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**Social Network Analysis in Program Evaluation:
Measuring the Impact of the State Health Leadership Initiative on the Creation of
Social Capital**

Abstract

We evaluate the impact of a program aimed at training new State Health Officials (SHOs) on their long run relationships. The State Health Leadership Initiative (SHLI) was originally aimed at increasing the human capital of SHOs, primarily through a two week program at the Harvard Kennedy School. Using a combination of survey and interview data, we find that there is a substantial cohort effect on the probability of ties between individuals that attend the program together. Given recent findings that highlight the role that interpersonal networks play in the effectiveness of individual managers, this suggests a potential role for interventions to improve the efficiency of dispersed, public sector manager to manager networks.

Keywords:

Program evaluation, social capital, public health networks, cross-agency communication

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Can we intervene in the structure of the networks of public sector managers? Networks are often characterized as “organic” “emergent” “grassroots” “bottom up”, to be contrasted with “command and control” and “hierarchy”. Such an impressive array of adjectives seemingly abhors the possibility of interventions to affect the structure of an interpersonal network, and yet serendipity is surely in part a product of design (or, as Branch Rickey would state: Luck is the residue of design.). In fact, we know that institutional and architectural design have profound impacts on network structure, where, for example, the probability of a tie between two people in an office drops off exponentially with physical distance (Allen 1977), and that organizational silo’s are typically reflected in the structural holes within organizations (Burt 1992).

The possibility of effective intervention in the structure of inter-managerial networks in the governing system of the United States is intriguing for several reasons. As Brandeis pointed out long ago, the potential genius of the decentralized federal system is that it allows for innovation at the periphery to gently diffuse across the country. Presumably interpersonal networks are one mechanism for this diffusion—especially for the multitude of small managerial innovations that would not receive attention more broadly. A considerable accumulation of research over the last decade (e.g., O’Toole Jr 1997; O’Toole and Meier 2004) highlights how the network of an individual manager

might affect their effectiveness. A demonstration that a system-wide intervention could have an impact on the structure of the network should therefore be of general interest.

Here we evaluate the impact of a particular, accidental, intervention in the network of State Health Officials (SHOs). A SHO is the official in charge of managing health related policy in each state. In 1998, the Robert Wood Johnson Foundation (RWJF) funded a program, the State Health Leadership Initiative (SHLI), that aimed at arming SHOs at the beginning of their tenure with policy and managerial knowledge to help them be more effective. This program was based on a traditional human capital paradigm: provide knowledge at a one-week training session that would subsequently prove useful to these managers. These sessions also created an accidental intervention in the networks of these managers, where that session provided an opportunity to create relationships with other SHOs from which they might subsequently draw resources. We take this as a natural (quasi)experiment, and evaluate whether this intervention did subsequently affect the probability of information exchange among the participating SHOs.

Studying networks in the public sector

The notion that informal connections play a key role in the functioning of US government has a long history in the study of federalism. It is only in the last decade or so that networks have received more formal attention. O'Toole (1997:45) defined as networks "*structures of interdependence involving multiple organizations or parts thereof, where one unit is not merely the formal subordinate of the others in some larger hierarchical arrangement.*" Most of the subsequent empirical research in Public Administration has focused on interorganizational collaborative networks and the measurement of networks for service delivery (Milward and Provan 1998), performance of managers within public sector networks based on their structural positions to exploit opportunities (see for example: Agranoff and McGuire 2001; Meier and O'Toole 2005; O'Toole and Meier 1999, 2004; Jackson and Stainsby 2000; Provan and Milward 2001), general governance issues in policy making (Klijn and M. 2000), or interaction processes within government as a network actor.

There has been relatively little research on the role of informal relationships and inter-organizational knowledge sharing, our focus here, in the literature on public organizations. There has been, however, an explosion of research inter-organizational knowledge sharing in the private sector, with a particular focus on the high tech industry (Powell 1990). This research suggests (for example) that not all information and knowledge required to pursue an organization's goals are readily available within the organizational boundaries (Anand, Glick, and Manz 2002; Grant 1996). Therefore, members of an organization often rely on knowledge from external third parties (Anand, Glick, and Manz 2002). One popular source for tapping into external knowledge is that

of networks of professionals who share similar occupations and have experience in similar fields.

For the purpose of this paper, we refer to networks of professionals and peer networks in a broad sense, defining them as a set of loosely coupled relationships that serve as bridges across formal organizational boundaries (Brown and Duguid 2000, 2001). They emerge from connections professionals establish among each other to share common practices and to support the knowledge flows within their overall community. Networks of professionals help to access knowledge to conduct the tasks within a professional environment that is not accessible in codified form, such as handbooks, training manuals or through existing reporting and hierarchical structures. In fact, knowledge is more complex and based on experience (Cross, Rice, and Parker 2001; Kram and Isabella 1985; Morrison 2002). It is therefore difficult to transfer knowledge and experiences from one individual to another. Research has shown that the transfer mostly occurs through informal processes such as socialization and internalization (Morrison 2002; Nonaka and Takeuchi 1995, 1996).

Given the apparent utility of effective knowledge sharing, it would seem certain there would be extensive evaluations of the impact of interventions to that end. While there has been research that has studied interventions meant to instigate knowledge sharing (Wenger and Snyder 2000), there have been few or no attempts to evaluate the impact of those interventions relative to a counterfactual of no intervention in either the private or public sector. Such an evaluation can pose many inferential challenges, although these challenges are necessarily embedded within a particular context. Since it is our objective to conduct such an evaluation, we first turn to a discussion of the context

in which we conducted our analysis, and then to the challenges of inferring a programmatic impact.

Context

The Robert Wood Johnson Foundation created a program in 1998, the State Health Leadership Initiative (SHLI), with the objective to accelerate the development of leadership capacity of newly appointed State Health Officials (SHOs) to build their personal skills and provide them with adequate knowledge to ensure the effectiveness of the public health system in a rapidly changing health care and political environment (see: <http://www.statepublichealth.org/>). The SHO in each state is the manager who is responsible for all public health issues. Each year there are about 10 new SHOs who are typically appointed by the governor.

The professional background of SHOs is relatively diverse. Some have extensive experience as public health administrators, such as hospital administrators, or even as alumni SHOs from other states. Some are MDs, others nurses, others Masters in Public Health. Some have devoted their careers to public health issues, and others have primarily been involved in delivering health care. SHOs are responsible for an extraordinarily wide ranging portfolio that might include everything from pandemic preparedness to nursing home regulation. In addition to scientific knowledge of public health, they also need expertise in management, communication, and politics. These extensive knowledge needs create potential benefits from information exchange among SHOs. As an illustration of the potential of the type of knowledge exchange we are

interested in, consider the following statement from an incumbent SHO (quote drawn from one of our interviews):

I had a situation with the EMS system, and I called [another SHO up] and said “the EMS folks here are riled up. He’s an emergency medicine doctor... and had headed an EMS system... He said “don’t do anything yet. This can get you fired.... You know there’s the EMS system, they’re connected to the fire chief, there’s a fire chief I every legislative district. These people connect, and no matter what the situation is, this could get you fired....”

This SHO went on to discuss how this advice likely saved his job. In short, the existence of this relationship provided enormous value to this individual. Of course, this phone call was part of an ongoing relationship between these two SHOs. We do not examine here how much exchanges like this increase the effectiveness of SHOs, instead we focus on whether the activities connected to SHLI increase the probability of such relationships.

The activities planned as part of the SHLI for new SHOs include orientation visits with each new SHO administered by the Association of State and Territory Health Officials (ASTHO), as well as a mentoring program which pairs SHLI participants with an experienced colleague who serves as a mentor during the first year of his or her tenure.¹ In addition, SHOs have the opportunity to participate in two SHLI networking meetings. The largest component of SHLI, and the activity we focus on here, is a weeklong seminar at Harvard aimed at developing effective leadership and communications strategies.

¹ A separate analysis suggests that the mentoring program had a relatively minor impact on the network of SHOs.

Methodology

This evaluation boils down to a simple question: did participating in SHLI together increase the probability of a tie between two SHOs? In the ideal (hypothetical) research design world we would randomly select SHOs over a series of years to participate in the program, and compare them to SHOs who were not invited to participate, and evaluate whether there were a difference between the treatment and control groups in terms of connectedness. In the second best case we would capture network data over a series of years, pre and post SHLI, and evaluate whether the network among SHOs was denser during the SHLI years.

However, neither approach was possible in this case, because the evaluation was conducted about a decade after the program began.² We therefore adopted a two pronged evaluation strategy. A quantitative quasi-experimental design based on surveys of current SHOs aimed at a standard quantitative evaluation of the impact of the program, and a qualitative study of the processes of knowledge sharing based on interviews of current SHOs. We discuss each in turn.

Quasi-experimental design

Our basic unit of analysis is the dyad: do two SHOs report sharing information with one another? We therefore surveyed all SHOs (N = 57) regarding their ties to one another. We had four network questions: *Among the following SHOs, who do you turn to for information...*

1) *in general, and specifically about*

² We did attempt collection of retrospective social network data from SHOs dating to prior to 1998, but, unsurprisingly, the response rate was too low to be useful.

- 2) *pandemic preparedness*
- 3) *media relations*
- 4) *personal professional development.*

The respondents were provided a full roster of current SHOs, and asked to indicate with whom they had which type of relationship. The total number of SHOs included was 57 (N), which represents the whole population of current State Health Officials in all states and territories. There were 40 responses, yielding an overall response rate of 70%, or 87%, if territories and SHOs that were replaced during our data collection are omitted (N=46).³ In addition to the network survey, we also collected attribute data on career (prior professional positions and career pathways), tenure, and gender.

The inferential challenge in quantitatively evaluating the impact of SHLI, given that all current SHOs had the opportunity to participate in the program, is to evaluate what would have happened if they had not had that opportunity. That is, given a treatment seemingly at the systemic level, and the ability only to examine the system while it has been “under treatment” how do we evaluate the impact of the treatment?

Here we rely on the fact that our analytic focus is on the *dyadic*, not systemic level. And there is, in fact, quite a lot of variation at the dyadic level. Some dyads “attended” the one-week SHLI program together and most did not. That is, if Joe and Anne attended the one-week training together, the Joe-Anne dyad received the treatment. In a given year, if 10 people attended SHLI together, that would equal 45 (undirected) dyads that received treatment.

The counterfactual is a bit trickier. The first issue is that a nontrivial number of SHOs did not attend SHLI at all. This might be exogenous (e.g., a random scheduling

³ No territory SHOs answered the survey.

conflict), or endogenous (some SHOs may feel they have little need to learn about their jobs from outsiders). If the choice to attend SHLI is endogenous, then including dyads with individuals that did not attend SHLI in the control group would badly bias the analysis in favor of a positive finding. Thus, while we include such dyads in our analyses below, *we view as our counterfactual dyads those dyads where both members attended the week long SHLI course in different years.* That is, we compare dyads where both individuals attended SHLI together to dyads where both individuals attended SHLI in different years, inferring that any difference is due to attending SHLI together.

The remaining inferential challenge is whether there are other mechanisms which drive people who became SHOs at about the same time to talk. To deal with this we control for the difference in years for when SHOs started, and explore with the qualitative data whether there is something else that would drive people who started in the same year to be more likely to talk to each other.

Qualitative component of research

We conducted a series of structured interviews with the SHOs in order to understand the processes by which SHOs formed relationships, when they meet and how they maintain communication across organizational and geographic boundaries (the interview protocol is available in Appendix 1). The secondary focus lay on the utilization of ties: When do SHOs have the need to reach out to their peers and consult each other. We interviewed 47 current SHOs, which yielded 622 pages of transcribed interview text which was hand-coded using the qualitative data analysis software NVIVO (2008). The coding scheme is available in Appendix 2.

Estimation

To assess the research question about what influences the observed network structure, a multiple regression with quadratic assignment procedure (MRQAP) was conducted. MRQAP is a statistical tool used to compute the extent to which different network types are associated to one another and is a statistical method that replaces ordinary regression statistical permutation-based tests of significance (Krackhardt 1988).⁴ The underlying assumption here is that the unit of observation is the dyad and therefore each unit in a dataset may be dependent on other units. In statistical terms, the data are most likely autocorrelated, and this might influence the analysis. For example, in a network matrix, each row is derived from self-reports of one actor representing his perceptions of how often he interacts with the other actors in the organization. Thus, each row in the matrix shows systematic interdependence because it is derived from the same source, which can lead to positively biased ordinary-least-squares (OLS) tests. This might create significant relations between independent and dependent variables where no significant relationship exists (Krackhardt 1988).

The purpose of the multiple regressions with quadratic assignment procedure (MRQAP) then is to regress a dependent relational matrix on one or more independent matrices and determine whether independent variables are significant predictions of the dependent variables. This procedure is used to model a social relation matrix using values of other relational matrices and control variables such as attributes of adopters

⁴ As a methodological footnote, we would note that the data is fairly close to a census of the population of relationships among SHOs. The simple descriptive statistics we report below are therefore close to definitive (putting aside measurement error). However, the safe assumption on which whole network statistical methods are built is that the observed network is the result of a stochastic process, and one therefore needs to evaluate the possibility that a specified stochastic process would produce the observed data.

(Everett and Borgatti 2002). The MRQAP procedure is superior to an OLS regression analysis for the testing of dyadic hypotheses because it is more accurate in dealing with autocorrelated social network data (Krackhardt 1988). This procedure requires one-mode, two-way matrices ($n \times n$ networks) in a square matrix format. MRQAP tests are robust against a variety of common network autocorrelation structures that do not have to be modeled explicitly, e.g., in other methodological approaches such as p-star (Raider and Krackhardt 2001 :69). In the first step, the MRQAP algorithm performs a standard multiple regression across corresponding cells of the dependent and independent matrices. The diagonal values of the matrix are ignored. In the second step, the rows and columns (together) of the dependent matrix are randomly permuted to give a new matrix. This step is repeated arbitrarily hundreds of times in order to estimate standard errors for the regression coefficient. For each coefficient, the proportion of random permutations that yielded a coefficient as extreme as the one computed in step 1 are counted for each coefficient. The result is a distribution of the permuted correlations between the two matrices that is compared to the actual correlation. If fewer than 5% of the regression coefficients are larger than the actual correlation, the correlation is considered to be significant at the 0.05 level (one-tailed test). The dependent variable contains the dataset with the observed data: the matrix, which values are to be predicted. The independent variables are the predictor matrices. To test the null-hypothesis that the social network and the professional network have no influence on the advice network, a K-step-semi-partialing asymptotic procedure was chosen (Everett and Borgatti 2002). The matrices were used in their original format and not symmetrized. This approach was chosen in

order to assess whether the attitudes and attributes of actors moderated their interaction behavior.

Findings

Our primary question is whether the SHLI had an impact on the probability of a tie between two SHOs.⁵ The interviews of SHLI participants repeatedly highlighted the importance of the comraderie of the week together at Harvard, where these two SHOs are representative:

I guess the most important thing is the personal relationships. We were able to gel as friends in a small group. I think there were 9 in our group, spending 4 days together, 5 days together. And those people, we still communicate with each other.

I think that getting away for that week, at Harvard, with your new classmates, provides an infrastructure and a cohort of people that come through that have an identity, and a comfort level, and I think that's really important. Even now I look at how many of my classmates are still there. I'd have to do the count, but people identify with their class. It gives them someone that can really help them a lot.

Having forged these relationships at SHLI allows the members of the cohort to call on each other subsequently, as another SHO states:

I think participation in the State Health Leadership Initiative has allowed me to get to know more of the health officials in other states. And so I just naturally turn to them more frequently now. It's a lot easier to pick up a phone and call someone when you know them even minimally, than when you just know them as a name on a sheet a paper.

⁵ Note elsewhere we analyze the overall structure of the SHO network (Mergel and Lazer 2009). We find that the network, especially the topic specific ones are quite sparse (as is clear from the above table), centralized, with key dyadic drivers of ties including adjacency of states and common region of the country.

The descriptive statistics from the network survey support the proposition that the program had an impact on the probability of a tie between two SHOs. As noted above, each dyad may be categorized in four ways: (1) where both members of the dyad were in the same SHLI cohort (N (number of dyads) = 124), (2) where the members of the dyad belonged to different SHLI cohorts (N = 428), (3) where only one member of the dyad participated in SHLI (N = 1,244), and (4) neither member of the dyad participated in SHLI (N = 646). We view the type 2 dyads as the counterfactual for type 1 dyads. Table 1 summarizes the different densities of ties for each type of dyad.

Table 1: Densities within and across SHLI cohorts

Dyad type	Network types			
	Talk in general	Media relations	Pandemic preparedness	Professional development
Both in SHLI, same cohort	0.32	0.02	0.08	0.07
Both in SHLI, different cohorts	0.10	0.02	0.04	0.03
One in SHLI, one not	0.04	0.01	0.01	0.01
Neither in SHLI	0.02	0.00	0.01	0.01
<i>Ratio of same cohort to different cohort</i>	<i>3.3</i>	<i>1.5</i>	<i>2.3</i>	<i>2.8</i>

The descriptive statistics suggest that the SHLI might have been having a very large effect on communication among SHOs, with a ratio of same cohort to different cohort of 3.3 for talk in general, and ranging between 1.5 to 2.8 for media relations, pandemic preparedness, and professional development (although it is important to note the very low densities of these latter networks).

We also examined whether there was a bigger impact across HHS regions. HHS regions have regular meetings of SHOs, which means that within region SHOs have other, institutionalized mechanisms to facilitate meeting and communication. The SHLI

program is one of the few mechanisms to support inter-region communication. In Table 2 we present the apparent treatment effect ratios from table 1, separating within versus across region ties. In each case, the apparent treatment ratio is greater between regions than within.

Table 2: Treatment effect ratios for different region vs. same region dyads

Dyad type	Network types			
	Talk in general	Media relations	Pandemic preparedness	Professional development
Different region	4.5	1.7	2.8	3.5
Same region	1.6	0.0	2.2	1.9

Of course, descriptive data does not convey the statistical significance of these relationships, nor control for any confounders. In table 3 we present the results of the MRQAP analysis. We include six independent variables for each of the networks: (1) whether the dyad was in the same SHLI cohort; (2) whether either member of the dyad did not participate in SHLI at all; (3) whether both members of the dyad came from the same region; (4) an interaction variable the is the product of (1) and (3) above; (5) years of overlapping tenures for the dyad; and (6) the difference in the tenures of the two members of the dyad.⁶

Independent variables	Dependent variables: Network types			
	Talk in general¹	Media relations²	Pandemic preparedness³	Professional development

⁶ Inclusion of additional control variables (such as proximity of states, gender of SHOs, etc) did not materially affect the statistical significance of the treatment effects discussed below. Results available upon request.

	Stdized. Coefficient	Significance	Stdized. Coefficient	Significance	Stdized. Coefficient	Significance	Stdized. Coefficient	Significance
SHLI Cohort overlap	0.195	0.000	0.065	0.010	0.063	0.011	0.130	0.000
Non-SHLI	0.014	0.260	0.025	0.086	-0.005	0.377	-0.003	0.980
Overlap in tenure	0.044	0.127	0.027	0.165	0.038	0.104	0.018	0.000
Difference in tenure	-0.014	0.310	-0.004	0.465	0.020	0.465	-0.004	0.980
Region overlap	0.140	0.000	0.051	0.006	0.096	0.000	0.063	0.000
Interaction term ⁷	-0.041	0.016	-0.005	0.394	0.020	0.167	-0.053	0.000

¹: R² “Talk in general” network = 0.053

²: R² “Media relations” network = 0.008

³: R² “Pandemic preparedness” network = 0.017

⁴: R² “Professional development” network = 0.017

n = 57 (US States and Territories)

of permutations: 2,000

Table 3: Multiple Regression Quadratic Assignment Procedure - MRQAP

The analysis in table 3 confirms the statistical significance of belonging to the same SHLI cohort for all four network types at observed R-squares between 0.053 (for the talk in general network) and 0.017 (for the professional development network) along with the proportion of random trials yielding an R-square as large as or larger than the observed. Moreover, the MRQAP calculations also confirm that regional overlap has a highly significant effect on tie creation across all four networks, where the interaction term suggests that the intra-regional treatment effect was significantly less than the inter-regional effect in two of the four networks

Discussion and conclusion

⁷ The interaction term was created by multiplying the SHLI cohort overlap variable with the regional overlap variable.

There has been increased attention to the role that networks play in the effective functioning of both public and private organizations. The existence of informal mechanisms of knowledge sharing is especially important when we consider the decentralized system of US government. Standard hierarchical mechanisms of knowledge sharing simply are not applicable in a federal system. This does not mean that interventions in the knowledge sharing process are impossible. The literature on networks thus begs the question: is it possible to intervene in the system so as to increase connectedness?

In order to address this question we examined a particular program—SHLI— that plausibly would have an impact on the connectedness of a particular set of public officials: State Health Officials. We compared the probability of a relationship between two individuals who participated in same training cohort of SHLI to pairs of individuals who were in different cohorts of SHLI. Our key finding: participating in SHLI together was associated with a statistically and substantively large increased probability of a relationship.

Further, the analysis suggests that the effect is especially large for inter-regional ties. This is important because long distance ties—ties connecting individuals who are not connected through many intermediaries—are critical drivers of diffusion of information in systems (Watts and Strogatz 1998; Granovetter 1973). A remarkable 33% of the “talk in general” ties in the entire system were from dyads that went through the system together (as compared to 13% of intra-regional ties).

There are a few caveats to the analysis, of course. On the inferential side, our analysis depends on the assumption that there are not other factors that drive individuals

from the same cohort to communicate. This is in part controlled for by including the difference starting years as a control; however, if there is a nonlinearity associated with being of exactly the same cohort this would not suffice. However, concerns in this regard are significantly attenuated because (1) there really do not exist distinct generations of SHOs in the sense that a SHO might be appointed any time during the year, and thus be closer in tenure to someone appointed in an adjacent year—thus in the absence of other institutional mechanisms that group SHOs by year it is hard to justify an expectation of a nonlinear relationship with different in starting years; (2) there was not a *single* mention in any of the interviews of some institutional mechanism (like some other orientation process) that would facilitate same cohort tie creation, as compared to repeated mentions of SHLI;⁸ and (3) there are no cohort effects for dyads where one or both members did not participate in SHLI. We would argue, therefore, that a causal interpretation is the most plausible explanation for the finding we report.

The second caveat is that while we find large effects, these are large effects relative to low base rates—that is, the density of ties among SHOs is generally fairly low, especially for the more specialized networks. Further, the systemic impact of SHLI is limited due to fact that relatively few dyads were “treated”. About 5% of the dyads we examined in the analysis above involved pairs of individuals who participated in SHLI together. Even among dyads where both members participated in SHLI, less than 25% involved pairs of individuals from the same cohort. In short, the cohort-based nature of the program intrinsically limited the potential of a wider impact. And further, the ties that were being fostered were among individuals who had the least experience (initially),

⁸ As discussed in Mergel and Lazer (2009), other factors that were repeatedly mentioned in the interviews include: (1) the role of HHS regional meetings, (2) the need to coordinate some policies with adjacent states.

and thus the least to learn from one another. That is, the program was not optimized to create social capital.

There are also some limitations in external validity, even within the population under study. Specifically, we excluded from the comparison dyads where one or both members did not participate in SHLI. There well may have been an interaction between the treatment and the proclivity to seek treatment. Thus, for example, if you could mandate that every SHO participate in SHLI, one could not extrapolate from these results to individuals who would have chosen not to participate.

Those caveats aside, this is an existential proof of the potential of external intervention to shape the informal networks among state (and likely local) governments. These were sizable effects, likely with systemic consequences, and this points both to the need for further research on when these types of interventions have an impact on tie formation, as well as to interventions in other sectors to facilitate the creation of social capital.

Appendix 1: Interview protocol

Interview Protocol for State Health Officials State Health Leadership Initiative Robert Wood Johnson Foundation

1. Introduction
 - a. Offer to answer questions about the research project
 - b. Ask for consent to record the interview.
 2. Would you please state your name and position title?
 3. How long have you been in this position?
 4. What is your education and professional background?
[ask about career path that lead to the current position]
 5. How were you recruited for this position? What makes you uniquely qualified for this position?
- 6. Searching for information**
- 1) *Types of information, 2) sources of information*
 - a) When you started your new job: who was most helpful to you when it came to:
 - Running the office
 - Getting to know the important issues
 - Pandemic preparedness
 - Dealing with the press
 - Dealing with the governor
 - Professional Development
 - b) Where do you get information needed to do your job?
[Follow up on the sequence of information sources: where do you look first, second, third....]
[Ask for specific examples]
 - c) What issues do you have most difficulties finding information on?
 - d) How do you proceed when you don't know whom to turn to?
[e.g., post on listserv, go to the ASTHO website, Google, ask for referrals, talk to your staff]
 - e) What kind of media do you use to communicate on these issues?
 - f) What are other important information sources for you?
 - Names of news media?
 - Conferences you attend?
 - Journals you read?
 - g) Are you in contact with alumni SHOs? Former SHOs?
 - How helpful are they to you? Can you give an example?
 - How often do you communicate with them?
 - h) In general, did your search strategy changed over time – compared to the time when you were new in this position and today? [Example: turn to different people, use different types of sources – change in Internet use strategy/Get to know other SHOs in other states]

II. Giving information to others

[Set the context: Answering questions takes scarce time, so why do you take the time to do so?]

- a) Do you get approached for help?
- b) Who approaches you for information?
- c) On what kind of topics?
- d) How do you respond to inquiries?
 - When someone calls you?
 - When someone emails you?
- e) Are there people from outside your agency who are approaching you for help?
- f) Are there other SHOs who approach you with specific requests for help or information?
- g) How did you get to know the different people who are reaching out to you and ask for your help? [Prompt for difference in helping behavior when they already know the person vs. don't know/never heard of]
- h) In what kind of situations or under what kind of circumstances are you willing to go the extra mile and take the time to answer their questions? [Do you remember a situation when you really went out of your way to help somebody (in the professional context)?]
- i) When did you feel you could have been helpful but you weren't able to help? And what did you do?
- j) Do you belong to any kind of listserver or mailing list?
 - If yes, what do you get out of the information posted on the listserver?
 - Have you ever asked/answered questions?
 - When do you feel inclined to respond to inquiries posted on the listserver?
 - Are there special topics you would respond to? How would you respond? [Offline or so that everyone on the listserver can see responses?]
 - Does the way the question is asked make a difference?
 - Are there special people who you would respond to?

These are all my questions:

Can you think of any type of support in terms of technology, database, networking events, which would be helpful to have or are not in place right now?

Is there anything else that you can think of in the context of our questions that you would like to add?

Closing remarks:

- Asking permission to pose follow-up questions
- Thank you so much for your time! We appreciate your help with our research project.

Appendix 2: Coding scheme for qualitative interviews

A. Individual information

- Name
- Position title
- Education
- Career path
- Previous jobs
- Start date as SHO
- Tenure in office
- How did he/she got this job?
- Friend of governor
- Official application
- Someone asked him/her

B. Knowledge sources by topic area

1. Getting up to speed on the new job

- Internal sources
- Staff (in the department)
- Experts (outside the department) / Advisors
- External sources
- Human sources
 - Other states
 - Mentors
 - Former SHOs
 - Friends
- Non-human sources
 - Handbooks, manuals
 - ASTHO
- Secondary data and reports
- Topic areas
- Running the office
- Personnel changes
- Former practices
- Past experience
- Legislature
- How to present self [this might go into the media category]
- Role as SHO/director
- Specific names of SHOs

2. Pandemic preparedness

- Internal sources
- Staff
- Other agencies within the same state
- External sources
 - o Former SHOs
- Internet, web, Google

- Regional groups
 - New England Group of SHOs
 - Region 8
 - Names of states within regions
- Topic areas
 - Bird flu
 - Anthrax
 - Pandemic pro-planning
 - Other public health issues
 - Communication
 - Frequency
 - Channel
 - Email
 - Phone (conversations)
 - Face-to-Face meetings
- 3. Dealing with the press**
 - Internal sources
 - External sources
- 4. Dealing with the governor**
 - External resources
 - ASTHO
 - Handbook of the first 100 days
 - phone calls with ASTHO
 - Day on the Hill
 - Names of ASTHO representatives
 - Regional representatives: State health officials covering a region
 - NGA
 - Internal resources
 - Staff
 - Governor himself
 - Ties to Governor
 - Prior to appointment
 - Friendship
 - Worked together
 - Not known before
 - Current relationship
 - How was the SHO appointed?
- 5. Professional development**
 - Human sources
 - Past SHOs
 - Mentor(s)
 - Formal
 - informal
 - Non-human sources
 - National conferences

- Regional meetings
 - Region 8 meetings
 - Names of states
 - Rocky Mountain States
 - Frequency of meetings
 - Meet periodically
 - Talk on the phone
 - ...
- ASTHO annual meetings:
 - ASHTO's Day on the Hill, Washington
 - ASTHO's committees, SHOs are members, regular phone conferences (every other months, annual meetings):
 - NGA – National Governor's association
 - CDC
 - Academy of Health
 - Robert Wood Johnson Foundation

6. Dealing with legislature

- Human sources
- Past SHOs
- Non-human sources

C. Relationships to other SHOs

- Creation of relationship
- Maintenance
- No relationships
- Reasons
- ...

D. General search strategies

1. Where to go first, second, etc. to find information needed to do the job?
 - Internal experts
 - National partners
 - CDC
 - ...
 - Former SHOs
2. Content areas
 - How to approach certain diseases
 - Types of diseases
3. Change of search strategy over time

E. Giving information to others

1. Approached for help
 - Yes/no
 - By whom
 - Friends / Based on previous friendships
 - Other SHOs
 - Based on title

- Inside own agency
 - Inside own state
 - Outside own agency
 - Outside state
2. Types of information/knowledge requested
 - Complex / Expert knowledge
 - Simple
 3. Type of question
 4. Frequency
 - Couple of times per year
 5. Form of request
 - Media
 - Email
 - Phone
 - Face to face
 - Context
 - At a conference
 6. Reason for request
 - Common problem
 - Unique problem
 - Prior experience
 - Faced similar problems in the past
 - ...
 - Reputation
 - of being an expert
 - ...
 - Prior relationship
 7. Form of response to inquiries
 - Media
 - Email
 - Phone
 - Face to face
 - Type of response
 - Long
 - Short
 - Written
 - Time to response
 8. Behavior on listserver
 - Response behavior
 - Lurker
 - Contributor
 - Status
 - Moderator
 - Expert
 - Searcher

F. Why people don't share knowledge

1. Reasons
 - a. Unique problems
 - b. Staff has all the knowledge (internal knowledge)

G. Additional needs (improvements)

1. Local email list (not all states, just neighboring states)
2. Networking opportunities

H. Comments about SHLI

1. Positive
2. Negative

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