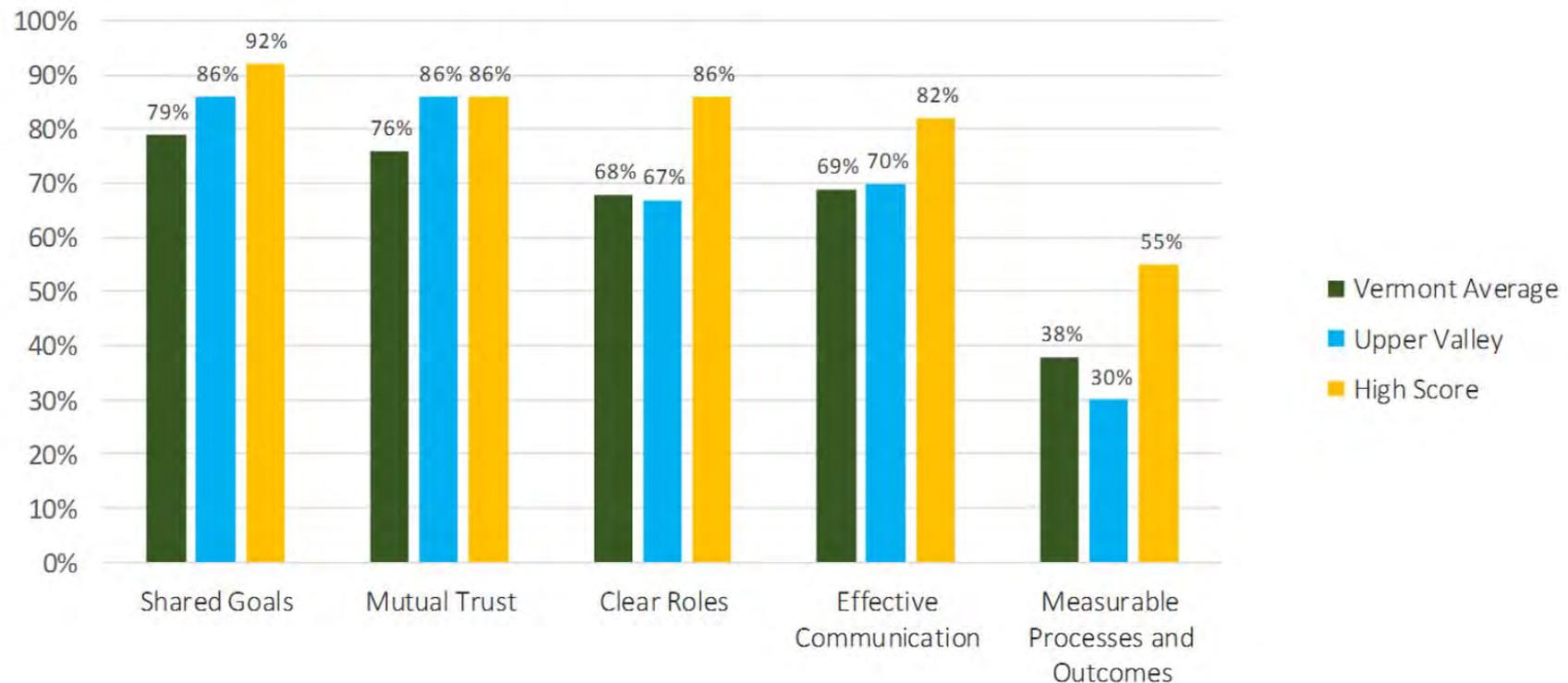
Benefits of Working Together in the Upper Valley HSA

Drawbacks of Working Together in the Upper Valley HSA

![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine]

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Network Analysis

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What data was used in this study?

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How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Screenshot of network analysis question:

Q7 Edit Question ▼ Move Copy Delete

Below is a list of organizations in your community that provide either direct health services, or social and economic services that help individuals and families care for themselves and, by extension, their health.

Check each of the ways your organization has worked with the organization listed.

(Please note that there will be no value judgement assigned to whether or not organizations work together in these particular ways. In some cases, these type of interactions may be useful to your organization's mission and in some cases they may not. In the final report, this is the one question where organization names may be reported in order to map functional relationships in your community.)

	Our organizations share information	Our organizations share resources (joint funding, shared equipment, personnel, facilities, etc.)	My organization sends referrals to this organization	My organization receives referrals from this organization
Alzheimer's Association of Vermont	☐	☐	☐	☐
APS Healthcare	☐	☐	☐	☐
Bayada Home Health Care	☐	☐	☐	☐

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

• The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

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Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

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Upper Valley HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
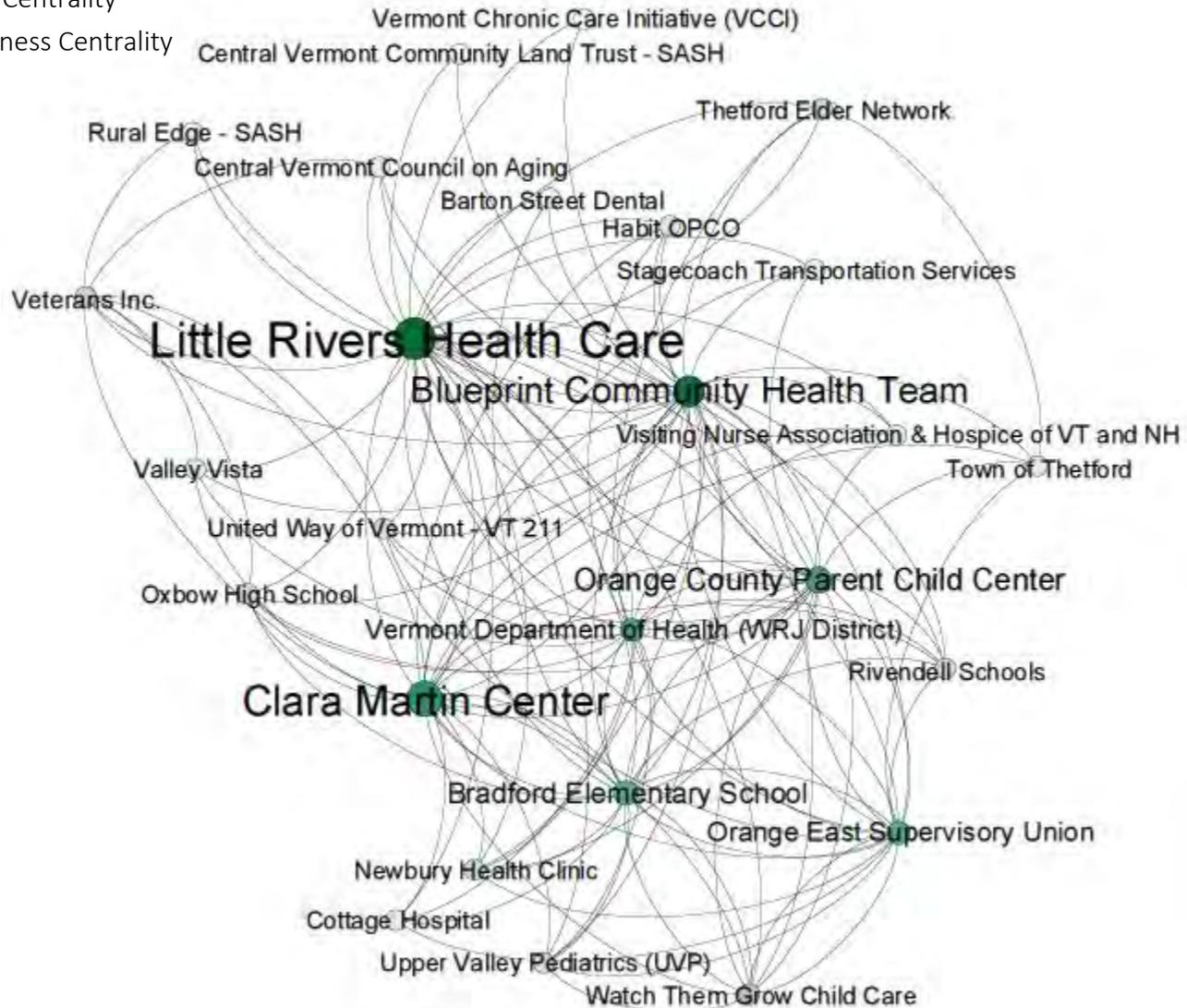
Upper Valley HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Upper Valley HSA
Referrals Network
Node color indicates Degree Centrality
Node size indicates Betweenness Centrality

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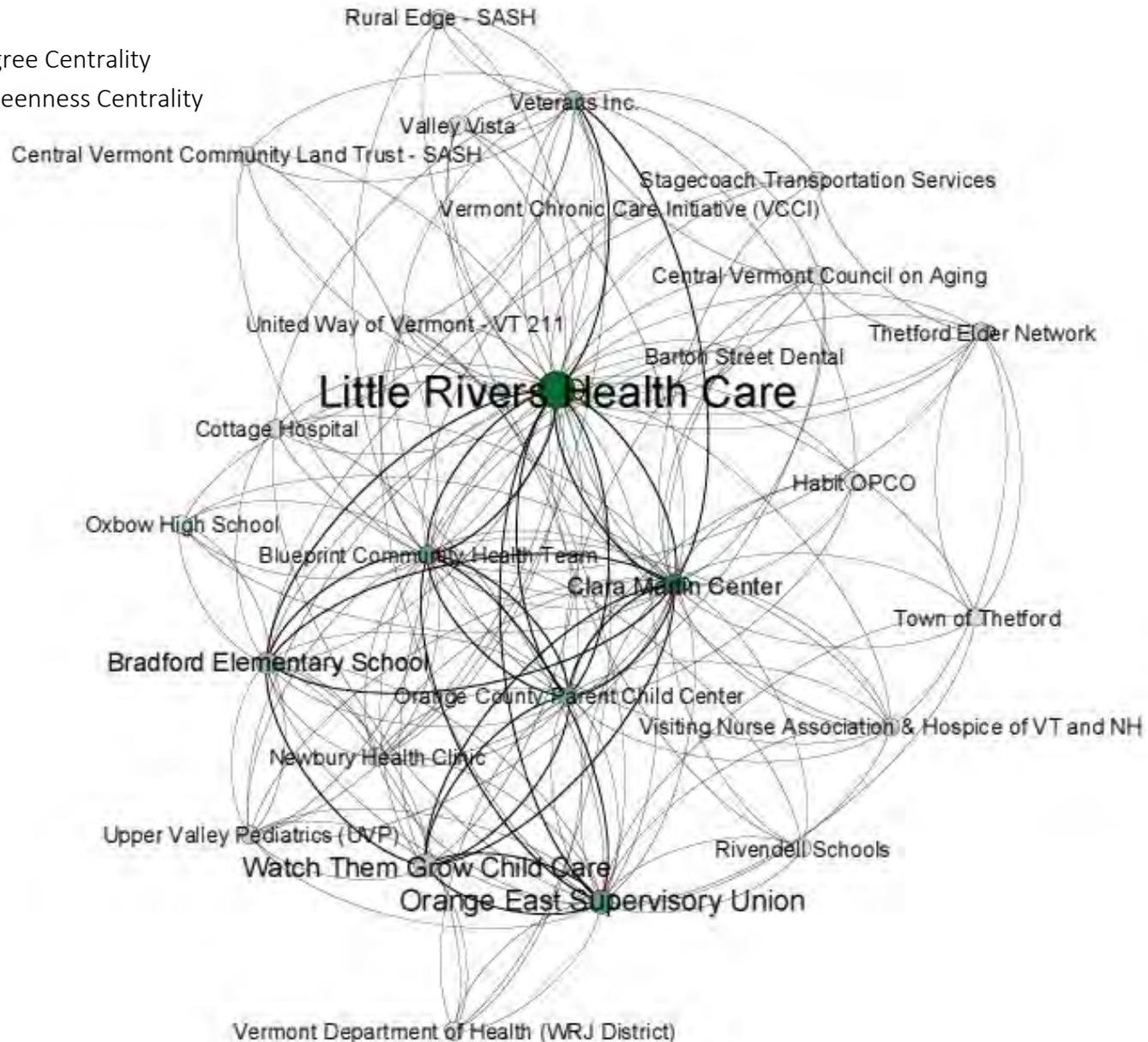
Upper Valley HSA

Full Network

Node color indicates Sub-network membership

Node size indicates Betweenness Centrality
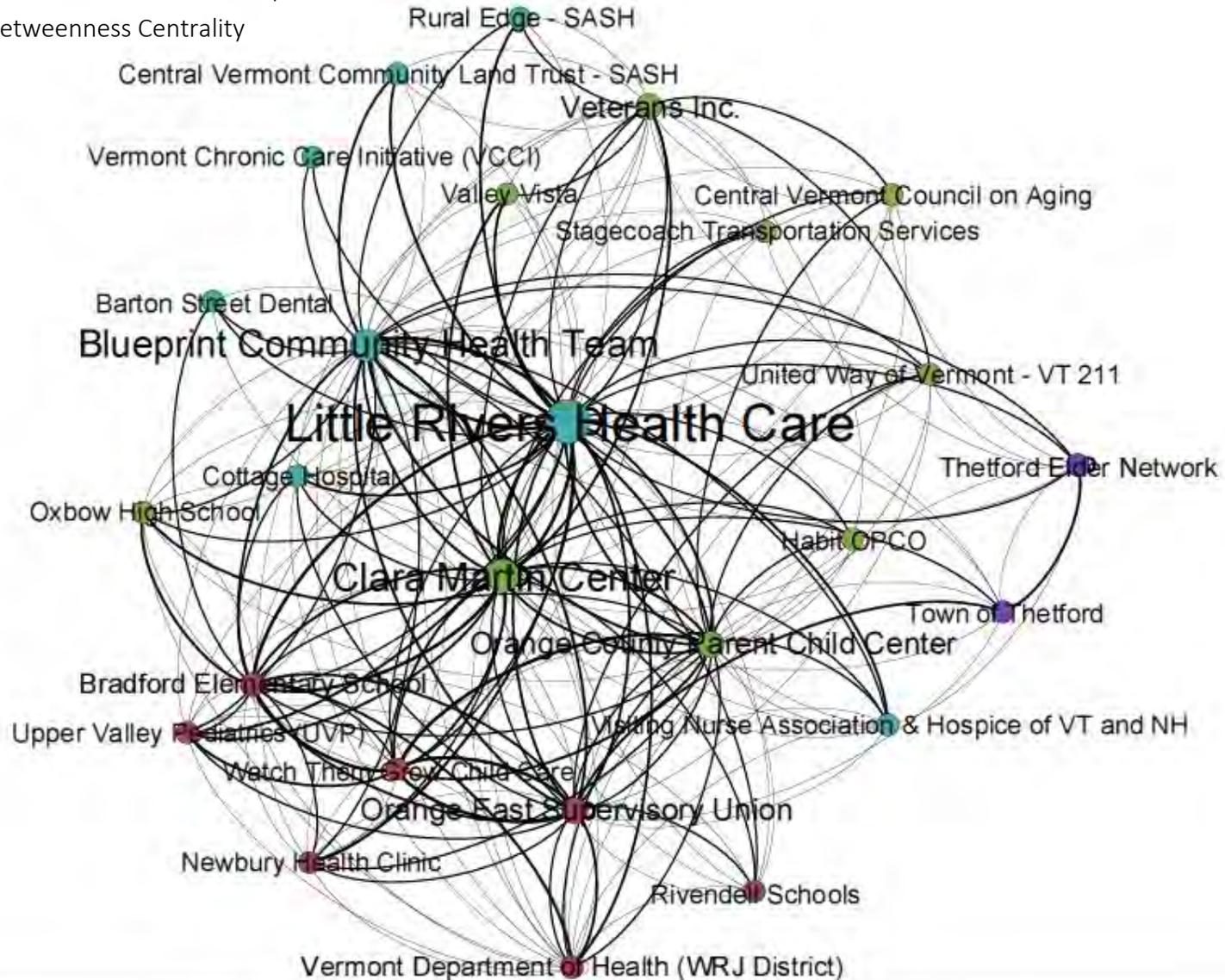
Upper Valley Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	26	The network contains 26 nodes (organizations)
Average Degree	8.2	Nodes in the network average about 8 connections each
Average Shortest Path Length	1.7	The average distance between any two randomly selected nodes in the network is about 1.7 connections
Graph Density	0.33	Of all possible connections in the network, about 1/3 are present
Modularity	.1	This measure of the how readily a network dissolves into communities or sub-networks is very low, indicating that the sub-networks that exist in the Upper Valley HSA are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In the Upper Valley HSA, these nodes are **Little Rivers Health Care, The Blueprint Community Health Team,** and **Bradford Elementary School.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of the Upper Valley's Network Graphs

These are preliminary observations based on the graphs alone—the Upper Valley community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. Little Rivers Health Care, the area's Federally Qualified Health Center, is clearly the most central organization in the full network and for all types of connections. As the administrative entity, it is very closely connected to the Blueprint CHT, which is also central.

2. The Clara Martin Center has a strong presence in the network, which also plays a central role in the Brattleboro CHT.

3. Services targeted to children and families are heavily represented in the Upper Valley network, they appear to be a larger proportion of the overall organizations in this network than in the other networks around the state.

4. Bradford Elementary School is a key player in the network, as well as a central player in a sub-network almost entirely focused on children's health and wellbeing.

5. The Upper Valley HSA is one of the few HSAs that appears to have a central sub-network (physically central on the map and also containing the most central players in the larger network). This sub-network includes the Little Rivers Health Care, the Blueprint CHT and its SASH partners, VCCI, the area hospital, a dentist and the VNA.

6. The town of Thetford and Thetford Elder Care Network make their own tiny sub-network.

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Vermont Blueprint for Health Community Health Network Study
White River HSA

June 2014

Research Overview

Objective

Describe the network of organizations that has emerged in each Blueprint HSA to support population and individual health, focusing on modes of collaboration and relationships between organizations.

Background and Key Questions

The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*
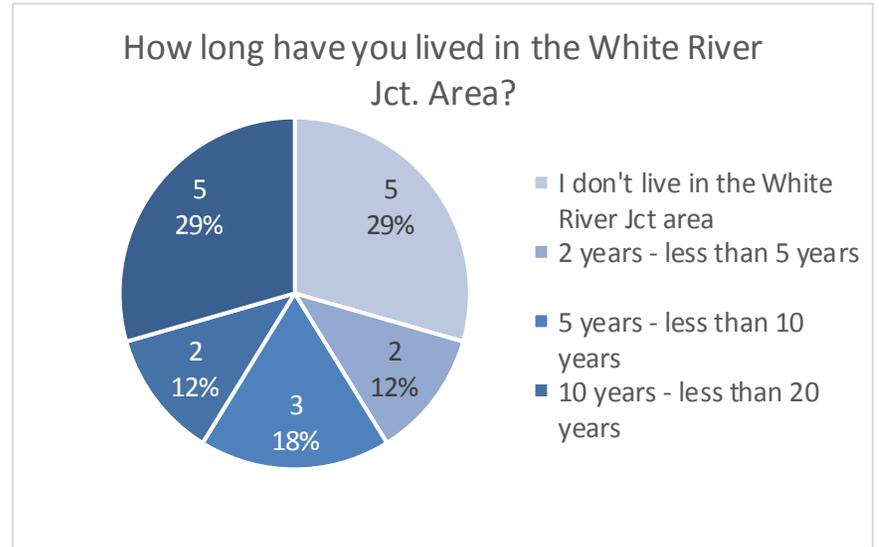
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This study combined observation of official meetings of network members in each HSA and a survey of network members' functional relationships and perceptions of collaboration and teamness within their HSA.

Observation: A VCHIP researcher attended community meetings in the majority of HSAs in the state, and observed those meetings with a focus on meeting leadership, participation, agenda, stated and perceived purpose, communication and decision-making styles, formal and informal networking and resulting action items. Findings are reported at the state level, please see the report "Vermont Blueprint for Health Community Health Network Study."

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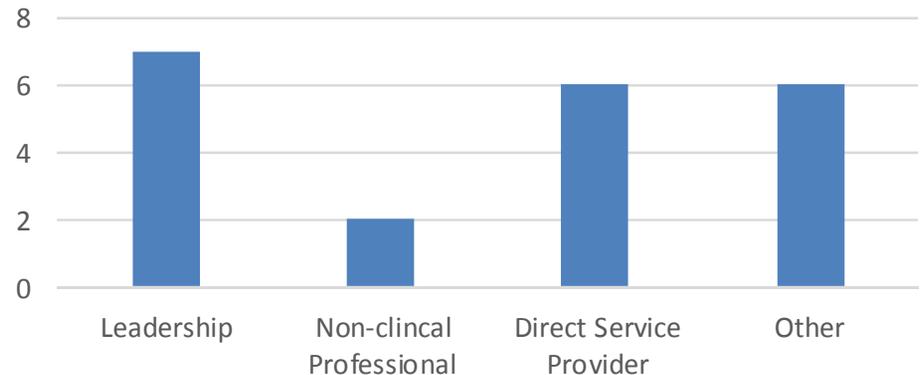
White River HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
White River	48	17	35%
Vermont	763	422	55%

How long have you lived in the White River Jct. Area?

- I don't live in the White River Jct area
- 2 years - less than 5 years
- 5 years - less than 10 years
- 10 years - less than 20 years

How often do you attend community meetings aimed at improving the health and wellbeing of members of your community?

- less than once per year
- 1 - 4 times per year
- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

What is your role within your organization?
*Multiple responses allowed, n=17

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Perceptions of "Teamness" in the White River HSA

In 2012 The Institute of Medicine (IOM) published the discussion paper "Core Principles & Values of Effective Team-Based Health Care." The Vermont Blueprint for Health embraces this paper's model, of how a team should function and feel, as a goal for both direct clinical care and multidisciplinary community health improvement.

We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care - White River Jct.
% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care

Chart data:

Principle	Vermont Average	White River	High Score
Shared Goals	79%	80%	92%
Mutual Trust	76%	81%	86%
Clear Roles	68%	69%	86%
Effective Communication	69%	77%	82%
Measurable Processes and Outcomes	38%	31%	55%

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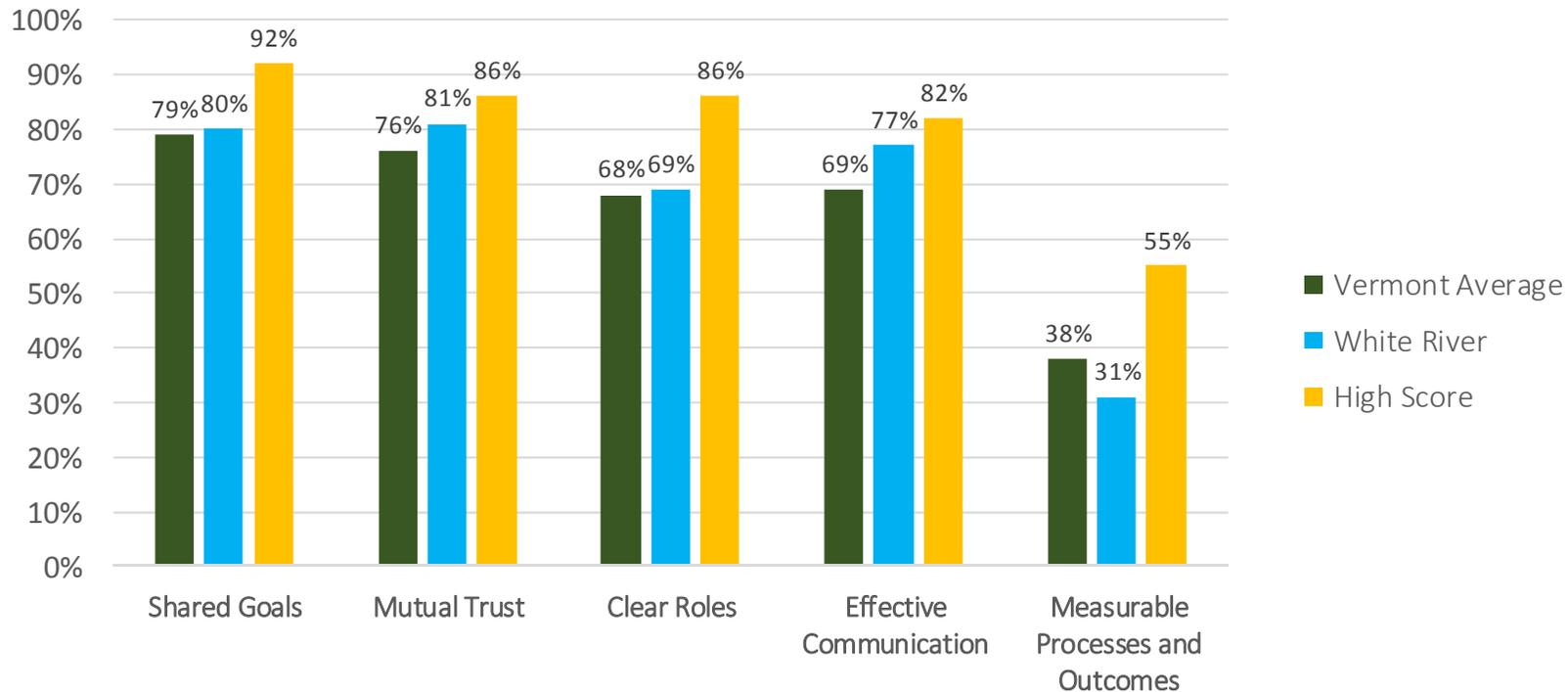
Benefits of Working Together in the White River HSA
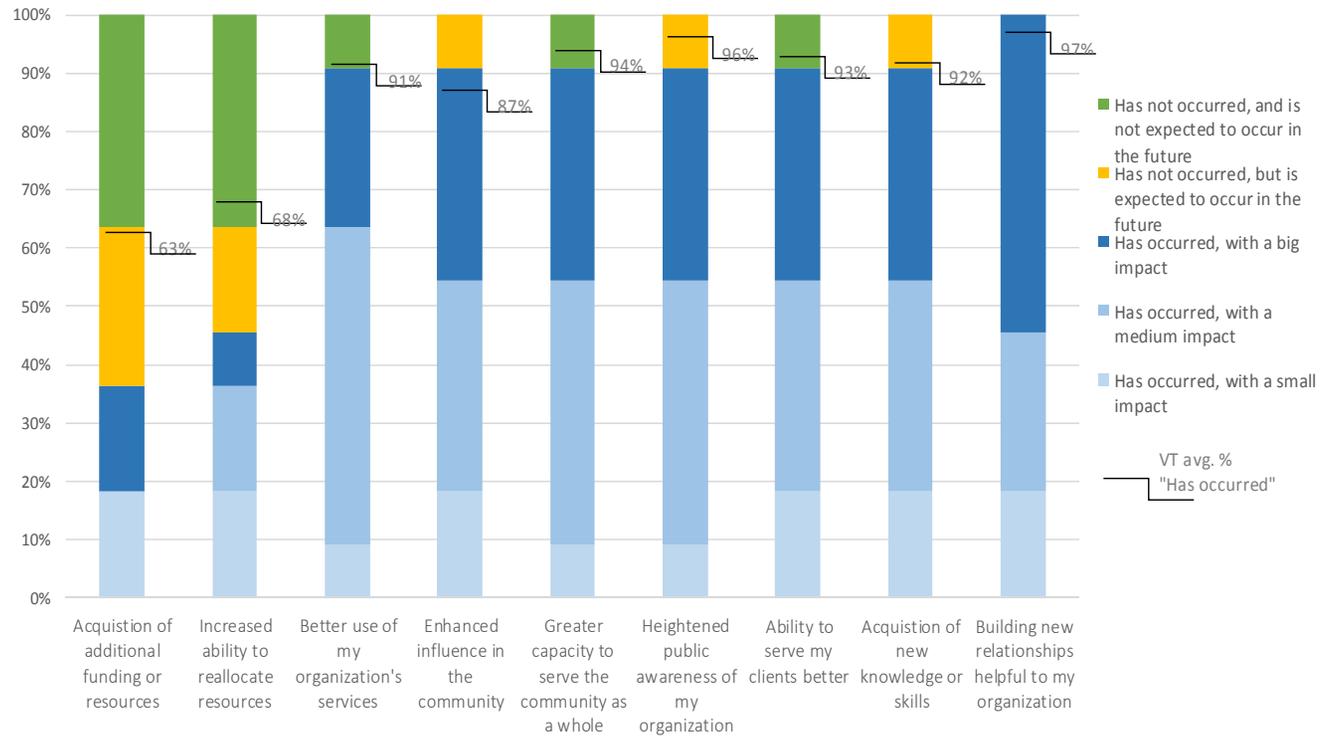
Drawbacks of Working Together in the White River HSA

Network Analysis

What is a network graph?

A network graph shows connections between individuals or (as in this case) organizations.

What data was used in this study?

The data used in the following network graphs are responses to a survey question that asked representatives of organizations to report whether they interacted with other organizations in their area in any (or all) of four ways—sharing information, sharing resources, sending referrals and receiving referrals. See the accompanying screenshot for an example.

How are the graphs plotted?

A "force-based" algorithm was used to lay out the following graphs. The algorithm operates on the simple principle that linked nodes attract each other and non-linked nodes are pushed apart.

What can network analysis tell me?

Network analysis can help describe a community and explore the relationships that make up that community. Once these relationships are visible, we can start to look for patterns, as well as changes over time. Observations of network data and network graphs can lead to smarter, better questions about how community-based teams coalesce and how they create change.

What are the limitations of a network graph (and this study in particular)? What can't it tell me?

- The goal of a full network study is to document all connections, not to sample them—so any missing data limits our understanding of the network as a whole. We must treat these graphs as partial representations of the network, not full pictures.

- Like any picture, a network graph shows a single point in time. It can't tell you how or why the relationships it represents formed. It doesn't show whether the connections it shows are formal or informal, durable or tenuous, friendly or tense. It won't answer whether more relationships would lead to improved effectiveness, or fewer active connections would improve efficiency. And it doesn't offer instructions for how to change the shape of the network, should you want to.

Network Glossary

Node

The "nodes" on these graphs are the dots that represent organizations

Edge

The "edges" on these graphs are the lines representing connections between organizations (connections of any sort, whether they represent sharing information, resources, or referrals)

Centrality

Importance or prominence of an actor in a network

Betweenness Centrality

A measure of how often a given node appears on the shortest paths between pairs of nodes in the network. Betweenness Centrality takes the entire network into consideration when calculating a score for an individual node, and is therefore considered one of the most powerful centrality measures.

Average Degree

The average number of edges connected to each node in the network

Average Shortest Path Length

The average number of edges on the shortest path between each pair of nodes in the network

Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

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White River HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

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White River HSA

Resources Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

Hartford Memorial Middle School - School Nurse

Child and Family Services   Apria Healthcare   Advance Transit

VCCI   The Family Place   Thetford Elder Network

Bayada   Southeastern Vermont Community Action

Habit OPCO   The Upper Valley Haven   Wise

VNA VNH   WISE - Women's Information Service   Hartford School District

The Stern Center   Listen Community Services   Comfort Zone

Good Neighbor Health Clinic / Red Logan Dental Clinic   Hartford Parks and Recreation Dept

Health Connections   Bugbee Senior Center   Upper Valley Turning Point / Second Wind Foundation / Willow Grove

VDH   VA / DVA Medical Center - Women Veterans Program Center

White River Jct Blueprint CHT

The Listen Center

Clara Martin Center   Blueprint CHT at Gifford

HCRS   Advance Physical Therapy

White River Family Practice

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White River HSA

Referrals Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality
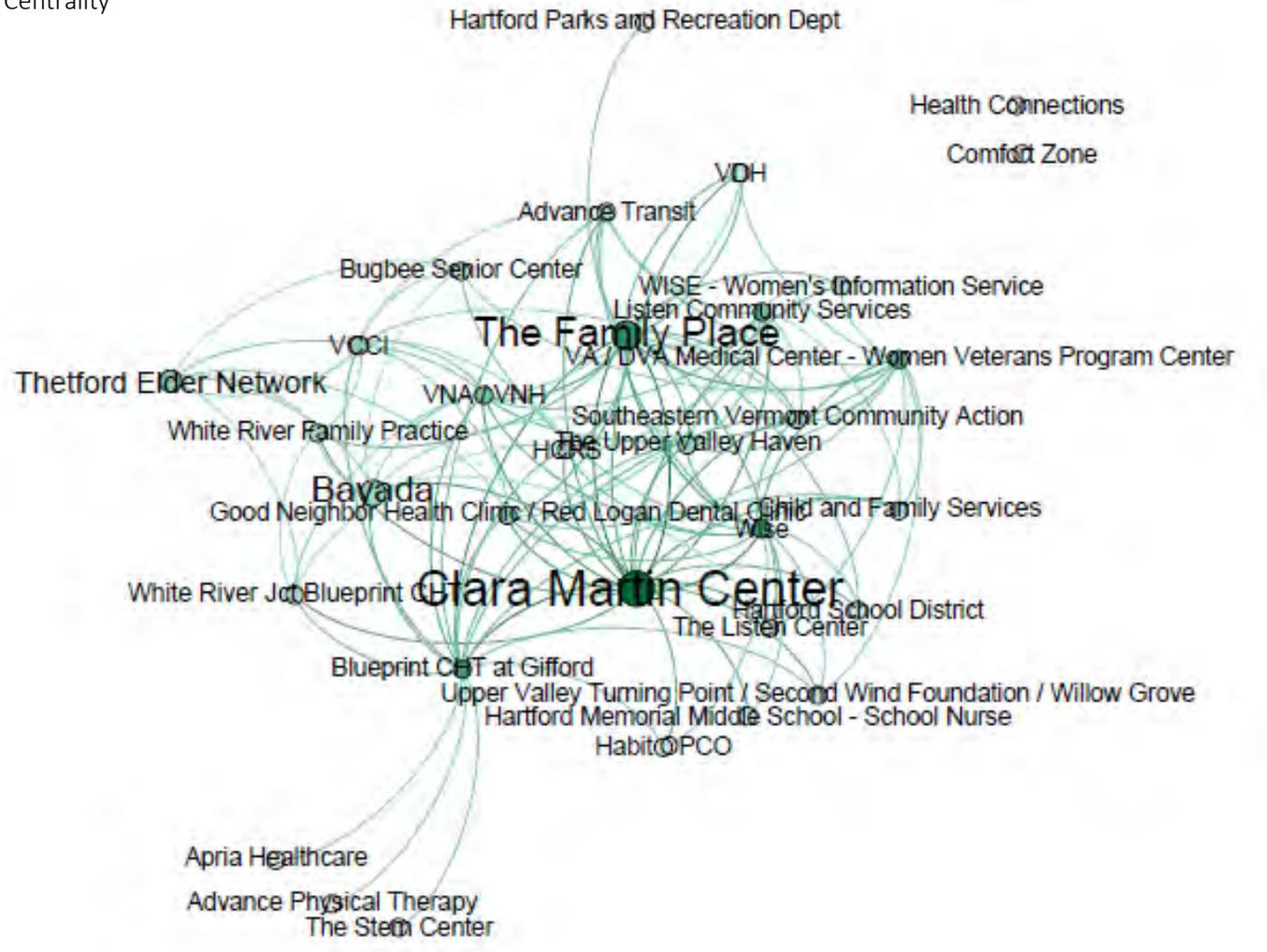
White River HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality
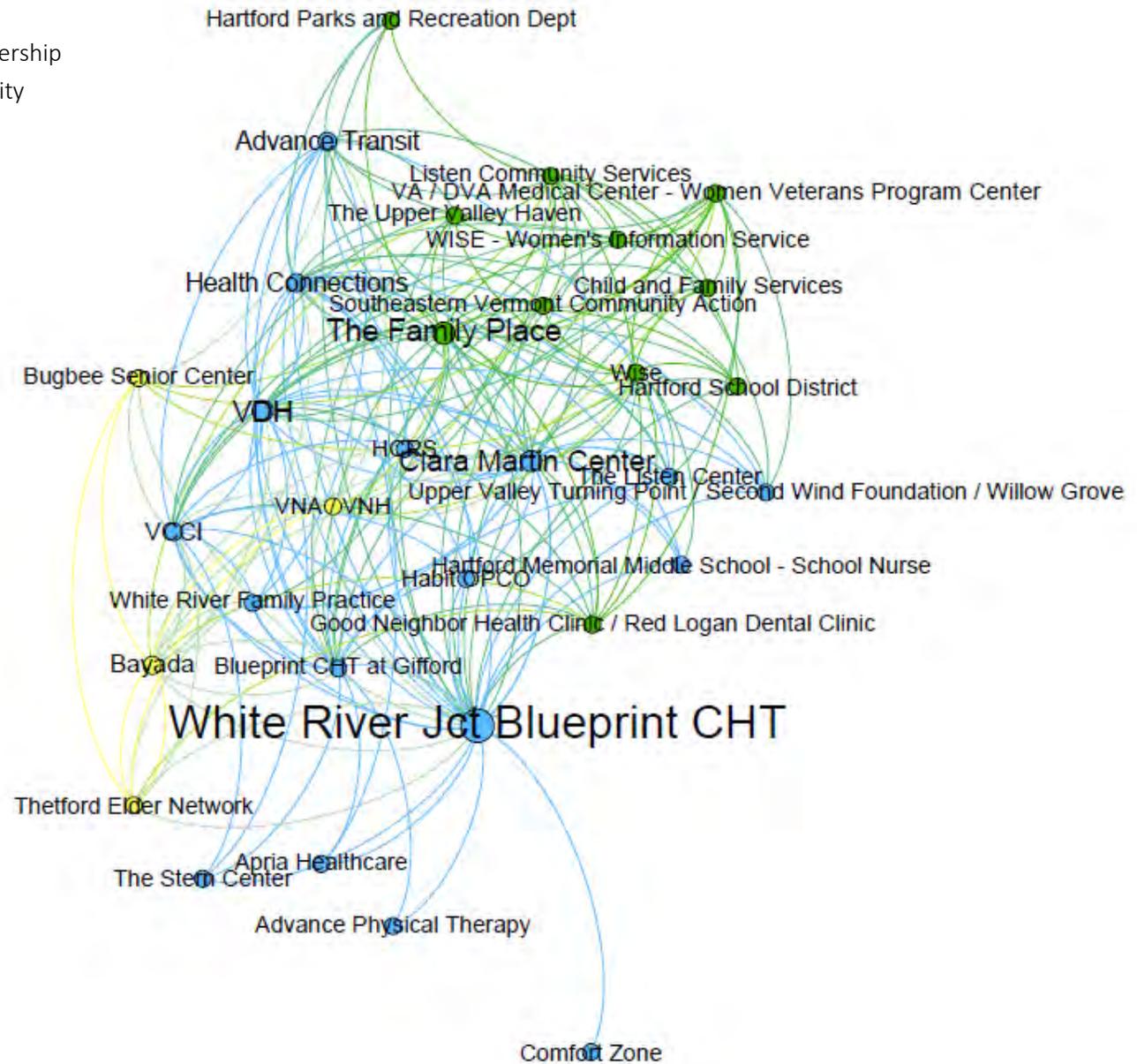
White River Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	32	The network contains 32 nodes (organizations)
Average Degree	6.3	Nodes in the network average about 6.3 connections each
Average Shortest Path Length	1.5	The average distance between any two randomly selected nodes in the network is about 1.5 connections
Graph Density	0.20	Of all possible connections in the network, about 20% are present
Modularity	.12	This measure of the how readily a network dissolves into communities or sub-networks is very low, indicating that the sub-networks that exist in the White River HSA are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In White River, these nodes are **the White River Jct. Blueprint CHT, the Blueprint CHT at Gifford,** and **Health Connections.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of White River's Network Graphs

These are preliminary observations based on the graphs alone—the White River community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. The White River Junction CHT is formally part of the Randolph network, but holds its own CHT meetings and has its own CHT staff group. However, their continuing close connection with the main Randolph/Gifford CHT is indicated by "The Blueprint CHT at Gifford" being a Key Player.

2. The White River Jct. CHT plays a central role in the information network, resources network, and full network but is relatively peripheral in the referrals network—an observation to explore with the group qualitatively.

3. The Clara Martin Center plays a central role in the referrals network, indicating that mental health and substance abuse treatment referrals are common and that the community is actively addressing this issue.

4. One sub-network (in yellow on the full network graph) is based on elder care and includes the VNA/VNH, Bayada, Thetford Elder Network and the Bugbee Senior Center

5. Another sub-network (green on the full network graph) appears to primarily serve children and families with a wide variety of services including child and family services, schools and a parks and recreation department.

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

4. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?

5. What community organizations are not represented on this graph? Is this accidental (an oversight) or does it reflect a true disconnect from the network? Which core network members have links to important resources through their involvement with organizations *outside* the network?

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Vermont Blueprint for Health Community Health Network Study

Windsor HSA

June 2014

Research Overview

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The Vermont Blueprint for Health is transforming health care delivery in Vermont with the triple-aim of improving population health, individual experience of care, and per-capita health care costs. The Blueprint encourages the growth of regionally-based multi-disciplinary networks of health, social and economic service providers (or "Functional Community Health Teams"). These networks are intended to bring a diverse group of service providers closer together, to deliver more seamless and holistic care to the people of their regions. But not every network looks the same. The Blueprint grants the HSAs significant autonomy; allowing them to run the initiative locally in whatever way they determine is best for their service providers and population. The newness of this overall model and the diversity of its expressions warrant a closer look. This study aims to describe the networks that currently exist, and poses several questions about them. This descriptive analysis is the first step towards answering some key questions about Blueprint communities: *What role did investment in core Community Health Teams have in seeding these larger networks? How are the participating organizations connected to each other? How are these relationships maintained and reinforced – how durable are they? What characteristics do the most successful networks share? And, ultimately, what impact do they have on individual and population health?*

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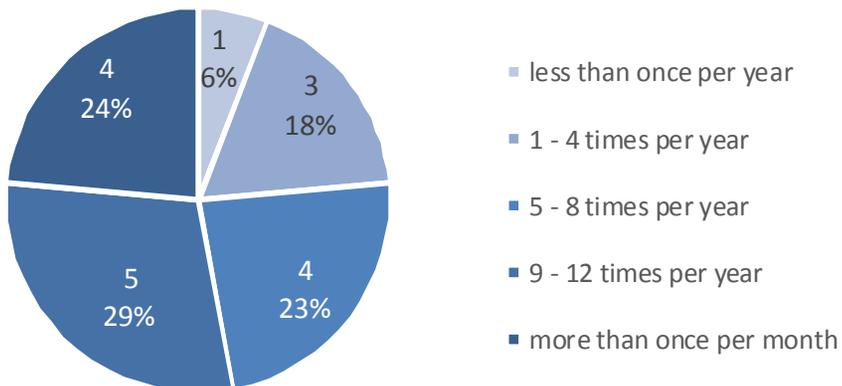
Windsor HSA Survey Participants

	Surveys Sent	Total Responses	Response Rate
Windsor	31	17	55%
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How long have you lived in the Windsor area?
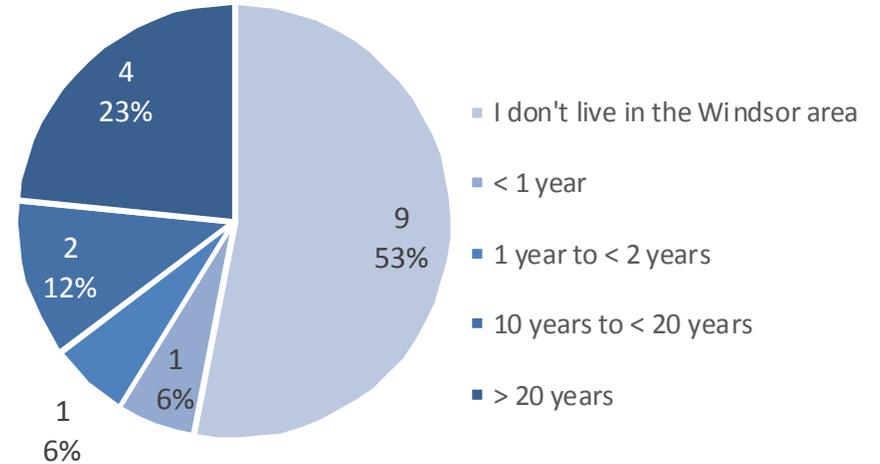
- I don't live in the Windsor area
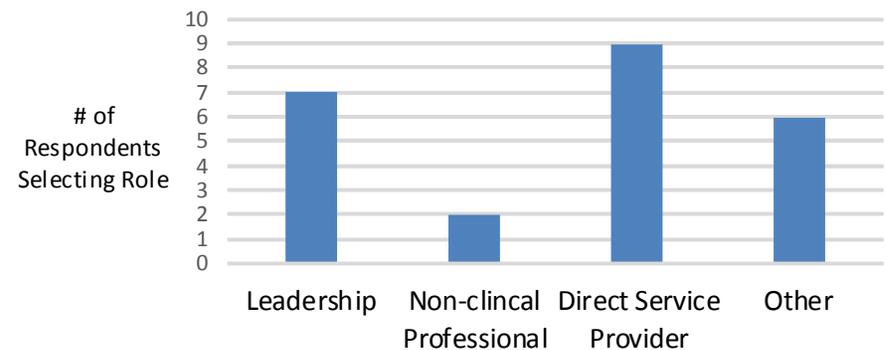- < 1 year
- 1 year to < 2 years
- 10 years to < 20 years
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How often do you attend community meetings aimed at improving the health and wellbeing of your community?

- less than once per year
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- 5 - 8 times per year
- 9 - 12 times per year
- more than once per month

What is your role within your organization?
Multiple responses allowed, n=17

# of Respondents Selecting Role

Leadership · Non-clincal Professional · Direct Service Provider · Other

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We asked respondents to tell us whether the working group in their community exhibits the following five core principles of team-based care, as defined by the IOM.

Team-Based Care - Windsor

% of respondents who "Agree" or "Strongly Agree" that the organizations in their community, working together, exhibit the following characteristics of team-based care

	Shared Goals	Mutual Trust	Clear Roles	Effective Communication	Measurable Processes and Outcomes
Vermont Average	79%	76%	68%	69%	38%
Windsor	69%	62%	63%	58%	48%
High Score	92%	86%	86%	82%	55%
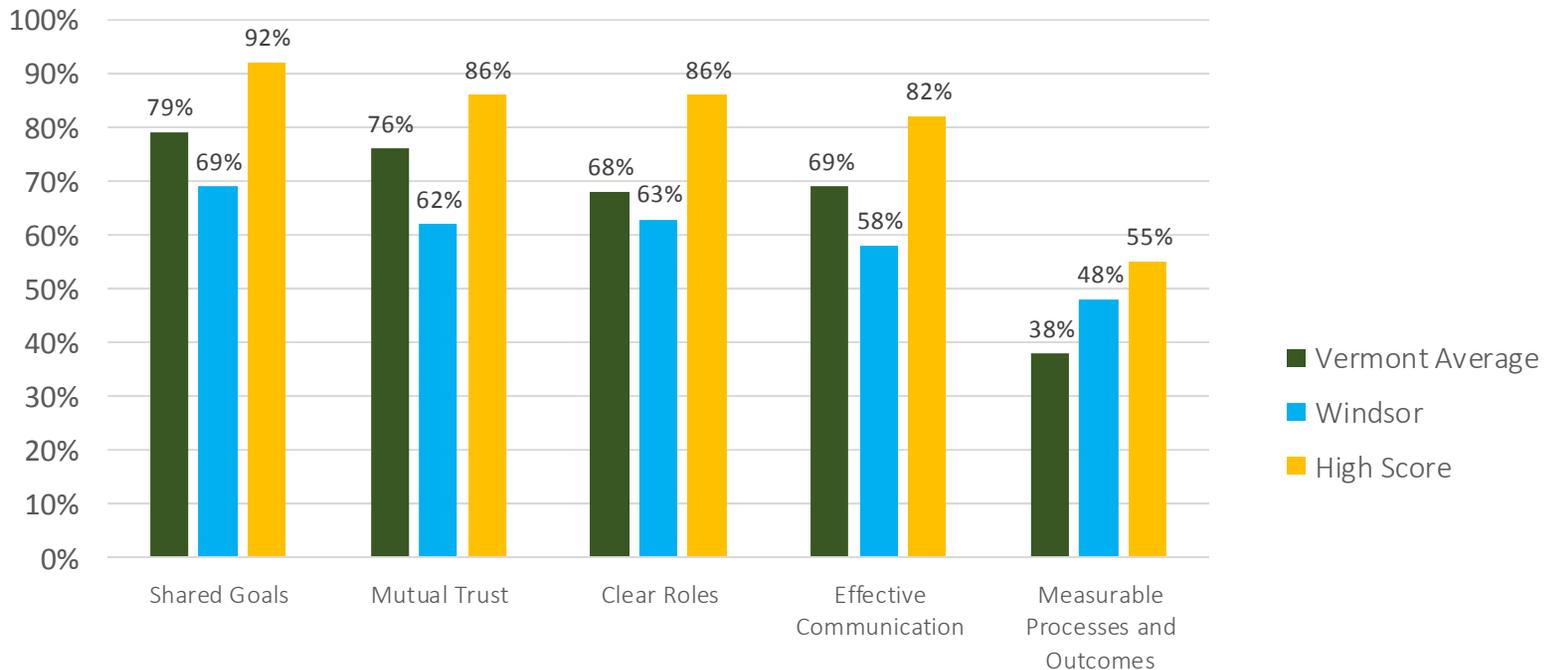
Benefits of Working Together in the Windsor HSA

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Screenshot of network analysis question:

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Graph Density

The proportion of all possible connections (represented as edges) that are present

Modularity

A measure of how readily a network decomposes into modular communities or sub-networks. This modularity numbers given here are based on the modularity function used in the Gephi software program (there are many other "modularity" or "community detection" functions that may be used in network analysis).

Windsor HSA

Information Sharing Network

Node color indicates Degree Centrality

Node size indicates Betweenness Centrality

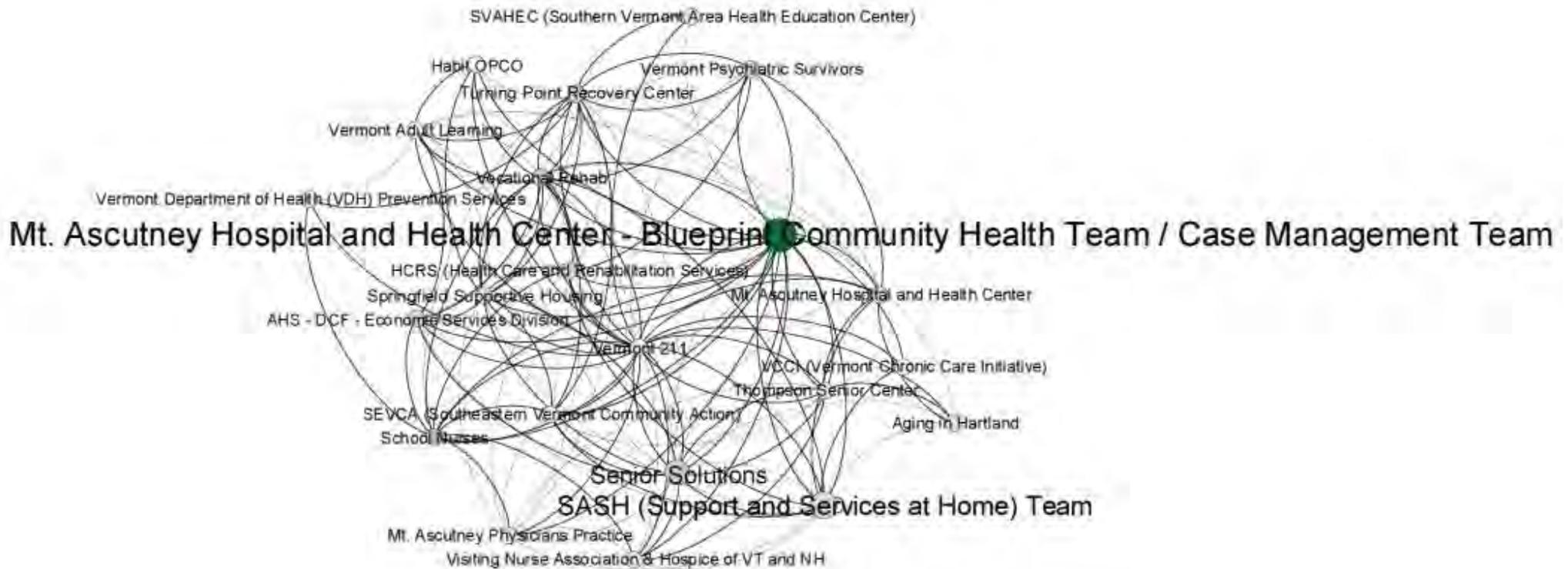![VCHIP - Vermont Child Health Improvement Program, University of Vermont College of Medicine](logo)

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Windsor HSA

Resources Sharing Network

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Windsor HSA

Referrals Network

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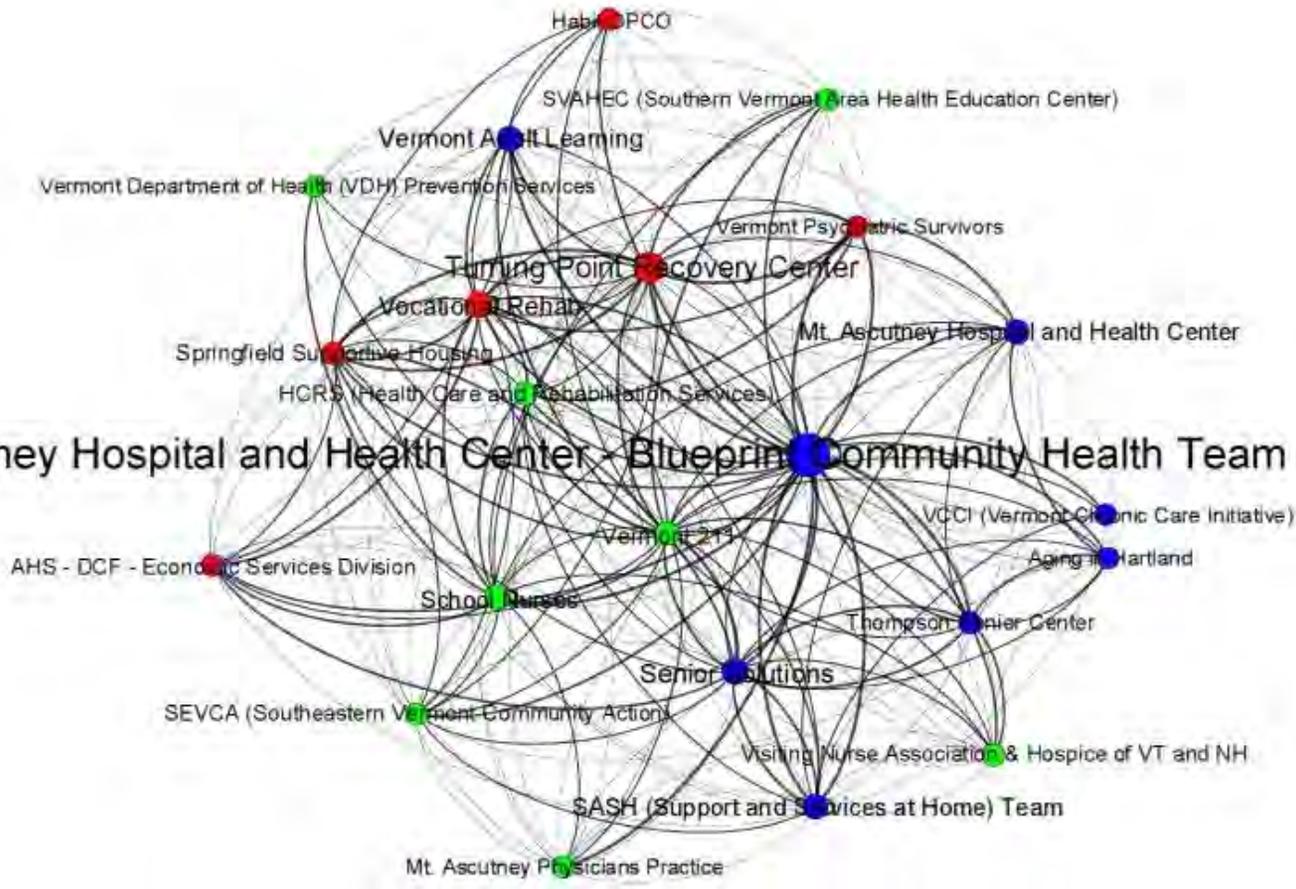802 656 8210 TEL   802 656 8368 FAX

Windsor HSA

Full Network

Node color indicates sub-network membership

Node size indicates Betweenness Centrality

Windsor Network Measures & Key Player Analysis

Network Measures:

Measure	Value	Notes / Explanation
Network Size	22	The network contains 22 nodes (organizations)
Average Degree	6	Nodes in the network average 6 connections each
Average Shortest Path Length	1.5	The average distance between any two randomly selected nodes in the network is a little more than one and a half connections
Graph Density	0.30	Of all possible connections in the network, about 30% are present
Modularity	0.09	This measure of the how readily a network dissolves into communities or sub-networks is very low, indicating that the sub-networks that exist in the Windsor HAS are densely interconnected.

Key Player Analysis:

This is a method for identifying well-connected nodes that are likely to possess a great deal of information and are in a position to influence others. A program removes nodes to find which ones, when removed, cause the maximum disruption to the network overall. In Windsor, these nodes are **Mount Ascutney Hospital and Health Center—Blueprint CHT and Case Management Team, Turning Point Recovery Center, and Vermont 211.** However, their removal causes relatively minimal fragmentation, indicating a redundant and durable network.

Observations of Network Graphs—Across HSAs

1. Each community network is substantially larger than its "core health team" and includes a range of public and private health and social service organizations that support a diverse swath of each community's population—young and old, well and sick, able and disabled, well-off and financially struggling.

2. Each community tends to have a few networks members that aren't a predictable part of every network—for instance local fitness clubs, churches, even a ski area. It would be interesting to better understand the benefits of these relationships and whether communities should be to encouraged to build more or stronger relationships with any of these types of organizations.

3. Divisions or departments of organizations tend to be connected to each other (e.g. departments of a hospital, divisions of Vermont AHS) a finding that is both predictable and positive.

4. Blueprint Community Health Teams (along with the community's Blueprint leadership) tend to be connected to the area hospital, usually the administrative entity, as well as to local SASH service providers.

5. Blueprint Community Health Teams are usually among the most central organizations in the network.

6. It's common to see sub-networks that serve a specific population within the community, for instance area youth (see the St. Johnsbury HSA for an example) or area elders (see the Randolph HSA for an example).

7. Very small networks are less likely to have sub-networks.

Observations of Windsor's Network Graphs

These are preliminary observations based on the graphs alone—the Windsor community will bring context and first-hand knowledge of the relationships and will therefore have richer observations about the network represented in these graphs.

1. The Blueprint Community Health Team has a prominent role in all of the graphs—information, resources, and referrals.

2. One of the Windsor community's sub-networks (blue) is made up of organizations focused on elder care. The most central organizations in another of the sub-networks (red) offer mental health and substance abuse treatment.

3. As of summer 2013, when the survey was conducted, SASH was already playing a central role in Windsor's referral network.

Next: Reflection and Evolution

The following questions may help individual communities reflect on the results of the network analysis

1. Which community agencies are most central in the network? Are there certain responsibilities that come with centrality?

2. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?

3. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?

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6. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

7. **How do you think this network analysis can be useful in your community?**

Additional Findings Based on Community Dialogue

The Windsor community provided feedback following a presentation of these findings at a "PATCH" meeting May 5, 2014.

1. Members of the Windsor community observed a strong relationship between Turning Point Recovery Center and the Blueprint CHT that they suppose is due in part to physical proximity—"they are right around the corner."

2. SASH's most central role is in the resources network, and the group says that is because right now, SASH is bringing new resources to the area.

3. Mount Ascutney Physicians Practice is peripheral on the full network map, and the group theorized this is because, rather than directly participating with most organizations in the network, they tend to engage with the network through Jill Lord and the Blueprint CHT. This relationship is key to network health overall and should be maintained.

4. The strong presence of 211 in the full network is relatively unique to the Windsor HSA. Jill has been a strong advocate of 211 in the community and a 211 representative can be counted on to attend almost all PATCH meetings. This advocacy and visibility has led to 211's central role.

5. Organizations to add to future studies include WISE, Windsor County Partners, school guidance counselors and school health teachers (in addition to the school nurses who are already part of the study).

6. The group expressed interested in using research findings as attachments to grants

7. The group hopes to conduct additional dialogue about this research and how they can use it to improve the work that they do (e.g. spend more time with the "Reflection and Evolution" questions and respond with clear answers and possibly action plans.