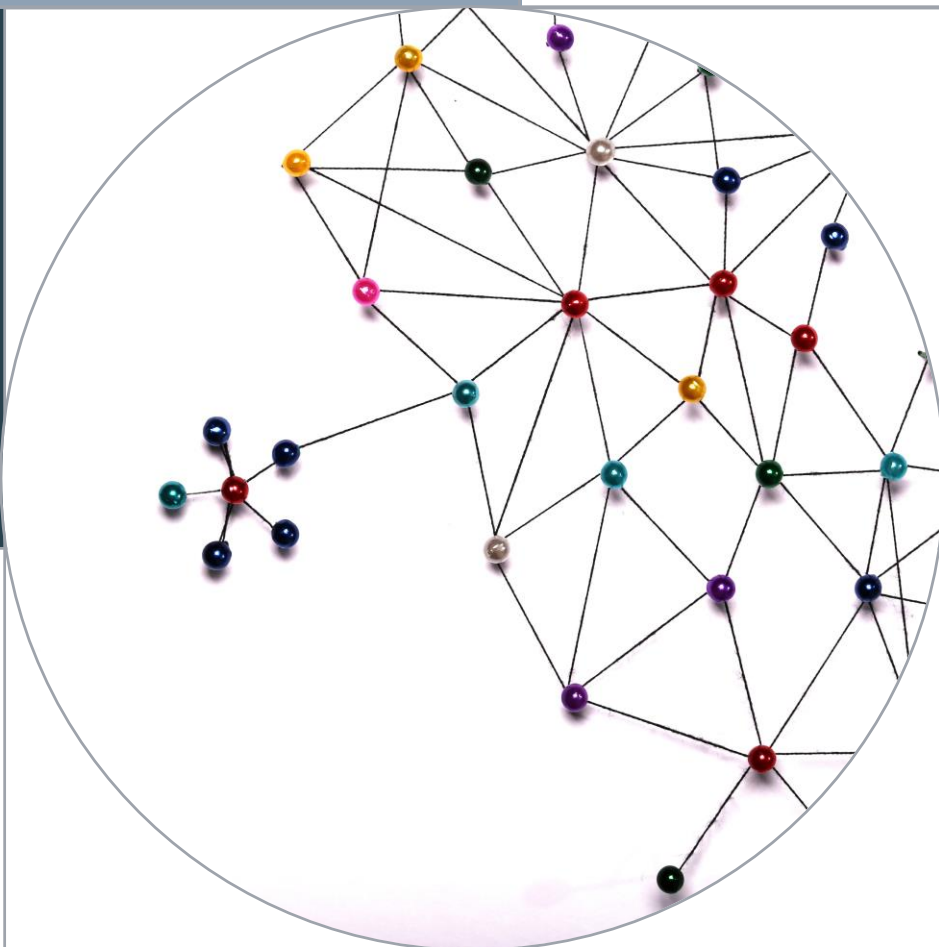# Collaboration and Coordination in Nigeria's Multi-Activity Program

Findings from an Organizational Network Analysis

February 2023

Collaboration and Coordination in Nigeria's Multi-Activity Program

Findings from an Organizational Network Analysis

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Acknowledgments

Cover

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Abbreviations

BA-N   Breakthrough ACTION-Nigeria

CBO   community-based organization

CSO   civil society organization

D4I   Data for Impact

FCT   Federal Capitol Territory

GHSC-PSM   Global Health Supply Chain Program-Procurement and Supply Management

HPN   health, population, and nutrition

IHP   Integrated Health Project

NGO   nongovernmental organization

ONA   organizational network analysis

PMI-S   President's Malaria Initiative for States

RMNCH+N   reproductive, maternal, newborn, and child health and nutrition

UN   United Nations

USAID   United States Agency for International Development

Executive Summary

Assessment Overview

- In 2022, as part of a larger evaluation, we conducted an **organizational network assessment** with four United States Agency for International Development (USAID)/Nigeria Health, Population, and Nutrition (HPN) activities and their collaborators in Ebonyi, Kebbi, and Zamfara states.
- Data were collected on information, non-monetary resource, and funding exchange.
- We compared network structures among states where different HPN activities operate and used modeling to identify how new relationships could increase sharing across networks and the role that government plays in that sharing.

Key Findings

Information exchange is the most common, but resource sharing networks are also robust. Implementing partners and the government play important roles in these networks. Differences by state point to multiple factors affecting collaboration and coordination. Optimizing networks may improve program effectiveness and sustainability.

Ebonyi

- Organizations commonly share information, and networks are centered around HPN activities and government health agencies.
- Connecting HPN activities to one another, professional societies, and NGOs could be beneficial.

Kebbi

- Organizations less commonly share resources, and networks connect a range of government agencies, including those focused on health as well as economic and social development.
- Connecting HPN activities to government organizations, and connecting HPN activities to each other could be beneficial.

Zamfara

- Organizations commonly share resources, and networks are centered around religious and cultural entities.
- New connections between HPN activities and key government health agencies and religious and cultural organizations could be beneficial.

Conclusions

- Networks in each state vary according to the local context as well as the program model, and potentially beneficial relationships depend on those structures.
- Ebonyi and Zamfara networks are more centralized, but in Zamfara bridging highly central HPN activities and key health-related government agencies may be especially constructive.
- Whereas Ebonyi networks are centered around HPN activities, Kebbi networks are centered around a wider range of government agencies related to health, the economy, and social development; and Zamfara networks emphasize religious and cultural institutions.

Fostering new strategic connections between HPN activities and other organizations in each state could increase the commonality and efficiency of sharing as well as government agencies' positions as resource and information brokers.

Introduction and Background

Data for Impact (D4I) is conducting a prospective mixed-methods portfolio evaluation of four USAID/Nigeria Health, Population, and Nutrition (HPN) activities, with a focus on comparing an integrated health-programming approach with a disease-focused approach (malaria). As part of this evaluation, we conducted an organizational network analysis (ONA) to better understand collaboration and coordination through structural aspects of resource, information, and funding exchange in Ebonyi, Kebbi, and Zamfara where different combinations of activities are being employed:

- **Integrated approach**: The Integrated Health Project (IHP) implements a fully integrated set of reproductive, maternal, newborn, and child health plus nutrition and malaria and health system strengthening interventions. This approach is being used in Ebonyi and Kebbi.

- **Disease-focused approach**: The President's Malaria Initiative for States (PMI-S) focuses on malaria health programming and health system strengthening. This disease-focused approach is being used in both Ebonyi and Zamfara.

- In all three states, demand creation is led by Breakthrough ACTION-Nigeria (BA-N), and commodity procurement and distribution is led by the Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM).

In this analysis, we evaluated the potential effects of the integrated, disease-focused, and combination approaches on three types of sharing networks constructed from a survey of organizations in these states: non-monetary resource sharing, information sharing, and funding sharing. Selected findings from a sustainability assessment that included a structured survey and key informant interviews among HPN activity stakeholders were also considered alongside the ONA results for additional context and triangulation.

Data and Methods

Network Survey Design and Sample

First, stakeholders representing IHP, PMI-S, BA-N, and GHSC-PSM in each state were asked to identify up to 10 organizations with whom they collaborate on their HPN activities. Together these groups formed the sample for the organizational network survey. One respondent from each organization in the sample was identified to respond to the survey questions on behalf of their organization. The survey asked basic information about the organization and then asked respondents to nominate up to 10 organizations with whom their organization collaborates on the four focal HPN activities. For each nominated organization, the respondent answered questions about the state in which it operates, the type of organization (for example, United Nations [UN] Agency, NGO, civil society organization [CSO], community-based organization [CBO], state government, or national government), and whether they collaborate in technical areas such as malaria or nutrition service delivery and for purposes such as policy dialogue, strategic implementation, or joint advocacy.

Table 1. Survey questions and corresponding measures

Survey Question	Measure
How often does your organization provide/receive resources (things bought with money or provided in-kind, such as drugs/commodities, meeting/office space, media time, etc.) to (name)?	Resources provided and received
How often does your organization provide/receive information (technical, training, educational, both formal and informal) to (name)?	Information provided and received
How often does your organization provide/receive funding to (name)?	Funding provided and received
Please rate the quality of your organization's relationship with (name).	Relationship strength

The primary measures used to construct sharing networks are based on responses to questions about the frequency with which respondent organizations share and receive three types of support from the nominated organizations: (1) information, (2) non-monetary resources (items bought with money or provided in-kind such as drugs/commodities, meeting/office space, media time, etc.), and (3) funding. Table 1 shows the survey questions and corresponding measure names. Responses are provided on a five-point scale: "never," "less than once a month," "1–3 times a month," "4–8 times a month," and "more than 8 times a month." To enable mean frequency scores to be calculated, we coded these responses on a scale from 0–4. Finally, surveyed organizations were asked to rate the strength of their relationship with each nominated organization on a four-point scale ranging from "weak relationship (little reliability)" to "excellent relationship (high reliability)."

Network Model Construction

To gain a more holistic understanding of exchange relationships in each of the three states, we used the survey data to construct network models where organizations are connected to each other based on whether and how often they exchange each type of resource. We created and analyzed nine distinct networks: one for each of the three resource types in each of the three states. For each of these networks, we compared properties of the overall network, the positions of organizations within them, and the role that selected relationships play in connecting different parts of the network.

Table 2. Glossary of terms from organizational network analysis

Organizational Network Terminology	
Organizational network	Set of organizations connected by particular types of collaboration or exchange. In this analysis we look at resource, information, and funding sharing relationships.
Node	Representation of an organization in the network.
Edge	Representation of a direct sharing relationship between two organizations in the network.
Edge weight	Numerical attribute of an edge, in this case indicating the commonality of sharing resources, information, or funding.
Direct distance	Numerical attribute of an edge, quantified as the inverse of the edge weight. A higher direct distance between two organization indicates that they share resources, information, or funding less commonly.
Shortest path	Ordered sequence of direct sharing relationships between two organizations with the smallest total distance. The organizations along this path may be important for the transmission of resources, information, or funding between those two organizations.
Distance	Length of the shortest path(s) between two organizations.

A list of terms from organizational network analysis appears in Table 2. In network terminology, organizations are represented as *nodes*, and the relationships between them are referred to as *edges*. In this study, both surveyed and nominated organizations are represented as nodes. Because this survey distinguishes between "provided" and "received," our networks are directed; that is, each edge represents a directed connection between two nodes. If, for example, surveyed organization **A** provides funding to nominated organization **B**, there exists an edge pointing from node A to node B. A directed edge from one node to another does not imply the existence of an edge in the reverse direction; in practical terms, one organization may share resources with another organization but not vice versa. Each network exchange measures and then corresponds to a single directed edge.

For some measures we also represent the amount that organizations exchange resources, information, or funding as numerical values assigned to each edge—these are called *weights*. To do this, we use the numerical 0–4 coding scale derived from the five possible responses to the relationship measures. A value of 0 indicates that the corresponding edge does not exist because no information is exchanged, where any other value is assigned directly as a numerical weight. For instance, if an organization reported providing information to another less than once per month (one of the options from the survey), the associated edge weight would be 1. If they provided information 4–8 times per month (another option), the associated edge weight would be 3. A higher weight corresponds to a higher exchange frequency, and thus we interpret higher weights as indicating a more significant relationship on some measures.

Some of our network measures rely on computing distances between nodes based on the frequency of sharing. Quantitatively, we define this distance as the inverse of the weight of the edge connecting them. For instance, if an organization reported providing information to another organization more than eight times per month, the associated edge weight would be 4 and the distance from the former node to the latter would be 1/4. Organizations that provide resources, information, or funding more frequently are represented as less distant to connected organizations.

In cases where two surveyed organizations nominate each other, two pieces of information are available, corresponding to each of the two possible edges. For example, if surveyed organization **A** reports sharing information with organization **B** 1–3 times per month, but **B** reports never receiving information from **A**, there is a mismatch. Our solution is to take the maximum of the two edge weights corresponding to answers from each organization. This response is based on the idea that the individual being surveyed may not know about all information and resource exchanges that the organization takes part in. We will discuss this low-information bias issue further in the next section.

Finally, some of our measures rely on path analyses. In network analysis terminology, a path is an ordered sequence of nodes where two nodes may appear in sequence if there is an edge that connects them. A *shortest path* is one that requires traversing the smallest total distance, computed by taking the sum of distances associated with each edge being traversed. Path analysis allows us to better understand how efficiently information or resources can be transferred across the network and identify individual organizations or relationships that play an important role in maintaining that efficiency.

Network Modeling Limitations

This work has some important limitations. First, the estimation of exchange frequency may be affected by social desirability bias, low-information bias, and bias in the survey method. Social desirability bias arises when the respondent considers more exchange to be preferred and overstates the exchange frequency. Low-information bias arises when the respondent has an incomplete understanding of collaborations or the frequency of sharing, causing nominations or exchange to be underreported. This may be especially prevalent among respondents at larger organizations. In addition, nominations reflect individual decision making about which collaborators to include when more than 10 are known to the respondent. Organizations with more than 10 real-world connections may appear less connected than they are, and some eligible nominees may be omitted entirely. Finally, we do not have information about exchange that originates with nominees who are not also respondents, since nominees are not interviewed.

As with any model, networks cannot perfectly represent the real world, and the results described here are primarily intended to prompt stakeholders to think about and discuss collaborations and relationships between organizations in new ways to benefit programming.

Activity-Specific Networks

For state-level network measures, we introduce an additional level of granularity by separately analyzing relationships which involve collaboration on two sets of activities: (1) malaria and (2) reproductive, maternal, newborn, and child health and nutrition (RMNCH+N). Results are presented for each of these subnetworks in addition to the networks based on all activities.

State-Level Network Comparison Metrics

We use three state-level network metrics to offer broad comparisons between networks from different states: density, reciprocity, and efficiency.

Figure 1. Illustration of state-level network measures

Low Density

High Density

Low Reciprocity

High Reciprocity

Low Efficiency

High Efficiency
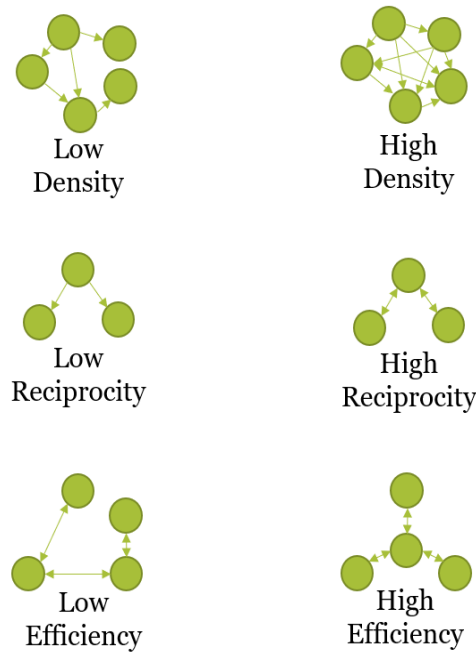
Density captures the overall amount of sharing happening in the network. Networks where sharing is more common can distribute resources, information, or funding between organizations more easily. Quantitatively, we measure this as the proportion of relationships that exist out of all possible relationships. Because edges are bidirectional and each surveyed organization can nominate a maximum of 10 organizations including another surveyed organization, we take the total number of edges to be $2 * 10 * n - 2k$, where k is the number of surveyed organizations that nominated each other, and n is the number of surveyed organizations in the given state. The last term is included so that we don't penalize networks where surveyed organizations nominate each other. For this study, in calculating density we ignore edge weights representing the frequency with which organizations share. The maximum theoretical density of a network is 1, although that scenario may be unrealistic depending on the number of nodes involved and the cost (time and energy) required to establish and maintain relationships.

Reciprocity indicates the proportion of relationships in the network that are reciprocated, that is, two organizations each report sharing with the other. A network with high reciprocity indicates that relationships between organizations are often mutual. For this measure, we ignore edge weights. The highest possible reciprocity value is 1.

Efficiency indicates how efficient the network is at distributing information and resources to all organizations. A network with high efficiency would be able to pass information from any organization to any other organization through the fewest intermediary organizations. Quantitatively, this is computed as the average inverse distance between each pair of nodes in the network, where distance is the length of the average shortest path. For this measure alone,

we ignore the directionality of edges because many nodes in our network will be unreachable otherwise.

Note that adding any additional edge cannot decrease the efficiency of the network but could increase it. In the unnormalized version of efficiency we use here, adding an edge could increase overall efficiency depending on which nodes it connects and the weight of the added edge. Thus, networks with higher density are also likely to have a higher efficiency, depending on the configuration of the edges, but not necessarily. While there are ways to control for the total number of edges through more complex simulation methods, we use the unnormalized version for simplicity.

Organization and Relationship Centrality

Now we examine the roles that individual organizations and exchange relationships play within the larger network using *betweenness centrality*. This centrality measure places importance on the ability of a node or edge to bridge otherwise disconnected or distant nodes and can be computed similarly for both nodes and edges. More precisely, betweenness centrality is a measure of the number of shortest paths that pass through the specific node or edge. When a node or relationship appears in one of several shortest paths, they are attributed to only a portion of the path. For instance, if there are two shortest paths between a pair of nodes and a given node lies on one of them, that node will receive a value of one-half of a path. The number of shortest paths in a network is $n(n-1)$, the number of node pairs in the network. Thus, if a node has a betweenness centrality of m, that organization will have appeared in $100 * m/(n(n-1))$ percent of shortest paths in the network. Relationships that are more central play a more critical role in the exchange of information and resources between organizations in the network.

Organizations and relationships with high betweenness centrality, then, are critical for exchange across the network. If a more central organization or relationship were to dissolve, it would have a larger impact on the ability of organizations in the network to exchange information or resources compared to the dissolution of less central ones. Organizations that are connected to other organizations who are themselves already highly connected will have lower betweenness centrality because their dissolution would not result in significant changes to the overall network structure.

There are alternative centrality metrics that we did not investigate in this analysis. Eigenvector centrality, for instance, is one possible measure of influence—it would capture the extent to which a given organization is connected to other well-connected organizations. We selected betweenness centrality since we are most interested in the exchange of resources and information between organizations across the network.

Predictive Network Modeling

We also use the networks derived from the survey to model the effects of establishing a new relationship on two primary measures: efficiency and government centrality. The centrality of government organizations in the network is of interest because it may relate to program

sustainability (that is, by reflecting a superstructure where government is pivotal); however, the feasibility of potential relationships identified through predictive modeling will vary. To model the establishment of a new relationship, we simply add the hypothetical relationship to the network model and recompute both network-level measures. We are then left with a score for each hypothetical edge indicating the change in these measures that we would observe if it existed.

Each hypothetical edge has a weight and distance of 1, modeling the scenario where organizations begin to collaborate by exchanging resources, information, and funding less than once a month. This is the lowest amount of sharing possible in our survey, and we choose this because it may take time to build relationships that involve more sharing. Following this logic, we also only consider possible relationships connected to at least one surveyed organization because they are deemed to have the most relevance to the topic of investigation.

The efficiency measure is the same as that presented in the network-level descriptive results. Because efficiency captures average distance between all nodes in the network, we are likely to observe that hypothetical edges that would increase efficiency would connect peripheral nodes with more central nodes because it would bridge otherwise distant parts of the network.

We compute government centrality as the average betweenness centrality of government organizations in the network. In a network with the highest possible government centrality, government organizations would lie on shortest paths between every pair of organizations. Our analysis is focused on the difference between empirically observed networks and ones with an additional edge. Thus, we are interested in the possibility that a new edge will create a new shortest path that includes government organizations.

Survey Summary Statistics

Table 3 provides summary statistics from the survey. These descriptive statistics offer a sense of the types and nature of exchanges reported between surveyed organizations and their nominees. For each measure in each state, two values are provided: (1) the average proportion of nominated organizations that respondents provide support to or receive support from with any frequency greater than "never," and (2) the average frequency score among those relationships. For example, Ebonyi respondents shared resources with 39 percent of the organizations they nominated, whereas Kebbi and Zamfara respondents shared resources with 29 percent and 59 percent of their nominees, respectively. Similarly, Ebonyi respondents indicated providing resources with a frequency score of 1.8 compared to the 1.4 average for both Kebbi and Zamfara. The averaged frequency scores here are based on the coding scheme where 1 corresponds to "Less than once a month," 2 corresponds to "1–3 times a month," 3 corresponds to "4–8 times a month," and a 4 corresponds to "more than 8 times a month."

Table 3. Survey descriptive statistics

Measure	Ebonyi	Kebbi	Zamfara
Number Organizations Surveyed	23	22	25
Av. Nominations (Maximum 10)	9.1	8.9	8.8
Any Resources Provided	39%	29%	59%
Resources Provided Av.	1.8	1.4	1.4
Any Resource Received	8%	37%	65%
Resources Received Av.	1.6	1.6	1.4
Any Information Shared	95%	93%	96%
Information Shared Av.	2.1	1.4	1.5
Any Information Received	95%	93%	91%
Information Received Av.	2.0	1.4	1.4
Any Funding Provided	11%	13%	16%
Funding Provided Av.	2.0	1.3	1.6
Any Funding Received	9%	19%	22%
Funding Received Av.	1.2	1.1	1.4
Strength Score Av.	3.2	3.0	3.4

The results in Table 3 show that the number of organizations surveyed from each state is approximately balanced, and the average number of nominations per surveyed organization is also very similar between states. Surveyed organizations in Kebbi provide resources to fewer nominated organizations, and Ebonyi has the highest frequency of resource sharing among nominees in the network. Respondents in Zamfara report receiving resources from a comparatively high number of nominated organizations, but the frequency with which they receive them is lower than in Ebonyi and Kebbi.

Surveyed organizations in all states exchange information with most of their nominated organizations, but organizations in Ebonyi tend to provide and receive information more frequently. Organizations in all states provide funding to a low portion of their nominated organizations, but in Ebonyi only nine percent of nominated organizations report receiving funding whereas in Kebbi and Zamfara funding is received by nearly twice that proportion.

These results make clear that organizations working in different states tend to have different kinds of exchange relationships. Relationships in Ebonyi tend to be focused more on information exchange and those in Zamfara tend to focus more on resource sharing and funding. Organizations in Kebbi appear to have overall lower rates of exchange of these three types and report that their relationships with nominee organizations are less strong. Findings from the sustainability survey echoed this, with higher scores in Ebonyi and Zamfara for items reflecting effective engagement and collaboration with government agencies and other partners.

Resource Sharing Network Results

First, we examine resource sharing networks. These networks are based on the resources provided and resources received measures (see Table 1). Note that the survey describes resources as "things bought with money or provided in-kind, such as drugs/commodities, meeting/office space, media time, etc."

From a network perspective, we can understand these exchange relationships in terms of their ability to distribute resources across organizations to increase the capacity of all organizations in the network. Resource exchange networks in which we see organizations sharing often, as captured by network density, are also likely to use resources more efficiently and be less asymmetrical in their access to resources, all other factors being equal.

Figures 2–4 represent the resource exchange networks, and the full names associated with the labels there are shown in the appendix. Green nodes correspond to surveyed organizations and dark blue nodes to organizations that were nominated but not surveyed. Node shape corresponds to HPN activity, and node size corresponds to betweenness centrality—larger nodes are more central. Darker edge lines correspond to edges with higher weights, and arrows show the directionality of the exchange relationship. For visualization purposes, the two possible edge lines between two nodes overlap, so the line shading is additive for reciprocated relationships. Where node labels are unable to fit without overlapping, a dark black line appears from the label to the node centers.

Figure 2. Ebonyi resource sharing network
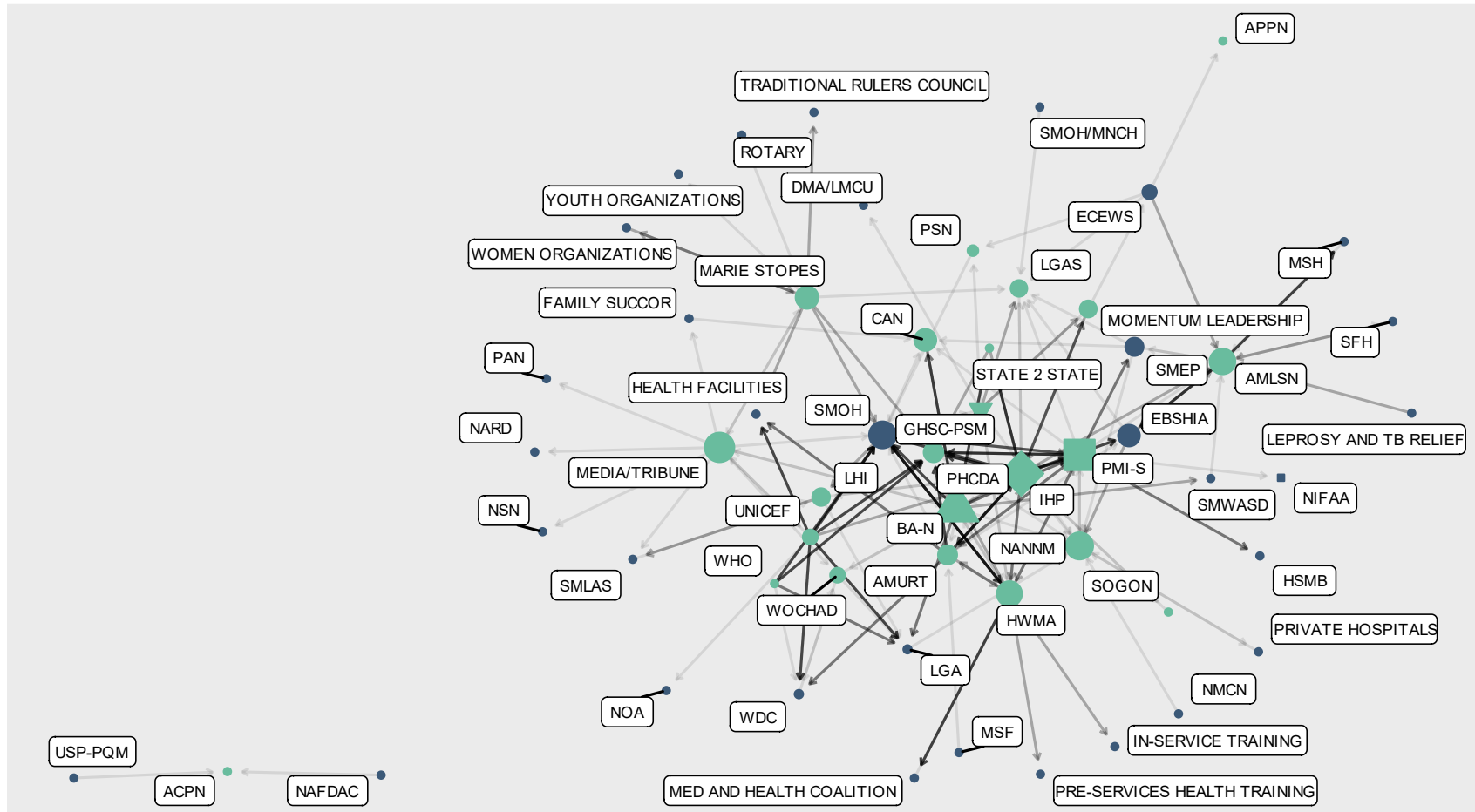
Figure 3. Kebbi resource sharing network

Figure 4. Zamfara resource sharing network
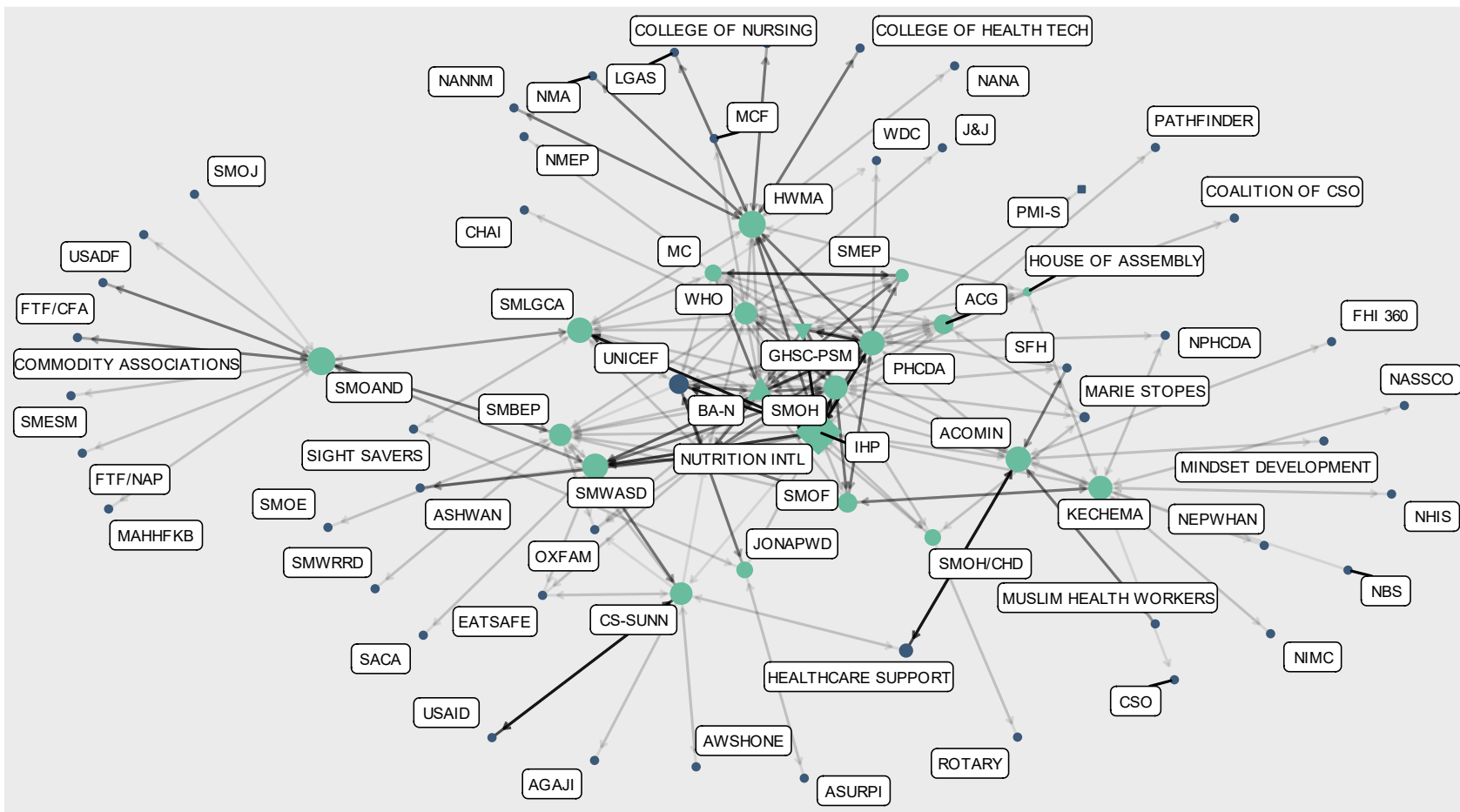
State-Level Network Comparison

Next, we compare network density, reciprocity, and efficiency measures across the three states. From Figure 5 we see that the Zamfara network has the highest resource sharing density, followed by Ebonyi and then Kebbi. This is consistent with the survey summary statistics and the network visualizations highlighted previously. In the sustainability assessment, HPN stakeholders in Zamfara also reported that their efforts reflected resource and funding stability to a greater extent than those reported by stakeholders in other states. Note that resource sharing density for Malaria and RMNCH+N collaborators is lower than for those relationships that involve all health activities, so we can say that collaboration on those activities involves less resource sharing than average.

Figure 5. Resource sharing network density by state and health activity
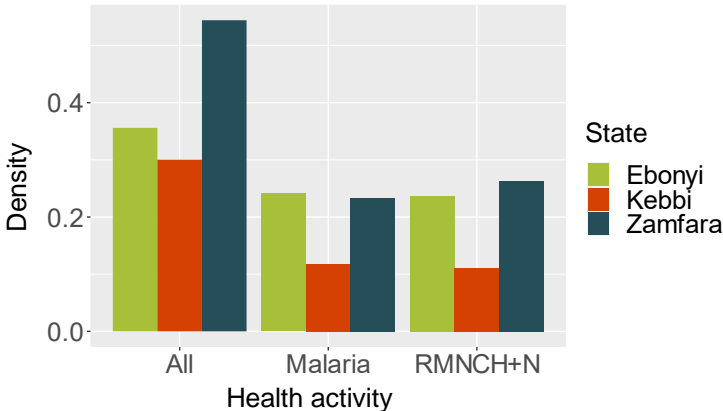
In Figure 6 we can see that Zamfara has the highest proportion of reciprocated resource sharing relationships, followed by Kebbi and then Ebonyi, and that this pattern is similar across Malaria and RMNCH+N subnetworks. Finally, Figure 7 shows resource sharing efficiency measures across the three states and two health activity subnetworks. Ebonyi has the highest efficiency, followed by Zamfara and then Kebbi. This is surprising because organizations in Zamfara more commonly share resources, so the pattern is not explained by more sharing overall. Instead, this difference is likely related to other aspects of the network structure, that is, relationships are optimally positioned for efficient exchange.

Figure 6. Resource sharing network reciprocity by state and health activity
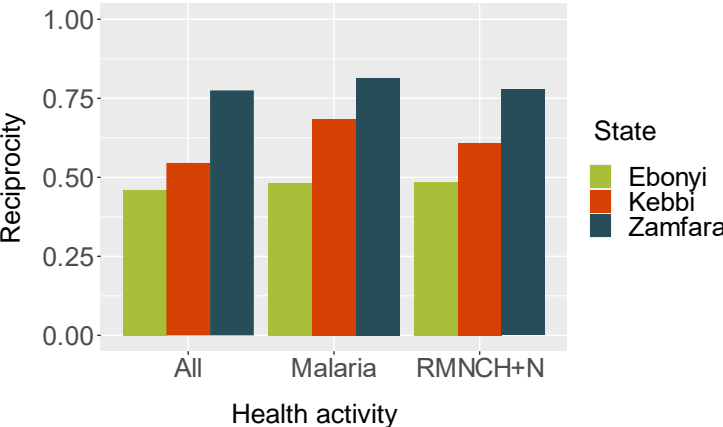
Figure 7. Resource sharing network efficiency by state and health activity
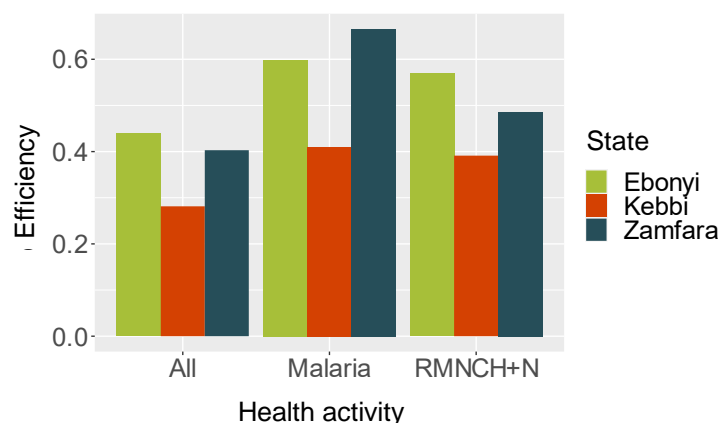
Central Organizations and Relationships

Table 4 shows the 10 organizations with the highest betweenness centrality, and their centrality scores, for resource sharing networks in each of the three states. In Ebonyi, HPN activities including IHP, PMI-S, and BA-N appear as the three most central organizations in the network. Because sampling and nominations are explicitly based on collaboration related to HPN activities, high centrality among these organizations is probably at least partially a measurement effect. In addition, both HPN activities and the names of their activity implementing partner organization(s) may appear as nodes in the network data based on the response that was provided.

Table 4. Resource sharing network: Most central organizations

Organization	Betweenness Centrality
Ebonyi	
IHP	650.1
PMI-S	608.8
BA-N	571.3
MEDIA/TRIBUNE	406.0
NANNM	323.0
SMOH	317.7
AMLSN	277.0
HWMA	259.8
MARIE STOPES	195.0
CAN	174.0
Kebbi	
IHP	503.7
ACOMIN	339.0
PHCDA	293.2
SMLGCA	253.0
BA-N	236.0

Organization	Betweenness Centrality
SMOAND	192.0
SMWASD	187.0
SMOH	181.8
GHSC-PSM	109.0
HWMA	70.0
Zamfara	
SPHCB	2261.2
PMI-S	1533.2
CAN	896.5
SMOH	763.0
RATTAWU	518.0
SMIC	468.0
SMLGCA	454.1
MSF SPAIN	434.0
IMAN	414.3
SMOE	397.9

In Ebonyi the Media/Tribune, National Association of Nigeria Nurses and Midwives (NANNM), the State Ministry of Health (SMOH), and the Association of Medical Laboratory Scientists of Nigeria (AMLSN) are the next most central organizations. The Media/Tribune is central because it connects otherwise disconnected organizations to relatively central actors within the network. NANNM and AMLSN are both professional organizations established to support and advocate for nurses/midwives and scientists across the organizations they are a part of. The State Ministry of Health is central because it connects Media/Tribune to core HPN organizations with a high quantity of resource sharing (see Figure 2).

Table 5. Resource sharing network: Most central relationships

Organization	Betweenness Centrality
Ebonyi	
BA-N → MEDIA/TRIBUNE	419.0
NANNM → PMI-S	332.0
PMI-S → BA-N	277.5
CAN → BA-N	221.0
IHP → PMI-S	208.5
EBSHIA → NANNM	193.7
MEDIA/TRIBUNE → MARIE STOPES	186.0
SMOH → HWMA	151.7
AMLSN → EBSHIA	145.5
SMEP → CAN	135.5

Organization	Betweenness Centrality
Kebbi	
SMLGCA → IHP	206.0
SMOAND → SMLGCA	186.0
IHP → PHCDA	141.5
PHCDA → ACOMIN	129.0
SMWASD → IHP	112.0
IHP → GHSC-PSM	108.0
SMOH → HWMA	105.0
CS-SUNN → SMWASD	102.0
ACOMIN → IHP	91.0
ACOMIN → BA-N	85.2
Zamfara	
SPHCB → PMI-S	680.0
PMI-S → SPHCB	564.7
SPHCB → SMIC	481.0
SMIC → RATTAWU	476.0
PMI-S → CAN	424.0
SMLGCA → SPHCB	380.1
CAN → PMI-S	336.0
MSF SPAIN → SPHCB	265.0
NSTOP → SPHCB	252.0
ZSPP → SMLGCA	245.2

The most central resource sharing relationships in Ebonyi (see Table 5) connect the HPN activities and other central organizations that are less connected to the center of the network. The connection between the Ebonyi State Health Insurance Agency (EBSHIA) and NANNM appears to be central because it connects central organizations like the AMLSN with the highly central HPN activities. The connection between Media/Tribune and Marie Stopes is important because it bridges peripheral organizations attached to each. The link between the SMOH and the Health Workforce Management Activity is also important because it links government organizations to private sector firms.

Central organizations in Kebbi tend to include more government organizations and more non-HPN activities, compared to Ebonyi. Below IHP we see the Civil Society for Malaria Control, Immunization and Nutrition (ACOMIN), a network of civil society organizations working on Malaria projects. We also see government organizations such as Kebbi's State Primary Health Care Development Agency (PHCDA), State Ministry of Local Government and Chieftaincy Affairs (SMLGCA), State Ministry of Agriculture and Natural Development (SMOAND), State Ministry of Women and Social Development (SMWASD), and SMOH in this top list.

The most central relationships between organizations in Kebbi primarily include links between government organizations and HPN activities along with the NGO ACOMIN. This suggests the existing links between government, HPN activities, and civil societies tend to be important for distributing resources across the network.

Highly central organizations in Zamfara include a combination of government organizations and HPN activities, as with the other states, in addition to the religious institutions Christian Association of Nigeria (CAN) and Islamic Medical Association of Nigeria (IMAN). The Radio, Television, Theatre and Arts Workers' Union of Nigeria (RATTAWU) and the NGO Médecins Sans Frontières Spain (MSF Spain) also appear as highly central. In the sustainability assessment, although coordination and collaboration between government entities and HPN activities was rated higher in Zamfara than any other state, the most central relationships in Zamfara primarily connect HPN activities to religious and cultural institutions.

Potential Relationship Models

Next, we present results from predictive modeling along two dimensions: network efficiency and government centrality. Recall that these relationships are identified by simulating the addition of every edge and measuring the change in the two outcome variables. Here the total value changes are presented along with the z-scored value calculated across changes resulting from all possible edges.

Efficiency

Table 6 shows the potential relationships that would have the largest effect on overall network efficiency. In Ebonyi, nearly all modeled relationships that would improve efficiency are links between one of the HPN activities and the Association of Private Practicing Nurses (APPN). APPN has high potential to increase total efficiency because it is connected to Excellence Community Education Welfare Scheme (ECEWS), which, in turn, serves to connect the Pharmacist Society of Nigeria (PSN), Local Government Authorities (LGAS), and Momentum Leadership, which otherwise are not that well connected. Of note, some nominees may appear poorly connected because the organization name provided by the respondent reflects an unusual response formulation (for example, naming LGAS instead of a more specific entity).

Table 6. Resource sharing relationships that could increase efficiency the most

Organization	Efficiency Change	Z-Scored Change
Ebonyi		
APPN ↔ IHP	0.00342	4.24
APPN ↔ BA-N	0.00327	4.03
APPN ↔ PMI-S	0.00321	3.95
APPN ↔ GHSC-PSM	0.00174	1.97
IHP ↔ MEDIA/TRIBUNE	0.00113	1.14
GHSC-PSM ↔ MEDIA/TRIBUNE	0.00071	0.57
IHP ↔ PSN	0.00051	0.30

Organization	Efficiency Change	Z-Scored Change
MEDIA/TRIBUNE ↔ PMI-S	0.00051	0.30
BA-N ↔ SOGON	0.00044	0.21
GHSC-PSM ↔ LHI	0.00035	0.09
Kebbi		
IHP ↔ SMOH/CHD	0.00089	4.25
ACOMIN ↔ GHSC-PSM	0.00049	2.11
GHSC-PSM ↔ WHO	0.00041	1.68
IHP ↔ WHO	0.00040	1.61
BA-N ↔ WHO	0.00038	1.55
GHSC-PSM ↔ KECHEMA	0.00037	1.46
BA-N ↔ KECHEMA	0.00036	1.40
BA-N ↔ SMOAND	0.00034	1.30
IHP ↔ MC	0.00032	1.18
BA-N ↔ SMEP	0.00025	0.81
Zamfara		
PMI-S ↔ SMOE	0.00164	3.75
IMAN ↔ PMI-S	0.00121	2.52
PMI-S FCT Abuja ↔ SPHCB	0.00119	2.47
PMI-S ↔ SOLIDARITÉS INTL	0.00112	2.26
PMI-S FCT Abuja ↔ MSF SPAIN	0.00087	1.54
LEPROSY MISSION ↔ PMI-S	0.00085	1.49
PMI-S FCT Abuja ↔ PMI-S	0.00082	1.41
PMI-S FCT Abuja ↔ IMAN	0.00064	0.89
PMI-S ↔ SMOH/NTD	0.00062	0.84
PMI-S FCT Abuja ↔ SMOE	0.00061	0.80

Relationships in Kebbi that would have the largest effect on increasing resource network efficiency primarily involve HPN activities and civil society or government organizations. In the network, SMOAND tends to connect a lot of otherwise disconnected organizations. The SMOH Community Health Department (SMOH/CHD) occupies a peripheral position in the network as can be seen from the network diagram—it is connected to relatively distant parts of the network, and therefore establishing connections with IHP, a very central organization, could have the largest effect on efficiency. ACOMIN also appears to be important for building connections to GHSC-PSM, showing there is more potential for important links between HPN activities and civil society organizations. The remaining potential relationships focus on increasing the centrality of the World Health Organization, which appears to be weakly connected to several distant organizations.

Relationships in Zamfara that would increase efficiency largely focus on connecting PMI-S to more central nodes. While PMI-S is fairly central, it exists in a part of the resource sharing

network that is relatively distant from the State Primary Health Care Board (SPHCB) and other more central organizations. Such relationships have the potential to bridge central organizations like CAN to the larger network.

Government Centrality

Table 7 shows relationships that could increase the centrality of government organizations within the resource sharing network. Many of these relationships in Ebonyi would connect HPN activities to government organizations, but we also see that connections between HPN activities and NGOs like Marie Stopes, the World Health Organization (WHO), and UNICEF have high potential for increasing government centrality. Finally, this list also includes Media/Tribune and NANNM, both relatively central organizations in the Ebonyi resource sharing network.

Table 7. Resource sharing relationships that could increase government centrality the most

Organization	Efficiency Change	Z-Scored Change
Ebonyi		
LGAS → BA-N	20.98	4.37
GHSC-PSM → MARIE STOPES	15.44	3.22
PHCDA → BA-N	13.11	2.74
IHP → MEDIA/TRIBUNE	12.67	2.64
NANNM → BA-N	11.17	2.33
PMI-S → MEDIA/TRIBUNE	8.67	1.81
GHSC-PSM → MEDIA/TRIBUNE	6.33	1.33
GHSC-PSM → UNICEF	5.72	1.20
IHP → MARIE STOPES	5.41	1.14
GHSC-PSM → WHO	4.28	0.90
Kebbi		
IHP → SMOAND	11.82	3.65
ACG → GHSC-PSM	10.24	3.14
BA-N → SMOAND	9.62	2.94
GHSC-PSM → SMOAND	9.47	2.89
ACG → IHP	7.59	2.29
ACG → BA-N	6.67	1.99
SMOH/CHD → GHSC-PSM	5.18	1.51
SMOH/CHD → IHP	4.12	1.17
SMOH/CHD → BA-N	3.76	1.06
HOUSE OF ASSEMBLY → GHSC-PSM	1.65	0.38

Zamfara		
RATTAWU → PMI-S	22.82	4.82
RATTAWU → PMI-S FCT Abuja	19.88	4.18
RATTAWU → BA-N	16.47	3.44
VECTOR LINK → PMI-S FCT Abuja	9.96	2.03
PMI-S → SOLIDARITES INTL	6.82	1.35
ZAMCHEMA → PMI-S FCT Abuja	6.76	1.34
SMOH/NTD → PMI-S FCT Abuja	6.64	1.31
VECTOR LINK → PMI-S	6.18	1.21
SMOE → PMI-S FCT Abuja	5.93	1.16
BA-N → SOLIDARITES INTL	5.47	1.06

In Kebbi, potential relationships that would increase efficiency the most primarily include links between HPN activities and SMOAND, SMOH/CHD, or Advocacy Core Groups (ACG), which are composed of civil society leaders focused on health outcomes. This shows that connecting core HPN activities with government and civil society organizations could have the largest impact.

In Zamfara, the relationships that could increase government centrality most include RATTAWU, PMI-S (Zamfara), and PMI-S in FTC Abuja, which is included in the network because they work with State Malaria Elimination Program (SMEP). These organizations all appear on the fringes of the network and could increase government organizations' centrality by connecting them to both parts of the network. We also see that connecting government organizations SMOH and the State Ministry of Education (SMOE) to PMI-S in the Federal Capital Territory (FCT) Abuja would have relatively large effects. Zamfara scored higher than other states on measures of government coordination and collaboration in the sustainability survey and on most measures of state government leadership competence, suggesting strong potential for optimizing government centrality in the HPN activity networks.

Resource Sharing Network Discussion

From these results we can draw some important insights about resource sharing network structures surrounding HPN activities and about the differences between networks in different states. We observe more sharing in Ebonyi networks and relatively high efficiency. Further investigation showed this is because Ebonyi's network tends to be concentrated around the core HPN activities. Potential relationships that would improve efficiency and government centrality, then, tended not to be focused on introducing direct connections between government organizations and the HPN activities.

On the other hand, organizations in Kebbi share resources less commonly. Government organizations there tend to be as critical for exchanging resources across the network as the HPN activities, and modeling showed that the relationships that would increase efficiency and government centrality the most were strongly focused on the government.

Organizations in Zamfara tended to share resources more commonly and formed a resource sharing network characterized by high efficiency. Central organizations include a mix of HPN activities, government organizations, and religious or cultural organizations. Potential relationships that would improve efficiency the most are primarily focused on government organizations and HPN activities. Relationships that would improve government centrality the most tend to focus more on connecting HPN activities to non-governmental institutions and initiatives like RATTAWU, Vector Link, and Solidarités International.

Information Sharing Network Results

Now we examine the information sharing networks in each of the three states. Table 1 shows the survey questions associated with these networks: "How often does your organization provide information (technical, training, educational, both formal and informal) to/from (name)?" Information sharing is the most common type of exchange, and thus these networks have the overall highest density and reciprocity across the three network types.

Figure 8. Ebonyi information sharing network
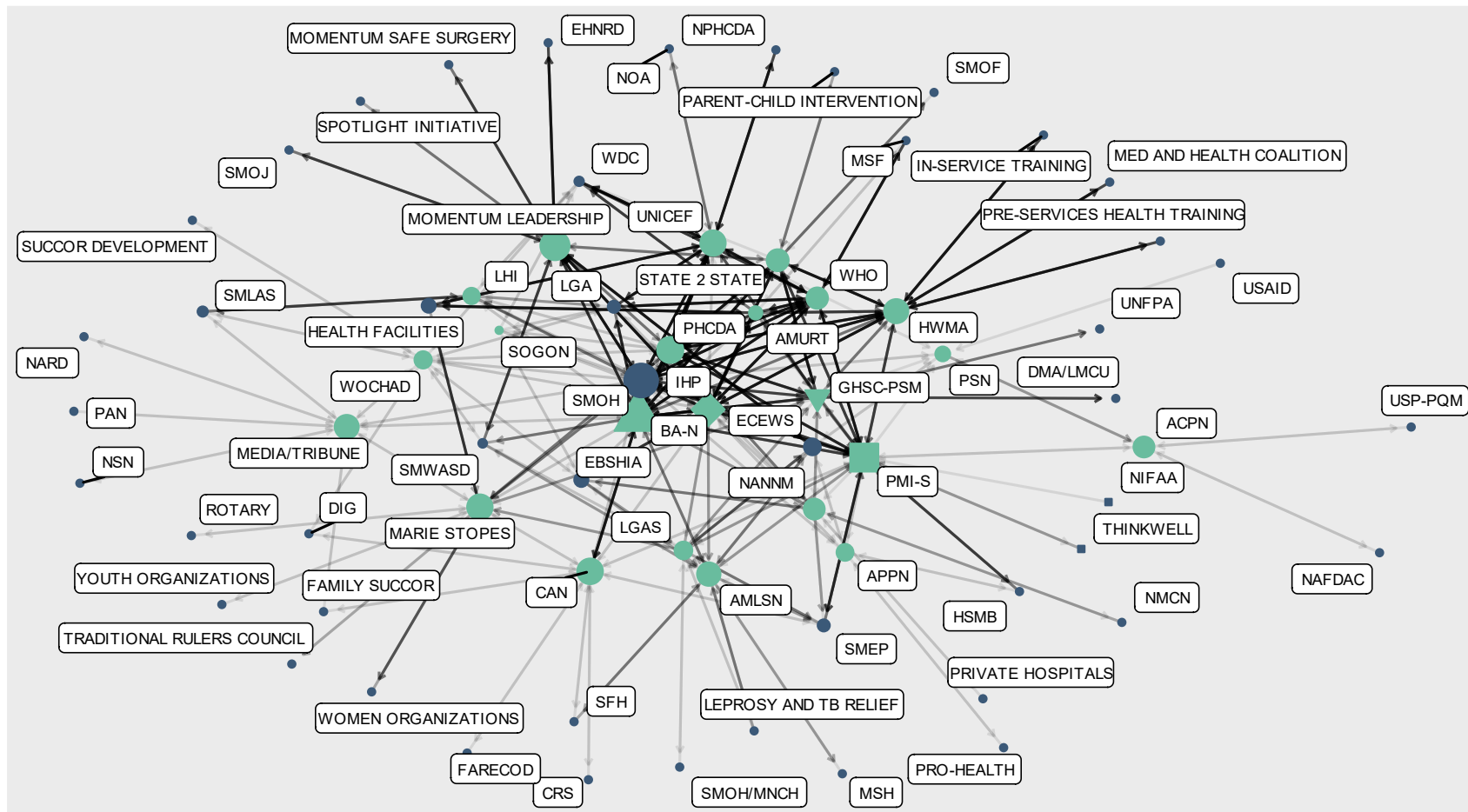
Figure 9. Kebbi information sharing network
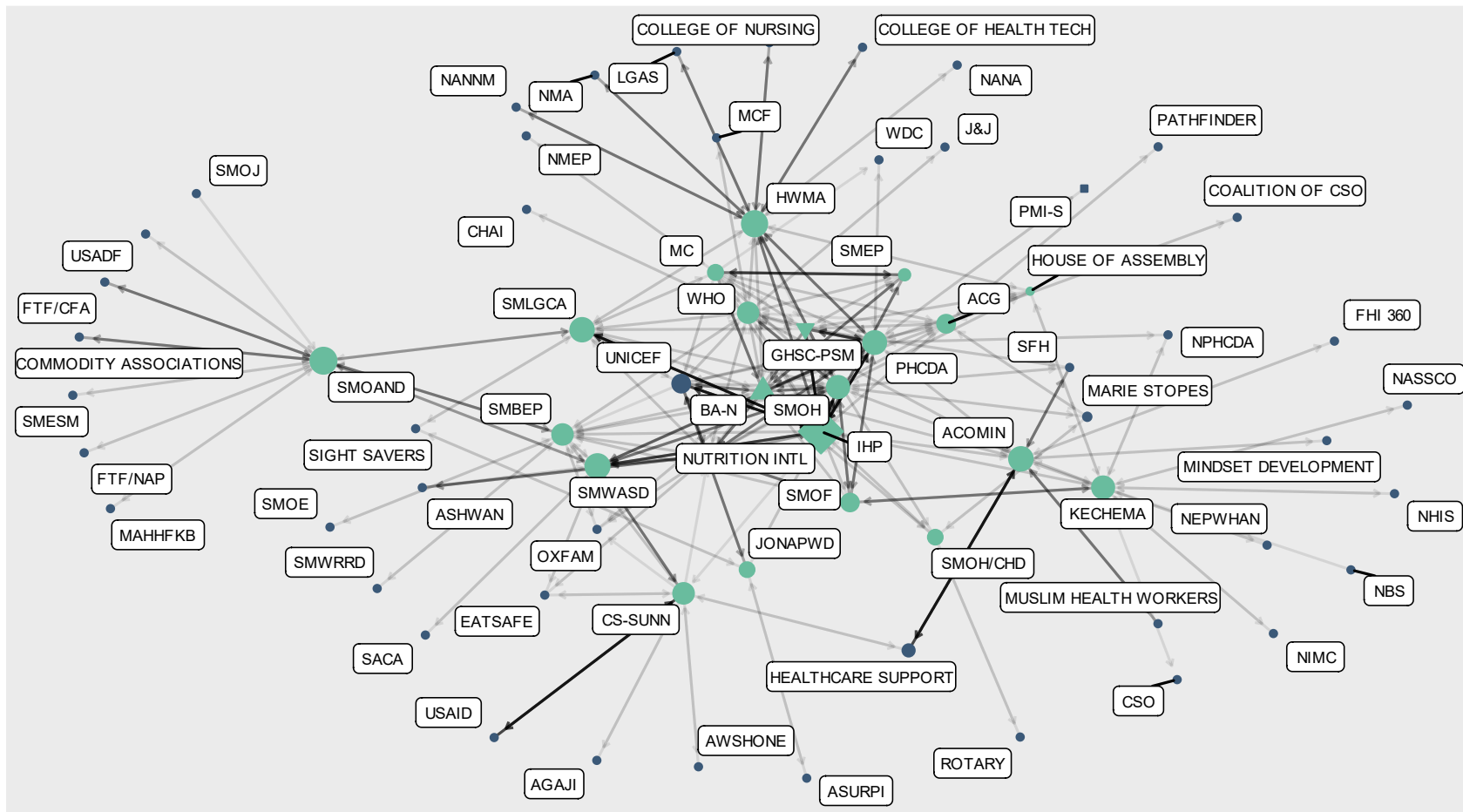
Figure 10. Zamfara information sharing network
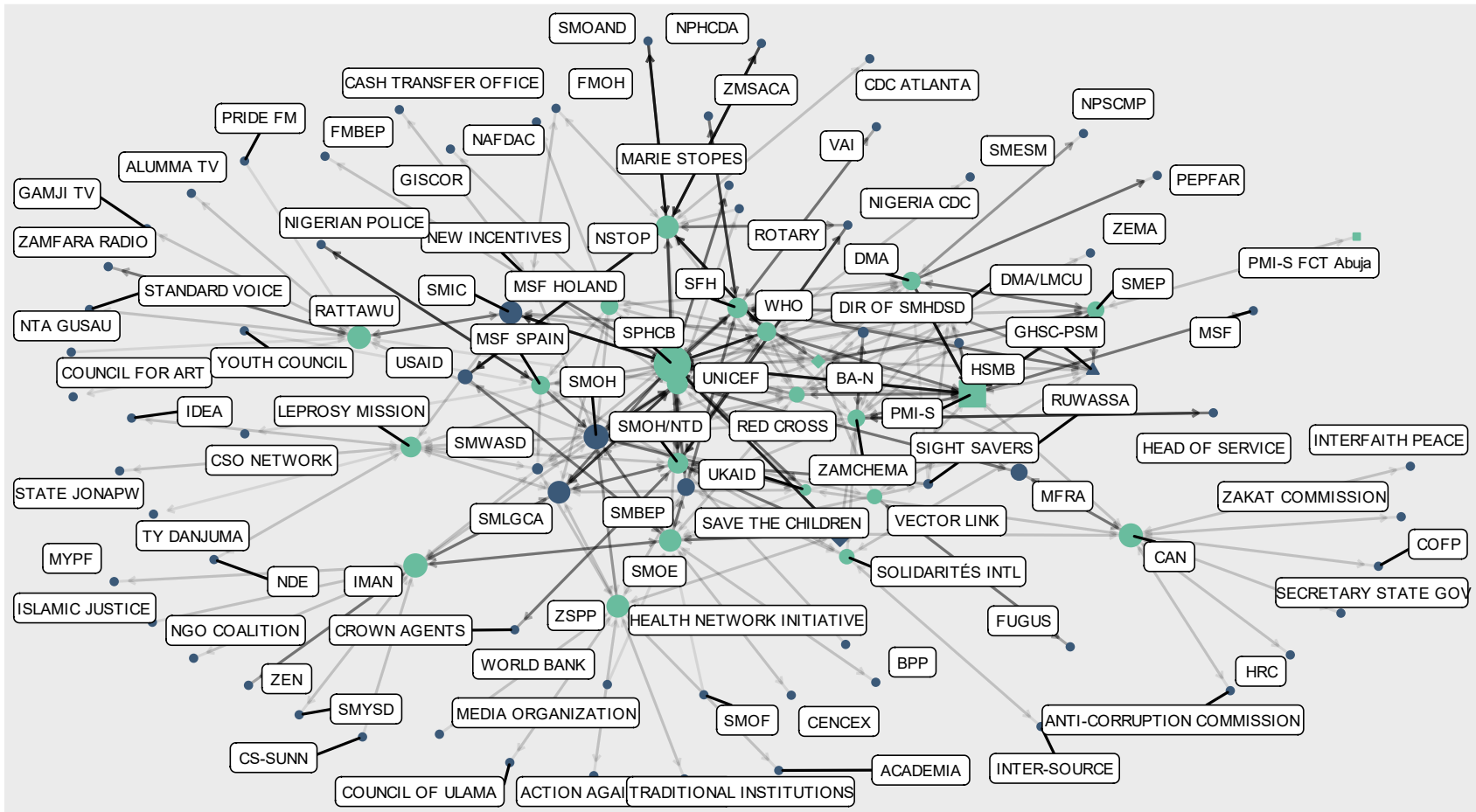
State-Level Network Comparison

First, we examine density, reciprocity, and efficiency across the three states. While all three states have similar information sharing density, we can see that Ebonyi has the highest followed by Kebbi and Zamfara. Ebonyi likewise scored highest on items in the "effective engagement and collaboration" domain of the sustainability survey, reflecting regular advocacy, open communication, and joint planning for gender integration and activity implementation. The pattern changes, however, when we look at the Malaria and RMNCH+N subnetworks. There we observe that Kebbi and Zamfara have significantly lower density of information exchange. In fact, we observe information exchange less commonly across both Malaria and RMNCH+N relationships. We do, however see high reciprocity across all states, including in the subnetworks.

Figure 11. Information sharing network density by state and health activity
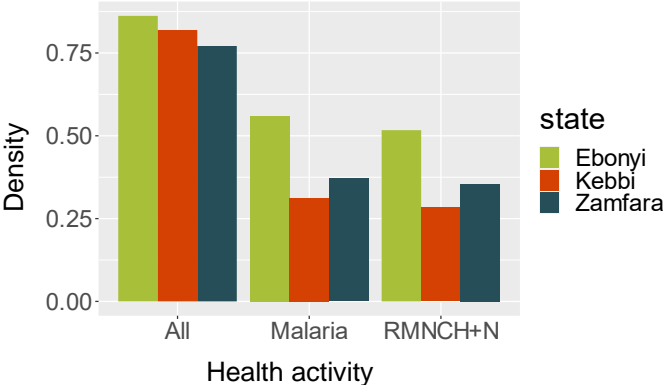
Figure 12. Information sharing network reciprocity by state and health activity
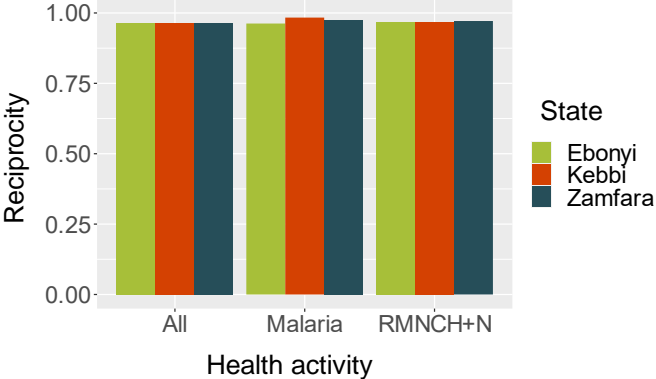
Figure 13. Information sharing network efficiency by state and health activity
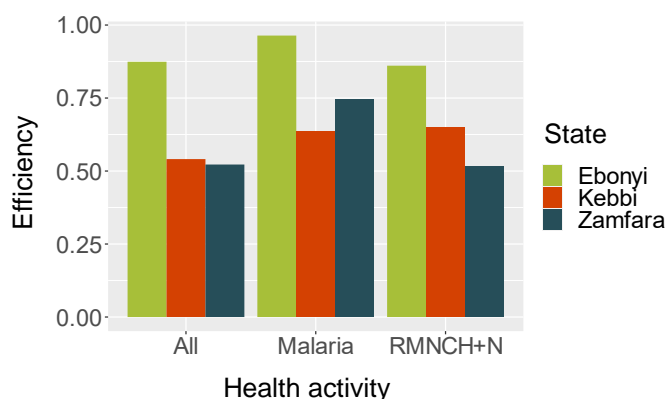
Across the full network and both subnetworks, Ebonyi has the highest efficiency, likely because sharing is much more common overall. Kebbi and Zamfara have similar efficiency measures for the full network, but Zamfara has greater efficiency in the Malaria subnetwork and Kebbi has greater efficiency in the RMNCH+N subnetwork.

Central Organizations and Relationships

Next, we look at the most central organizations and relationships in the network shown in Table 8. In Ebonyi, information sharing is again centered around the HPN activities and health-related government organizations. Further down the list we also see other organizations like Momentum Leadership, CAN, Marie Stopes, and The United Nations Children's Fund (UNICEF).

Table 8. Information sharing network: Most central organizations

Organization	Betweenness Centrality
Ebonyi	
BA-N	1140.9
SMOH	1016.1
PMI-S	858.0
MOMENTUM LEADERSHIP	694.4
IHP	535.8
PHCDA	512.9
CAN	489.2
MARIE STOPES	476.3
UNICEF	471.9
HWMA	410.1
Kebbi	
IHP	1828.4
SMOAND	825.8
HWMA	756.0
SMWASD	667.5
ACOMIN	619.5

Organization	Betweenness Centrality
SMLGCA	615.8
PHCDA	568.4
SMOH	523.6
KECHEMA	515.7
CS-SUNN	421.9
Zamfara	
SPHCB	3765.9
PMI-S	2207.7
SMOH	1212.7
IMAN	1080.0
CAN	1062.0
RATTAWU	977.0
NSTOP	926.6
SMIC	916.5
ZSPP	890.0
SMLGCA	865.7

The most central relationships in the Ebonyi network shown in Table 9 are between BA-N and the Christian Association of Nigeria (CAN). The relationship between these two organizations is strong—they both share information frequently, and CAN itself serves to connect many peripheral organizations to the larger network. Momentum Leadership maintains some critical connections to SMOH and IHP in addition to other more peripheral organizations such as SMWASD. Again NANNM, while not a very central organization itself, maintains an important relationship with the PHCDA, a highly central organization. The importance of the relationships between the Association of Community Pharmacists of Nigeria (ACPN) and PMI-S is notable. It creates a shortest path between PMI-S and PSN, and these organizations themselves are both highly connected.

Table 9. Information sharing network: Most central relationships

Organization	Betweenness Centrality
Ebonyi	
CAN → BA-N	291.8
BA-N → CAN	288.2
ACPN → PMI-S	197.7
SMOH → MOMENTUM LEADERSHIP	183.1
PMI-S → ACPN	176.8
PHCDA → NANNM	171.8
PMI-S → SMOH	160.0
MOMENTUM LEADERSHIP → IHP	158.1
MOMENTUM LEADERSHIP → SMOH	156.0
MEDIA/TRIBUNE → BA-N	144.3

Kebbi	
SMLGCA → IHP	386.3
SMOAND → SMLGCA	326.8
IHP → SMLGCA	276.3
HWMA → IHP	264.2
IHP → HWMA	264.2
SMWASD → CS-SUNN	217.0
SMLGCA → SMOAND	199.5
IHP → SMWASD	192.0
SMWASD → IHP	192.0
CS-SUNN → SMWASD	190.0
Zamfara	
SPHCB → PMI-S	968.3
PMI-S → SPHCB	735.2
SMIC → SPHCB	555.0
RATTAWU → SMIC	525.0
SPHCB → SMIC	437.5
NSTOP → SPHCB	422.9
IMAN → SMLGCA	415.7
SMIC → RATTAWU	403.0
ZSPP → SMOH	392.0
SMLGCA → IMAN	386.8

Kebbi information sharing networks are largely connected by relationships between government and civil society organizations, a finding consistent with that for resource sharing networks. Somewhat surprisingly, IHP is the only HPN activity to appear among the most central organizations. The most central organizations are not necessarily health focused (as they are in Ebonyi), but rather focused on issues like agriculture, women, and social development. Key informants in the sustainability assessment also noted that Kebbi is the only state in the country using a community scorecard approach in multiple sectors, not only the health sector.

The State Ministry of Local Government and Chieftaincy Affairs maintains several of the most central relationships in the Ebonyi network, particularly those between IHP and SMOAND. Bridging those two organizations plays an important role in connecting some peripheral organizations in the network. Other highly central relationships are primarily between IHP and government organizations.

The most central organizations in Zamfara include a combination of health-focused government agencies, the HPN activity PMI-S, and several religious and cultural institutions including IMAN, CAN, RATTAWU, and the Ministry of Information and Culture (SMIC). The most central relationships involve connections between SPHCB and PMI-S as well as SMIC. Other central relationships connect government organizations and religious and cultural institutions.

Potential Relationship Models

Now we use these network models to propose relationships that could increase overall network efficiency and government centrality.

Efficiency

Table 10 shows that in Ebonyi, relationships that would improve network efficiency appear to involve connecting HPN activities to the professional societies ACPN and APPN and Media/Tribune. Those organizations are both connected to many peripheral nodes and connecting them to the core of the network would bring many peripheral organizations towards all other organizations.

Table 10. Potential relationships that would improve efficiency

Organization	Efficiency Change	Z-Scored Change
Ebonyi		
ACPN ↔ BA-N	0.00173	3.88
ACPN ↔ IHP	0.00116	2.39
ACPN ↔ GHSC-PSM	0.00113	2.32
MEDIA/TRIBUNE ↔ PMI-S	0.00060	0.95
APPN ↔ BA-N	0.00048	0.65
PMI-S ↔ WOCHAD	0.00039	0.41
IHP ↔ MEDIA/TRIBUNE	0.00036	0.34
GHSC-PSM ↔ MEDIA/TRIBUNE	0.00035	0.32
APPN ↔ GHSC-PSM	0.00035	0.30
BA-N ↔ PSN	0.00030	0.18
Kebbi		
HOUSE OF ASSEMBLY ↔ IHP	0.00062	2.83
BA-N ↔ KECHEMA	0.00048	2.06
BA-N ↔ HOUSE OF ASSEMBLY	0.00032	1.17
ACOMIN ↔ GHSC-PSM	0.00025	0.77
BA-N ↔ CS-SUNN	0.00024	0.67
GHSC-PSM ↔ KECHEMA	0.00020	0.49
GHSC-PSM ↔ SMBEP	0.00013	0.09
BA-N ↔ SMOAND	0.00011	-0.06
CS-SUNN ↔ GHSC-PSM	0.00007	-0.25
GHSC-PSM ↔ SMOAND	0.00000	-0.65
Zamfara		
PMI-S FCT Abuja ↔ SPHCB	0.00147	2.94
PMI-S ↔ SOLIDARITÉS INTL	0.00139	2.72
PMI-S FCT Abuja ↔ UNICEF	0.00105	1.78
PMI-S FCT Abuja ↔ WHO	0.00097	1.56
PMI-S FCT Abuja ↔ NSTOP	0.00093	1.45

Organization	Efficiency Change	Z-Scored Change
PMI-S FCT Abuja ↔ PMI-S	0.00092	1.44
PMI-S ↔ ZSPP	0.00091	1.41
PMI-S FCT Abuja ↔ SMOE	0.00090	1.39
IMAN ↔ PMI-S	0.00089	1.36
PMI-S FCT Abuja ↔ MSF SPAIN	0.00080	1.12

In Kebbi, connecting the House of Assembly, Kebbi Contributory Healthcare Management Agency (KECHEMA), and ACOMIN—all of which are connected to peripheral organizations—with HPN activities could have the largest effects on the efficiency of information sharing.

High-potential relationships in Zamfara primarily involve PMI-S—and connecting PMI-S to SPHCB would increase information sharing efficiency the most. Both organizations are very central in the networks, indicating overall that there is a divide between their two sides of the network that a new relationship would bridge. Others include WHO and UNICEF—two organizations that are central and close to SPHCB—and Solidarités International, an organization connecting more peripheral organizations.

Government Centrality

Table 11. Potential relationships that would improve government centrality

Organization	Government Centrality Change	Z-Scored Change
Ebonyi		
There are no potential relationships that would increase government centrality.		
Kebbi		
There are no potential relationships that would increase government centrality.		
Zamfara		
PMI-S FCT Abuja → SPHCB	1.26	1.09
SPHCB → PMI-S FCT Abuja	1.20	1.06
SMOH/NTD → PMI-S FCT Abuja	1.17	1.04
PMI-S FCT Abuja → SMOH/NTD	1.04	0.99
ZAMCHEMA → PMI-S FCT Abuja	0.56	0.77
PMI-S FCT Abuja → SMOE	0.34	0.66
SMOE → PMI-S FCT Abuja	0.31	0.65
PMI-S → PMI-S FCT Abuja	0.18	0.59
PMI-S FCT Abuja → PMI-S	0.16	0.58
PMI-S FCT Abuja → ZAMCHEMA	0.02	0.52

Table 11 shows that the modeling exercise identified no relationships in Ebonyi or Kebbi that would ultimately increase the centrality of government organizations. This is possible because adding certain relationships will change shortest paths such that government organizations have decreased betweenness centrality. For this reason, we do not present any potential relationships for Ebonyi or Kebbi.

In Zamfara, however, we observe that connecting PMI-S FCT Abuja and SPHCB would increase government centrality in addition to improving efficiency as we established before. This provides further evidence that bridging the two sides of the network, where SPHCB and PMI-S are, would be beneficial for the structure of the network. The next potentially most helpful connections are those between PMI-S and government health organizations State Ministry of Health / Neglected Tropical Diseases Elimination (SMOH/NTD) and Zamfara Contributory Healthcare Management Agency (ZAMCHEMA).

Information Sharing Network Discussion

Findings from the information network analysis closely parallel those from the resource network analysis. Ebonyi is characterized by high overall levels of information sharing and network efficiency. HPN activities and health-focused government agencies tend to be highly central and constitute the most central relationships.

Kebbi, in contrast, has many central government organizations that are not necessarily from the health sector, but rather agriculture, women, and social development areas. In addition to the HPN activities, these government agencies play an important role in connecting the otherwise distant areas of the network.

Zamfara is characterized by highly central religious and cultural organizations along with a sprawling network with two central yet distant organizations: SPHCB and PMI-S. In terms of religious and cultural institutions, SPHCB is connected to institutions like RATTAWU and IMAN and PMI-S appears to be most closely associated with CAN and other health activities.

Funding Network Results

Finally, we will examine results from funding network analysis. In comparison to resource and information sharing networks, we observed far fewer instances of funding exchange in this survey. As such, the funding networks are relatively sparse, and our observed measures may be more difficult to compare for that reason.
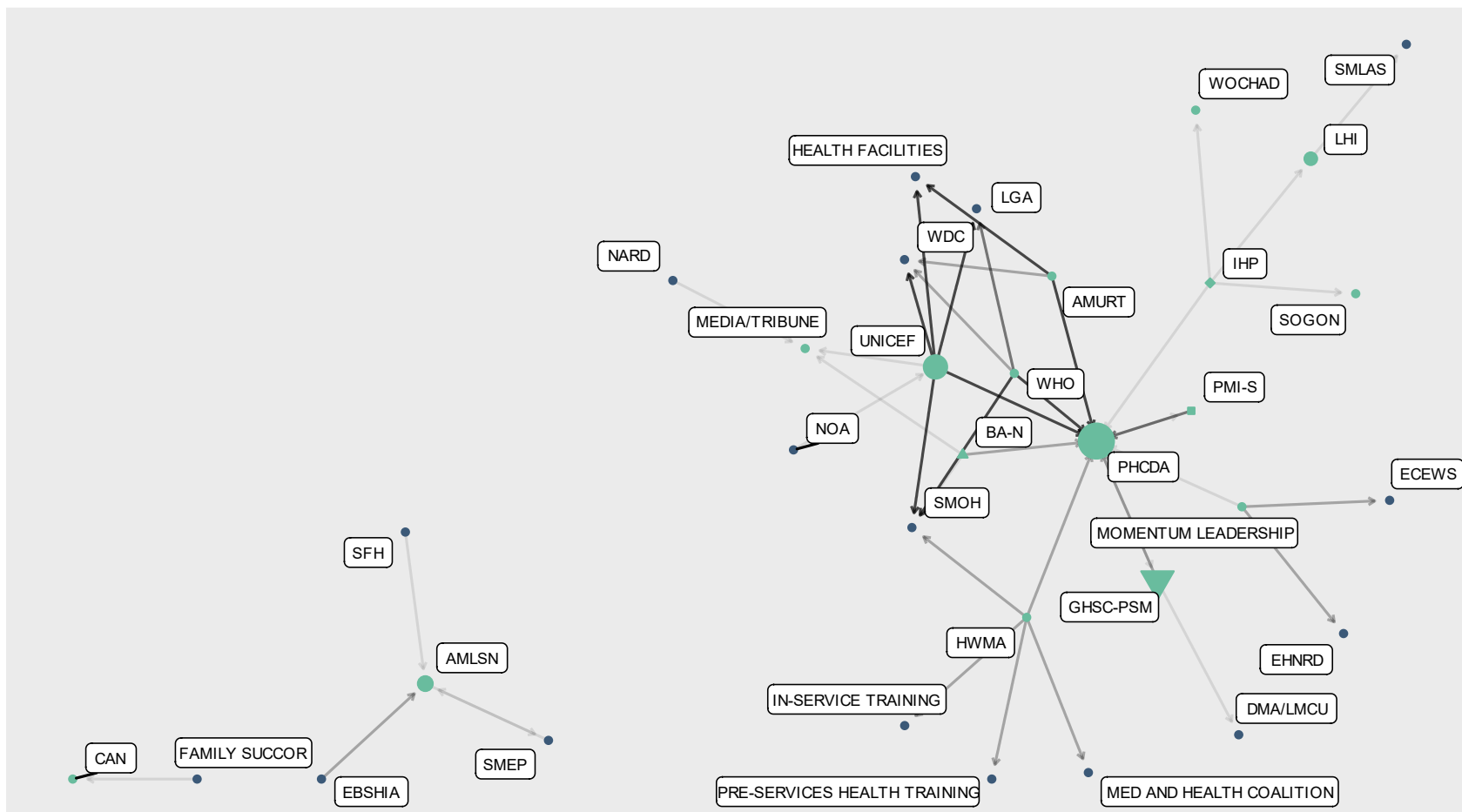
Figure 14. Ebonyi funding network

Figure 15. Kebbi funding network
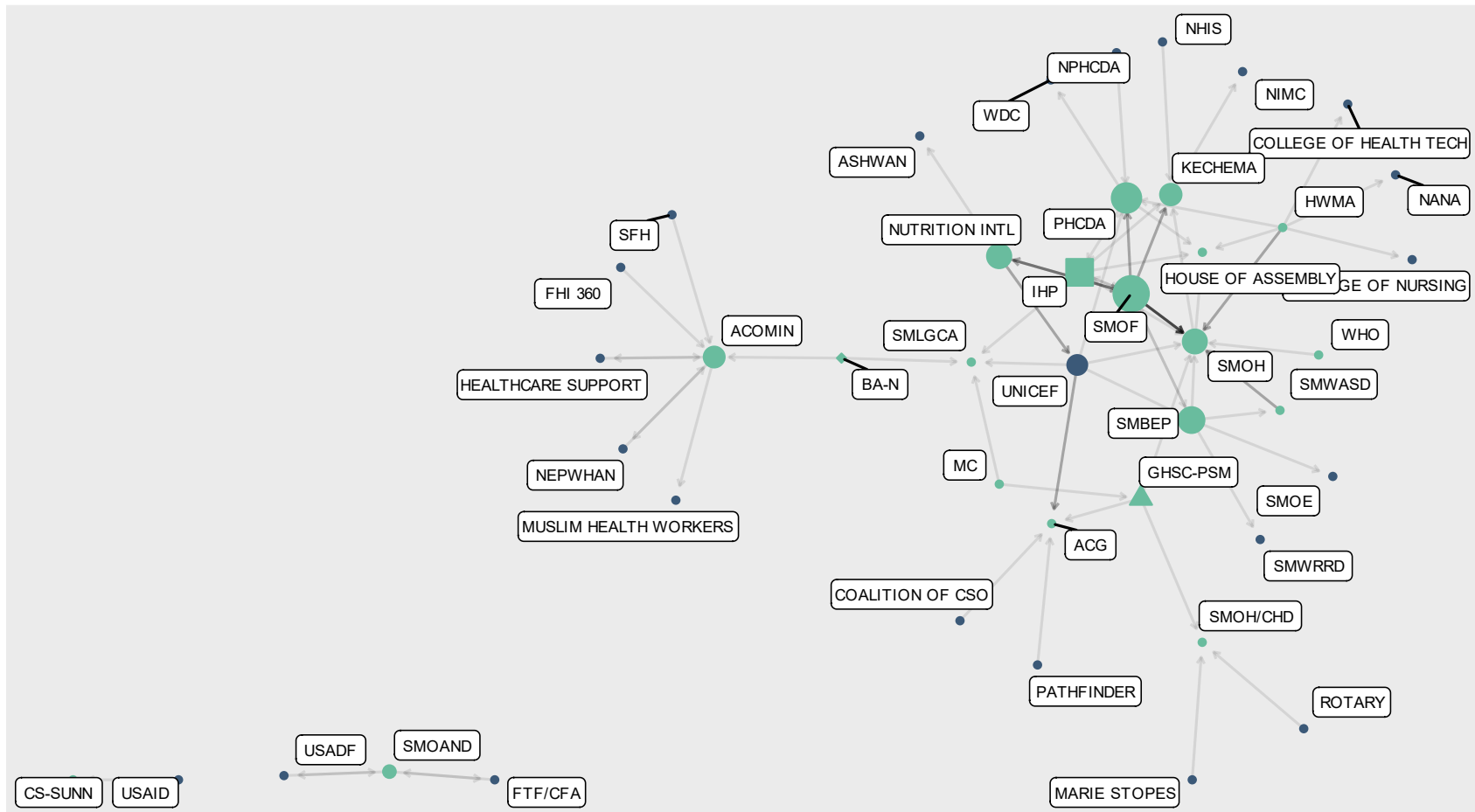
Figure 16. Zamfara funding network
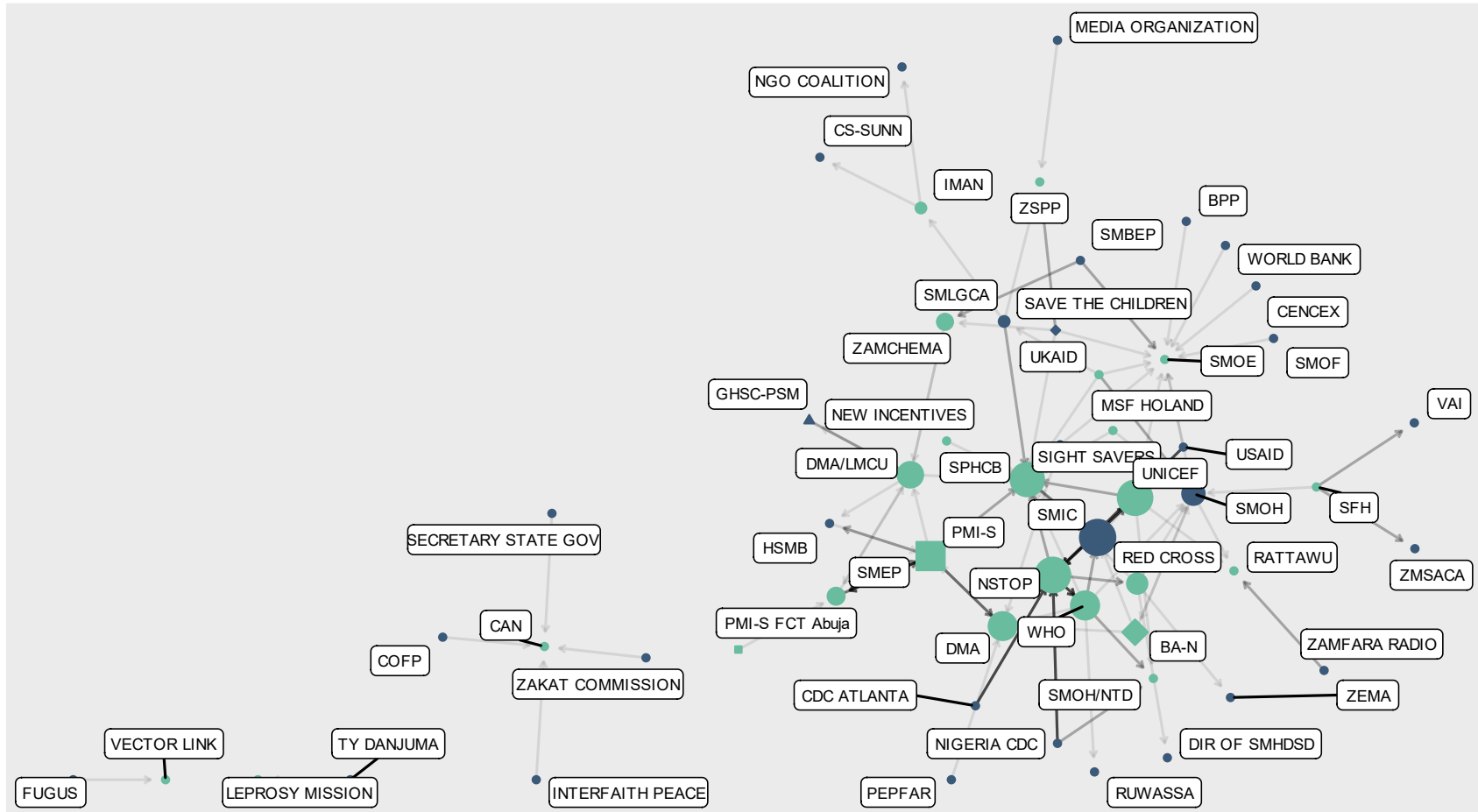
It is important to note that funding network results require slightly different interpretation than resource and information sharing networks. Firstly, funding relationships are often part of formal relationships established within a legal or procedural framework. Because of that, there are often significant constraints on when and how organizations can issue or receive funding. In this way, funding networks do not necessarily serve to distribute funding in the same ways as resource or information sharing networks.

Importantly for this survey, the options available to the respondent about the frequency with which they exchange funding may not reflect the actual quantity of funding they receive but rather the particular type of funding. This result may be misleading because it will over-emphasize funding sources that may be less reliable for sustainability and under-emphasize significant funding paid infrequently in lump sums. That said, the lowest frequency response option in the network survey is "never," and so the mere existence or nonexistence of a funding relationship is important.

Funding networks are also distinct from resource and information sharing in that we would expect more of a hierarchical relationship given that some organizations are receiving large amounts of funds from outside organizations and channeling it to the smaller organizations. Our analysis of potential relationships that would increase efficiency must therefore be interpreted with caution—increasing efficiency in a funding network will involve connecting parts of the network that are otherwise disconnected so that funding could make its way from central organizations to the periphery more easily. In a funding structure, it is not necessarily true that this is a better outcome; at times, it may be better for funding networks to be more hierarchical because it relieves some funding recipients from some reporting and administrative requirements.

Funding network visualizations appear in Figures 14–16. Recall that we omitted nodes with no relationships from visualizations, so here we only show groups of connected nodes. The visualization for the Ebonyi funding network shows three components: a primary component with HPN activities and PHCDA, GHSC-PSM, and UNICEF at the center; a component where AMLSN receives funding from several other organizations, and one in which CAN receives funding from Family Succor.

Kebbi's diagram also contains three components: one large component that contains central nodes State Ministry of Finance (SMOF), IHP, PHCDA, and SMOH, one two-node component consisting of Civil Society Scaling Up Nutrition in Nigeria (CS-SUNN) being funded by USAID, and another where SMOAND receives and gives funding to both United States Africa Development Foundation (USADF) and Feed the Future: Cultivating New Frontiers in Agriculture (FTF/CFA).

Finally, the Zamfara funding network consists of four components, with one large component maintaining most of the organizations and connections. The smaller components consist of CAN receiving funding from four otherwise disconnected organizations: Vector Link receiving funding from Federal University Gusau (FUGUS), and TY Danjuma Foundation (TY Danjuma) providing funding to the Leprosy Mission.

State-Level Network Comparison

First, we compared networks from each state in terms of density, reciprocity, and efficiency. Figure 17 shows that Zamfara has the highest level of funding exchange, followed by Kebbi and Ebonyi. While all state networks have low reciprocity, Kebbi has the highest levels followed by Zamfara and Ebonyi (see Figure 18). This suggests that the overall level of sharing may not be explained by reciprocity. Finally, in Figure 19 we observe the same ordering for efficiency. Because our measure of efficiency is such that every edge is considered bi-directional, this cannot be explained by reciprocity patterns.

Figure 17. Funding network density by state and health activity
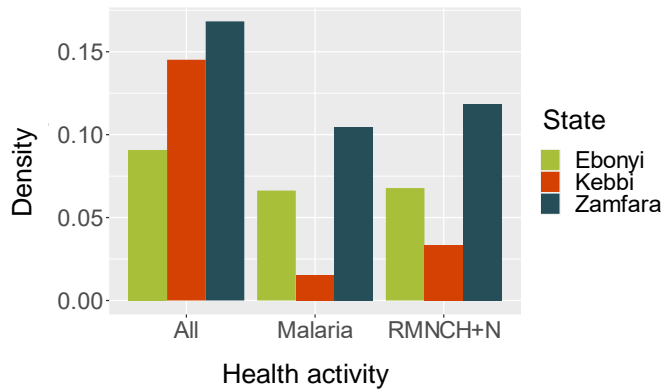
Figure 18. Funding network reciprocity by state and health activity
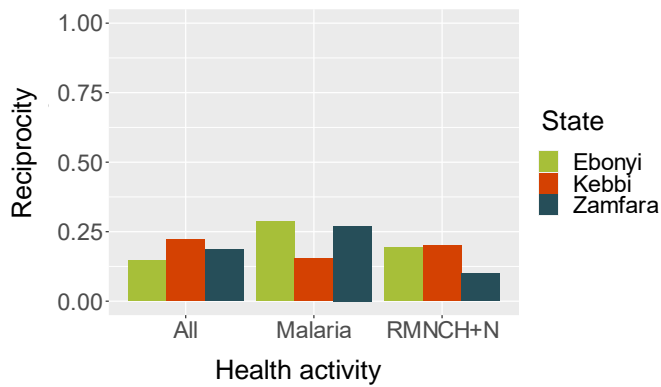
Figure 19. Funding network efficiency by state and health activity
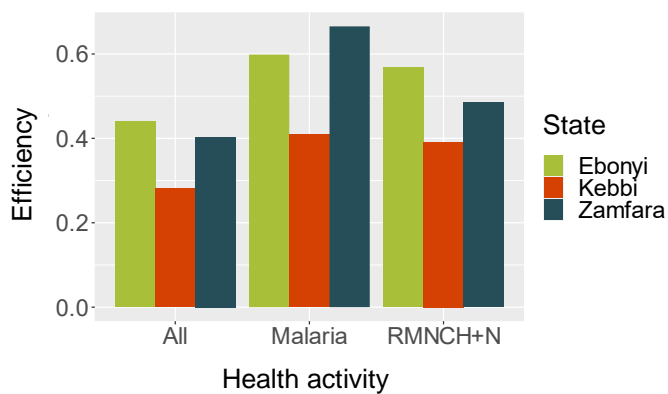
Central Organizations and Relationships

Table 12 shows that only five organizations in the Ebonyi funding network had non-zero betweenness centrality: the HPN activity GHSC-PSM; PHCDA, an organization that receives a variety of funding from various sources; the major donor UNICEF; AMLSN, which receives funding from three separate sources; and Life Helpers Initiative (LHI), which receives funding from IHP and provides funding for Safe Motherhood Ladies Association (SMLAS). It is then unsurprising that we see that the most central relationships include those between PHCDA and GHSC-PSM and others primarily connecting the most central organizations with those that are more peripheral (Table 12).

Table 12. Funding network: Most central organizations

Organization	Betweenness Centrality
Ebonyi	
PHCDA	27.0
GHSC-PSM	10.0
UNICEF	9.0
AMLSN	2.0
LHI	1.0
Kebbi	
SMOF	55.0
IHP	37.0
PHCDA	34.5
SMBEP	24.0
NUTRITION INTL	20.0
SMOH	19.5
KECHEMA	14.0
ACOMIN	13.0
UNICEF	11.0
GHSC-PSM	6.0
Zamfara	
SMIC	251.0
NSTOP	242.0
UNICEF	237.5
SPHCB	218.0
PMI-S	193.5
WHO	139.0
DMA	136.5
DMA/LMCU	107.0
SMOH	73.5
BA-N	55.0

Table 13. Funding network: Most central relationships

Organization	Betweenness Centrality
Ebonyi	
PHCDA → GHSC-PSM	20.0
GHSC-PSM → DMA/LMCU	11.0
PHCDA → PMI-S	10.0
NOA → UNICEF	10.0
UNICEF → PHCDA	8.0
BA-N → PHCDA	4.0
MOMENTUM LEADERSHIP → PHCDA	4.0
HWMA → PHCDA	4.0
WHO → PHCDA	4.0
AMURT → PHCDA	4.0
Kebbi	
PHCDA → IHP	40.0
IHP → SMOF	38.0
SMOF → NUTRITION INTL	27.0
SMOF → SMBEP	22.0
NUTRITION INTL → UNICEF	18.0
NPHCDA → PHCDA	17.0
KECHEMA → NIMC	15.0
SMBEP → SMOF	14.0
SMOH → KECHEMA	14.0
HWMA → PHCDA	13.0
Zamfara	
SMIC → UNICEF	253.5
SPHCB → SMIC	238.0
UNICEF → NSTOP	208.0
NSTOP → WHO	166.0
DMA → PMI-S	156.5
PMI-S → SPHCB	98.5
SMOH → BA-N	82.0
NSTOP → RED CROSS	81.0
WHO → DMA	70.0
PMI-S → DMA/LMCU	63.0

In Kebbi, we see a fair number of government organizations such as SMOF, PHCDA, the State Ministry of Budget and Economic Planning (SMBEP), and SMOH among the most central for funding exchange. These organizations are both sending and receiving funding to other organizations. In contrast to the situation in Ebonyi, the most central relationships tend to be between these central organizations, suggesting that they act as the backbone of the funding infrastructure in Ebonyi.

In Zamfara, we see that SMIC is the most central, reinforcing the idea that organizations centered around culture play an important role in Zamfara networks. Following that, we see a combination of health-oriented funding agencies such as African Field Epidemiology Network Program (NSTOP) and UNICEF, government organizations, and HPN activities. Like in Kebbi, the most central relationships in Zamfara tend to be between highly central organizations, again suggesting that there is kind of a backbone supporting the major funding networks.

Potential Relationship Models

We examined potential relationships that could increase funding efficiency across the network.

Efficiency

Table 14 shows that in Ebonyi, the highest-potential relationships for efficient funding exchange are between HPN activities and LHI. Other high-potential relationships include primarily organizations from the same branch as LHI, so relationships that would improve efficiency largely involve connecting that small branch to the larger core to funnel funding back through the network. As previously noted, this may not always be optimal in practical funding networks, but, if the goal is to reach downstream organizations with funding more directly, these relationships may be useful.

Table 14. Funding relationships that could improve efficiency the most

Organization	Efficiency Change	Z-Scored Change
Ebonyi		
LHI ↔ PMI-S	0.00186	2.86
BA-N ↔ LHI	0.00154	2.24
GHSC-PSM ↔ LHI	0.00151	2.20
PMI-S ↔ SOGON	0.00128	1.75
PMI-S ↔ WOCHAD	0.00128	1.75
BA-N ↔ SOGON	0.00105	1.31
BA-N ↔ WOCHAD	0.00105	1.31
GHSC-PSM ↔ SOGON	0.00104	1.28
GHSC-PSM ↔ WOCHAD	0.00104	1.28
IHP ↔ MOMENTUM LEADERSHIP	0.00098	1.16

Kebbi		
ACOMIN ↔ GHSC-PSM	0.00690	2.72
ACOMIN ↔ IHP	0.00610	2.31
BA-N ↔ SMOH	0.00602	2.27
BA-N ↔ SMOF	0.00593	2.23
BA-N ↔ HWMA	0.00473	1.62
BA-N ↔ PHCDA	0.00442	1.46
BA-N ↔ NUTRITION INTL	0.00430	1.40
BA-N ↔ KECHEMA	0.00407	1.28
BA-N ↔ SMWASD	0.00403	1.26
BA-N ↔ SMBEP	0.00308	0.78
Zamfara		
PMI-S ↔ SFH	0.00193	4.51
PMI-S ↔ SMOE	0.00105	1.94
PMI-S FCT Abuja ↔ NSTOP	0.00103	1.90
PMI-S FCT Abuja ↔ SPHCB	0.00088	1.45
PMI-S FCT Abuja ↔ UNICEF	0.00085	1.38
PMI-S FCT Abuja ↔ WHO	0.00085	1.37
IMAN ↔ PMI-S	0.00083	1.31
PMI-S FCT Abuja ↔ SMOE	0.00076	1.10
PMI-S ↔ ZAMCHEMA	0.00072	0.99
PMI-S FCT Abuja ↔ SFH	0.00070	0.94

In Kebbi, relationships between central organizations appear to have the most potential for increasing efficiency, mirroring findings that those relationships tended to be the most central. In Zamfara many of the relationships that would increase efficiency the most include PMI-S, and there is a good balance between connections to central and non-central organizations. This suggests that the Zamfara network is more distributed than the Kebbi network. As previously noted, resource and funding stability was rated highest for Zamfara in the sustainability survey, which could be related to its more distributed network.

Government Centrality

Table 15 shows relationships that have the most potential to increase the centrality of government organizations. In Ebonyi several of the top relationships connect IHP, which appears on a branch off the main component with central organizations like PHCDA. Other relationships follow a similar path of connecting otherwise disconnected branches of the main component to the core HPN activities. This follows the trend shown across other network types.

Table 15. Funding relationships that could improve government centrality the most

Organization	Efficiency Change	Z-Scored Change
Ebonyi		
PHCDA → IHP	5.00	3.29
GHSC-PSM → IHP	4.44	2.86
PMI-S → IHP	4.44	2.86
PMI-S → HWMA	4.00	2.52
GHSC-PSM → HWMA	4.00	2.52
GHSC-PSM → UNICEF	3.78	2.35
PMI-S → UNICEF	3.78	2.35
GHSC-PSM → MOMENTUM LEADERSHIP	2.67	1.50
PMI-S → MOMENTUM LEADERSHIP	2.67	1.50
PMI-S → WHO	2.56	1.42
Kebbi		
KECHEMA → IHP	12.82	4.50
HOUSE OF ASSEMBLY → IHP	11.18	3.84
SMOH/CHD → IHP	7.53	2.37
KECHEMA → BA-N	7.24	2.25
HOUSE OF ASSEMBLY → BA-N	7.18	2.23
SMOH → IHP	6.71	2.04
SMWASD → BA-N	6.32	1.89
ACOMIN → IHP	5.29	1.47
SMOH → BA-N	4.29	1.07
SMLGCA → IHP	4.12	1.00
Zamfara		
BA-N → UKAID	19.44	6.14
SMOE → PMI-S	12.74	3.96
SMOE → PMI-S	11.82	3.67
BA-N → SFH	7.06	2.12
BA-N → IMAN	6.71	2.00
PMI-S → UKAID	6.44	1.92
SMOH/NTD → PMI-S	4.29	1.22
SMOE → BA-N	4.00	1.13
SMOH/NTD → PMI-S	3.56	0.98
RATTAWU → PMI-S	2.62	0.68

In Kebbi, we observe that several of the top relationships include IHP and BA-N. While IHP is very central in this network, BA-N is not—it primarily serves to connect ACOMIN, a central organization, to SMLGCA and through it the more central nodes. BA-N becoming connected to central organizations would increase the centrality of SMLGCA, thus increasing government centrality.

In Zamfara many potential relationships that would increase government centrality involve connecting HPN activities with religious/cultural institutions, government organizations, and UKAID.

Summary

The Ebonyi network is characterized by a comparatively low level of within-network funding and has several branches off the core HPN activities in the largest component. Central organizations here tend to connect those branches to central organizations, and proposed relationships further build those types of connections.

The Kebbi funding network has several central government organizations, and it is the relationships between these central organizations that have the most potential to increase overall efficiency. In addition to connecting the central IHP to peripheral organizations, connecting BA-N to distant peripheral organizations could have the largest effect on government centrality.

The most central organizations in Zamfara primarily include state government and UN agencies as well as PMI-S and BA-N. The most central relationships appear to be between state government and a combination of UN agencies and USAID-funded activities. Potential relationships that would increase efficiency in the funding network are primarily focused on HPN and other USAID-funded activities, while those that would increase government centrality are focused directly on the government and HPN activities.

Discussion

Across networks from all three states, the most central HPN activities were as expected: in Ebonyi, where both integrated and disease-focused approaches are present, IHP and PMI-S were the most central organizations. In Kebbi, where integrated approaches are most central, IHP was most central (along with BA-N/GHSC-PSM to some degree). In Zamfara, which has a disease-focused intervention approach, PMI-S was most central. This pattern of results suggests that the networks do capture important features about the types of health interventions being implemented across the three states.

Ebonyi networks are characterized by highly central HPN activities (IHP, PMI-S, and BA-N) and health-focused government organizations (SMOH, PHCDA). Amongst this core group we also see professional societies, and other local organizations such as the media. The most central relationships tend to be between these central organizations, particularly between the different HPN activities, although relationships between the HPN activities and health-focused government organizations, NGOs, and government were also central. Although Ebonyi networks are currently concentrated towards the central organizations, relationships that would improve efficiency and government centrality tend to connect the central HPN activities to more peripheral professional societies, the media, and NGOs. Models indicate that increasing sharing between the central HPN activities and health-focused government agencies would also have a positive effect on these outcomes.

Consistent with expectations based on the health activities, sharing networks in Kebbi are centered on IHP and a wide range of government organizations, including ministries like SMLGCA and SMWASD that are less focused on health specifically and more oriented towards larger economic and social development. The most central relationships tend to be those between highly central organizations and include connections from government ministries to IHP and local NGOs. Modeling suggests that for increasing network efficiency and government centrality, the most promising new relationships would be between HPN activities and the various government organizations. While IHP may be the most central HPN activity operating in this network, fostering connections to BA-N and GHSC-PSM may also be helpful.

In contrast to Ebonyi and Kebbi where networks tend to be focused towards a highly connected center, in Zamfara we observe a divide in the network between SPHCB and PMI-S, even though the two organizations are connected directly (and, unsurprisingly, that relationship is highly central). While religious and culture-focused organizations like IMAN, CAN, RATTAWU, and the government agency SMIC tend to be much more central than in Ebonyi and Kebbi, the visualizations reveal that the apparent distance between SPHCB and PMI-S also separates these organizations. Whereas IMAN, RATTAWU, and SMIC appear to be more closely connected to SPHCB, CAN is more closely connected to PMI-S. Relationships that would increase efficiency and government centrality, then, tend to connect HPN activities to organizations situated close to SPHCB in the existing network.

These results may help facilitate understanding about the structures of communication and resource exchange that emerge from a combination of local context and the HPN interventions.

Systematic differences identified in this organizational network analysis suggest that sharing patterns are different in each state where different activities are implemented in ways that can inform the adaptation of interventions to local contexts. Modeling the effects of potential new relationships on network characteristics like efficiency and government centrality provides further insights about how collaboration and coordination might be optimized. Crucially, these results and their implications require discussion by local stakeholders to explore real-world feasibility and appropriateness. Overall, we believe the results provide a useful platform for reflection and planning related to coordination and collaboration in Nigeria's multi-activity HPN program.

Appendix 1. Full List of Organizations

State	Name	Type	Surveyed	Nominations
Ebonyi	Ananda Marga Universal Relief Team (AMURT)	NGO, FBO	Yes	6
Ebonyi	Association of Community Pharmacists of Nigeria (ACPN)	Other	Yes	0
Ebonyi	Association of Medical Laboratory Scientists of Nigeria (AMLSN)	Other	Yes	0
Ebonyi	Association of Private Practicing Nurses (APPN)	Other	Yes	0
Ebonyi	Breakthrough ACTION-Nigeria (BA-N)	USAID-funded activity/project	Yes	15
Ebonyi	Catholic Relief Service (CRS)	FBO	No	1
Ebonyi	Christian Association of Nigeria (CAN)	FBO	Yes	2
Ebonyi	Coalition of Medical and Health Professionals (MED AND HEALTH COALITION)	Other	No	1
Ebonyi	Development & Integrity Intervention Goal Foundation (DIG)	NGO	No	2
Ebonyi	Drug Management Agency/Logistics Management Coordination Unit (DMA/LMCU)	State government	No	1
Ebonyi	Ebonyi State Health Insurance Agency (EBSHIA)	State government	No	7
Ebonyi	Essential Health Network for Rural Dwellers (EHNRD)	CSO	No	1
Ebonyi	Excellence Community Education Welfare Scheme (ECEWS)	Non-USAID-funded activity/project, NGO	No	5
Ebonyi	Family Reformation and Community Development Initiative (FARECOD)	NGO	No	1
Ebonyi	Family Succor (FAMILY SUCCOR)	NGO	No	2
Ebonyi	German Leprosy and Tuberculosis Relief Association (LEPROSY AND TB RELIEF)	NGO	No	2
Ebonyi	Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM)	USAID-funded activity/project	Yes	11
Ebonyi	Health Facilities (HEALTH FACILITIES)	LGA government	No	3
Ebonyi	Health Workforce Management Activity (HWMA)	USAID-funded activity/project	Yes	4
Ebonyi	Hospital Services Management Board (HSMB)	State government	No	2
Ebonyi	In-Service Health Training Institutions (IN-SERVICE TRAINING)	State government	No	1
Ebonyi	Integrated Health Program (IHP)	USAID-funded activity/project	Yes	18
Ebonyi	Life Helpers Initiative (LHI)	NGO	Yes	0
Ebonyi	Local Government Health Authorities (LGA)	LGA government	No	7
Ebonyi	Local Governments Areas (LGAS)	Other	Yes	0
Ebonyi	Management Sciences for Health (MSH)	USAID-funded activity/project	No	1
Ebonyi	Marie Stopes (MARIE STOPES)	Other (non-USAID) bilateral donor, NGO	Yes	2

State	Name	Type	Surveyed	Nominations
Ebonyi	Media/Tribune (MEDIA/TRIBUNE)	Other	Yes	0
Ebonyi	Momentum Country Global Leadership (MOMENTUM LEADERSHIP)	USAID-funded activity/project	Yes	3
Ebonyi	Momentum Safe Surgery for Family Planning and Obstetrics (MOMENTUM SAFE SURGERY)	USAID-funded activity/project	No	1
Ebonyi	Médecins Sans Frontières (MSF)	Non-USAID-funded activity/project, NGO	No	2
Ebonyi	National Agency for Food and Drug Administration and Control (NAFDAC)	National government	No	1
Ebonyi	National Association of Nigeria Nurses and Midwives (NANNM)	Other	Yes	0
Ebonyi	National Orientation Agency (NOA)	National government	No	1
Ebonyi	National Primary Health Care on Development Agency (NPHCDA)	National government	No	1
Ebonyi	Nigeria Accountability, Transparency, Effectiveness Activity (STATE 2 STATE)	USAID-funded activity/project	Yes	5
Ebonyi	Nigeria Association of Resident Doctors (NARD)	Other	No	1
Ebonyi	Nigeria Inter-Faith Action Association (NIFAA)	USAID-funded activity/project	No	1
Ebonyi	Nursing and Midwifery Council of Nigeria (NMCN)	National government	No	1
Ebonyi	Nutrition Society of Nigeria (NSN)	Other	No	1
Ebonyi	Parent-Child Intervention Center (PARENT-CHILD INTERVENTION)	CSO	No	1
Ebonyi	Pediatrician Association of Nigeria (PAN)	Other	No	1
Ebonyi	Pharmacist Society of Nigeria (PSN)	Other	Yes	1
Ebonyi	Pre-Services Health Training Institutions (PRE-SERVICES HEALTH TRAINING)	Other	No	1
Ebonyi	Presidents Malaria Initiative for States (PMI-S)	USAID-funded activity/project	Yes	16
Ebonyi	Private Hospitals (PRIVATE HOSPITALS)	Other	No	1
Ebonyi	Pro-Health International (PRO-HEALTH)	Non-USAID-funded activity/project	No	1
Ebonyi	Rotary Club (ROTARY)	NGO	No	1
Ebonyi	Safe Motherhood Ladies Association (SMLAS)	NGO	No	3
Ebonyi	Society for Family Health (SFH)	NGO, USAID-funded activity/project	No	2
Ebonyi	Society of Obstetrics and Gynecologists of Nigeria (SOGON)	Other	Yes	0
Ebonyi	Spotlight Initiative (SPOTLIGHT INITIATIVE)	UN Agency	No	1
Ebonyi	State Malaria Elimination Programme (SMEP)	State government	No	5
Ebonyi	State Ministry of Finance (SMOF)	State government	No	1

State	Name	Type	Surveyed	Nominations
Ebonyi	State Ministry of Health (SMOH)	State government	No	18
Ebonyi	State Ministry of Health / Maternal, Newborn and Child Health (SMOH/MNCH)	State government	No	1
Ebonyi	State Ministry of Justice (SMOJ)	State government	No	1
Ebonyi	State Ministry of Women and Social Development (SMWASD)	State government	No	5
Ebonyi	State Primary Health Care Development Agency (PHCDA)	State government	Yes	13
Ebonyi	Succor Development Initiative (SUCCOR DEVELOPMENT)	FBO	No	1
Ebonyi	Thinkwell (THINKWELL)	USAID-funded activity/project	No	1
Ebonyi	Traditional Rulers Council (TRADITIONAL RULERS COUNCIL)	State government	No	1
Ebonyi	USAID (USAID)	USAID	No	1
Ebonyi	United Nations Children Education Fund (UNICEF)	UN Agency, USAID-funded activity/project	Yes	5
Ebonyi	United Nations Population Fund (UNFPA)	USAID-funded activity/project	No	1
Ebonyi	United States Pharmacopeia-Promoting Quality of Medicine (USP-PQM)	USAID-funded activity/project	No	1
Ebonyi	Ward Development Committees (WDC)	CBO, Ward government	No	7
Ebonyi	Women Organizations (WOMEN ORGANIZATIONS)	CBO	No	1
Ebonyi	Women, Children's Health and Community Development (WOCHAD)	NGO	Yes	1
Ebonyi	World Health Organization (WHO)	UN Agency	Yes	2
Ebonyi	Youth Organizations (YOUTH ORGANIZATIONS)	CBO	No	1
Kebbi	Active Support of Rural Peoples Initiative (ASURPI)	NGO	No	1
Kebbi	Advocacy Core Group (ACG)	Other	Yes	0
Kebbi	Agaji (AGAJI)	FBO	No	1
Kebbi	Association of Women Living with HIV/AIDS in Nigeria (ASHWAN)	CBO, CSO	No	2
Kebbi	Awshone (AWSHONE)	CSO	No	1
Kebbi	Breakthrough ACTION-Nigeria (BA-N)	USAID-funded activity/project	Yes	17
Kebbi	Civil Society Organizations (CSO)	CSO	No	1
Kebbi	Civil Society Scaling Up Nutrition in Nigeria (CS-SUNN)	NGO, CSO	Yes	1
Kebbi	Civil Society in Malaria Control, Immunization and Nutrition (ACOMIN)	NGO	Yes	0
Kebbi	Clinton Health Access Initiatives (CHAI)	NGO	No	1
Kebbi	Coalition of CSOS (COALITION OF CSO)	CSO	No	1
Kebbi	Commodity Associations (COMMODITY ASSOCIATIONS)	CSO	No	1
Kebbi	Eatsafe (EATSAFE)	NGO, USAID-funded	No	3

State	Name	Type	Surveyed	Nominations
		activity/project, CSO		
Kebbi	Family Health International (FHI 360)	NGO	No	1
Kebbi	Feed the Future: Cultivating New Frontiers in Agriculture (FTF/CFA)	USAID-funded activity/project	No	1
Kebbi	Feed the Future: Nigerian Agricultural Policy Activity (FTF/NAP)	USAID-funded activity/project	No	1
Kebbi	Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM)	USAID-funded activity/project	Yes	12
Kebbi	Health Workforce Management Activity (HWMA)	USAID-funded activity/project	Yes	7
Kebbi	Healthcare Support Intervention (HEALTHCARE SUPPORT)	NGO, State government	No	2
Kebbi	Integrated Health Program (IHP)	USAID-funded activity/project	Yes	20
Kebbi	Johnson and Johnson (J&J)	NGO	No	1
Kebbi	Joint National Association of Persons with Disability (JONAPWD)	CSO	Yes	0
Kebbi	Kebbi Contributory Healthcare Management Agency (KECHEMA)	State government	Yes	3
Kebbi	Kebbi State College of Health Technology, Jega (COLLEGE OF HEALTH TECH)	State government	No	1
Kebbi	Kebbi State College of Nursing Science (COLLEGE OF NURSING)	State government	No	1
Kebbi	Local Governments Areas (LGAS)	Other	No	1
Kebbi	Malaria Consortium (MC)	Private donor/entity, FBO, Other (non-USAID) bilateral donor, NGO	Yes	8
Kebbi	Marie Stopes (MARIE STOPES)	NGO	No	3
Kebbi	Medicaid Cancer Foundation (MCF)	NGO	No	1
Kebbi	Mindset Community Development Initiatives (MINDSET DEVELOPMENT)	NGO	No	1
Kebbi	Ministry of Animal Health, Fisheries & Husbandry (MAHHFKB)	State government	No	1
Kebbi	Ministry of Budget and Economic Planning (SMBEP)	State government	Yes	4
Kebbi	Ministry of Environment and Solid Minerals (SMESM)	State government	No	1
Kebbi	Ministry of Local Government and Chieftaincy Affairs (SMLGCA)	State government	Yes	2
Kebbi	Ministry of Water Resources and Rural Development (SMWRRD)	State government	No	1
Kebbi	Muslim Health Workers (MUSLIM HEALTH WORKERS)	NGO	No	1
Kebbi	Nana Girls and Women Empowerment Initiative (NANA)	NGO	No	1
Kebbi	National Association of Nigeria Nurses and Midwives (NANNM)	Other	No	1
Kebbi	National Bureau of Statistics (NBS)	National government	No	1
Kebbi	National Health Insurance Schemes (NHIS)	National government	No	1

State	Name	Type	Surveyed	Nominations
Kebbi	National Identity Management Commission (NIMC)	National government	No	1
Kebbi	National Malaria Elimination Programme (NMEP)	National government	No	1
Kebbi	National Primary Health Care on Development Agency (NPHCDA)	National government	No	2
Kebbi	National Social Safety-Nets Coordinating Office (NASSCO)	National government	No	1
Kebbi	Network of People Living with HIV and AIDS in Nigeria (NEPWHAN)	CSO	No	1
Kebbi	Nigerian Medical Association (NMA)	Other	No	1
Kebbi	Nutrition International (NUTRITION INTL)	NGO, UN Agency, CSO	Yes	11
Kebbi	Oxfam (OXFAM)	USAID, NGO	No	4
Kebbi	Pathfinder International (PATHFINDER)	NGO	No	1
Kebbi	Presidents Malaria Initiative for States (PMI-S)	USAID-funded activity/project	No	1
Kebbi	Rotary Club (ROTARY)	NGO	No	1
Kebbi	Sight Savers (SIGHT SAVERS)	NGO	No	2
Kebbi	Society for Family Health (SFH)	NGO, USAID-funded activity/project	No	3
Kebbi	State Action Committee on AIDS (SACA)	CSO	No	1
Kebbi	State House of Assembly (HOUSE OF ASSEMBLY)	State government	Yes	1
Kebbi	State Malaria Elimination Programme (SMEP)	State government	Yes	1
Kebbi	State Ministry of Agriculture and Natural Development (SMOAND)	State government	Yes	0
Kebbi	State Ministry of Education (SMOE)	State government	No	1
Kebbi	State Ministry of Finance (SMOF)	State government	Yes	1
Kebbi	State Ministry of Health (SMOH)	National government, State government	Yes	12
Kebbi	State Ministry of Health / Community Health Department (SMOH/CHD)	State government	Yes	0
Kebbi	State Ministry of Justice (SMOJ)	State government	No	1
Kebbi	State Ministry of Women and Social Development (SMWASD)	National government, State government	Yes	5
Kebbi	State Primary Health Care Development Agency (PHCDA)	State government	Yes	10
Kebbi	USAID (USAID)	USAID	No	1
Kebbi	United Nations Children Education Fund (UNICEF)	UN Agency	No	11
Kebbi	United States Africa Development Foundation (USADF)	USAID-funded activity/project	No	1

State	Name	Type	Surveyed	Nominations
Kebbi	Ward Development Committees (WDC)	CBO, Ward government	No	2
Kebbi	World Health Organization (WHO)	UN Agency	Yes	10
Zamfara	Action Against Hunger (ACTION AGAINST HUNGER)	NGO	No	1
Zamfara	African Field Epidemiology Network Program (NSTOP)	NGO, UN Agency, Other	Yes	2
Zamfara	Alumma TV (ALUMMA TV)	Private donor/entity	No	1
Zamfara	Anti-Corruption Commission (ANTI-CORRUPTION COMMISSION)	State government	No	1
Zamfara	Breakthrough ACTION-Nigeria (BA-N)	USAID, Other, USAID-funded activity/project	Yes	7
Zamfara	Bureau for Public Procurement (BPP)	State government	No	1
Zamfara	CDC Atlanta (CDC ATLANTA)	Private donor/entity	No	1
Zamfara	Cardinal Onaiyeken Foundation for Peace (COFP)	NGO	No	1
Zamfara	Centre for Community Excellence (CENCEX)	LGA government	No	1
Zamfara	Child Protection Network (CPN)	NGO	No	1
Zamfara	Christian Association of Nigeria (CAN)	FBO	Yes	0
Zamfara	Civil Society Network (CSO NETWORK)	CSO	No	1
Zamfara	Civil Society Scaling Up Nutrition in Nigeria (CS-SUNN)	CBO	No	1
Zamfara	Council for Art (COUNCIL FOR ART)	State government	No	1
Zamfara	Council of Ulama (COUNCIL OF ULAMA)	State government	No	1
Zamfara	Crown Agents (CROWN AGENTS)	Private donor/entity	No	1
Zamfara	Drug Management Agency (DMA)	NGO, State government	Yes	4
Zamfara	Drug Management Agency/Logistics Management Coordination Unit (DMA/LMCU)	State government	Yes	1
Zamfara	Federal Ministry of Budget and Economic Planning (FMBEP)	National government	No	1
Zamfara	Federal Ministry of Health (FMOH)	National government	No	2
Zamfara	Federal University Gusau (FUGUS)	Other	No	1
Zamfara	Gamji TV (GAMJI TV)	Private donor/entity	No	1
Zamfara	Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM)	Other, USAID-funded activity/project	No	6
Zamfara	Global Network for Islamic Justice (ISLAMIC JUSTICE)	FBO	No	1
Zamfara	Grassroot Initiative to Strengthen Community Resilience (GISCOR)	NGO	No	1
Zamfara	Health Network Initiative (HEALTH NETWORK INITIATIVE)	CSO	No	1
Zamfara	Hospital Services Management Board (HSMB)	State government	No	5

State	Name	Type	Surveyed	Nominations
Zamfara	Human Rights Commission (HRC)	NGO	No	1
Zamfara	Integration Dignity and Economic Advancement (IDEA)	CBO	No	1
Zamfara	Inter-Source (INTER-SOURCE)	NGO	No	1
Zamfara	Interfaith Dialogue for Peace (INTERFAITH PEACE)	NGO	No	1
Zamfara	Islamic Medical Association of Nigeria (IMAN)	FBO	Yes	0
Zamfara	Joint National Association of Persons with Disability (STATE JONAPW)	CBO	No	1
Zamfara	Leprosy Mission (LEPROSY MISSION)	NGO	Yes	0
Zamfara	Marie Stopes (MARIE STOPES)	NGO	No	2
Zamfara	Media Organization (MEDIA ORGANIZATION)	Other	No	1
Zamfara	Members of Academia (ACADEMIA)	CSO	No	1
Zamfara	Ministry for Religious Affairs (MFRA)	State government	No	2
Zamfara	Ministry of Budget and Economic Planning (SMBEP)	State government	No	8
Zamfara	Ministry of Environment and Solid Minerals (SMESM)	State government	No	1
Zamfara	Ministry of Humanitarian Affairs, Disaster Management and Social Development (DIR OF SMHDSD)	State government	No	4
Zamfara	Ministry of Information and Culture (SMIC)	State government	No	6
Zamfara	Ministry of Local Government and Chieftaincy Affairs (SMLGCA)	State government	No	8
Zamfara	Ministry of Youth and Sport Development (SMYSD)	State government	No	1
Zamfara	Médecins Sans Frontières (MSF)	Other (non-USAID) bilateral donor, NGO	No	2
Zamfara	Médecins Sans Frontières Holland (MSF HOLAND)	NGO	Yes	2
Zamfara	Médecins Sans Frontières Spain (MSF SPAIN)	NGO	Yes	2
Zamfara	National Agency for Food and Drug Administration and Control (NAFDAC)	National government	No	1
Zamfara	National Cash Transfer Office (CASH TRANSFER OFFICE)	National government	No	1
Zamfara	National Directorate of Employment (NDE)	State government	No	1
Zamfara	National Primary Health Care on Development Agency (NPHCDA)	National government	No	1
Zamfara	National Product Supply Chain Management Programme (NPSCMP)	National government	No	1
Zamfara	National Youth Council of Nigeria (YOUTH COUNCIL)	CSO	No	1
Zamfara	New Incentives (NEW INCENTIVES)	NGO	Yes	1
Zamfara	Nigerian Center for Disease Control (NIGERIA CDC)	National government, NGO	No	3
Zamfara	Nigerian Police Force (NIGERIAN POLICE)	National government	No	1
Zamfara	Nigerian Television Authority Gusau (NTA GUSAU)	National government	No	1

State	Name	Type	Surveyed	Nominations
Zamfara	Nigerian Young Professionals Forum (MYPF)	CSO	No	1
Zamfara	Office of The Head of Service (HEAD OF SERVICE)	State government	No	1
Zamfara	US President's Emergency Plan for AIDS Relief (PEPFAR)	USAID	No	1
Zamfara	Presidents Malaria Initiative for States (PMI-S)	USAID, USAID-funded activity/project, State government	Yes	9
Zamfara	Pride Fm (PRIDE FM)	National government	No	1
Zamfara	Radio, Television, Theatre and Arts Workers Union (RATTAWU)	Other	Yes	0
Zamfara	Red Cross (RED CROSS)	NGO, USAID-funded activity/project	Yes	4
Zamfara	Rotary Club (ROTARY)	NGO	No	2
Zamfara	Rural Water Supply and Sanitation Agency (RUWASSA)	State government	No	3
Zamfara	Save The Children (SAVE THE CHILDREN)	Non-USAID-funded activity/project, NGO, USAID-funded activity/project	No	6
Zamfara	Secretary To State Government (SECRETARY STATE GOV)	State government	No	1
Zamfara	Sight Savers (SIGHT SAVERS)	Non-USAID-funded activity/project, NGO	No	4
Zamfara	Society for Family Health (SFH)	USAID, USAID-funded activity/project	Yes	1
Zamfara	Solidarités International (SOLIDARITÉS INTL)	NGO	Yes	1
Zamfara	Standard Voice (STANDARD VOICE)	Private donor/entity	No	1
Zamfara	State Malaria Elimination Programme (SMEP)	State government	Yes	4
Zamfara	State Ministry of Agriculture and Natural Development (SMOAND)	State government	No	1
Zamfara	State Ministry of Education (SMOE)	State government	Yes	4
Zamfara	State Ministry of Finance (SMOF)	State government	No	2
Zamfara	State Ministry of Health (SMOH)	National government, State government	No	16
Zamfara	State Ministry of Health / Neglected Tropical Diseases Elimination (SMOH/NTD)	NGO, State government	Yes	1
Zamfara	State Ministry of Women and Social Development (SMWASD)	State government	No	7
Zamfara	State Primary Health Care Board (SPHCB)	National government, State government	Yes	13
Zamfara	Traditional Institutions (TRADITIONAL INSTITUTIONS)	State government	No	1
Zamfara	Ty Danjuma Foundation (TY DANJUMA)	NGO	No	1
Zamfara	UKAID (UKAID)	NGO	Yes	1

State	Name	Type	Surveyed	Nominations
Zamfara	USAID (USAID)	USAID	No	2
Zamfara	United Nations Children Education Fund (UNICEF)	UN Agency	Yes	11
Zamfara	Vector Link (VECTOR LINK)	Other	Yes	0
Zamfara	Voluntary Aid Initiative (VAI)	CBO	No	1
Zamfara	World Bank (WORLD BANK)	State government	No	1
Zamfara	World Health Organization (WHO)	NGO, UN Agency	Yes	10
Zamfara	Zakat Commission (ZAKAT COMMISSION)	State government	No	1
Zamfara	Zamfara Coalition of Ngo (NGO COALITION)	CBO	No	1
Zamfara	Zamfara Contributory Healthcare Management Agency (ZAMCHEMA)	State government	Yes	1
Zamfara	Zamfara Emergency Management Agency (ZEMA)	State government	No	1
Zamfara	Zamfara Environmental Network (ZEN)	CSO	No	1
Zamfara	Zamfara Radio (ZAMFARA RADIO)	State government	No	1
Zamfara	Zamfara Social Protection Platform (ZSPP)	NGO	Yes	0
Zamfara	Zamfara State Agency for The Control of AIDS (ZMSACA)	State government	No	1