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Barriers and Facilitators to Collaboration Between Local Health Departments and Schools and Programs of Public Health – A Mixed-Methods Study

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Collaboration between local health departments (LHDs) and schools and programs of public health (SPPH) have potential to improve public health practice, education and research. However, little is known about the barriers and facilitators to LHD and SPPH collaboration. The purpose of this paper is to identify and explore factors that affect the level of collaboration between LHDs and SPPH. A mixed-methods study was used. LHD characteristics associated with the degree of collaboration with SPPH were identified thorough a survey, and these and other factors were explored through group interviews with LHD practitioners and faculty from SPPH. Proximity, community size, organizational capacity, and goal and process clarity were all found to influence the degree of collaboration. This study highlights needs and opportunities for expanding collaboration between LHDs and SPPH.

Keywords: Academic Health Department; Local Health Department; Schools and Programs of Public Health; Collaboration

Local health departments (LHDs) are part of the governmental public health system which aims to improve population health by assuring conditions in which people can be healthy. LHDs are responsible for providing the three core functions of public health (assessment, policy development, and assurance) in the jurisdiction they represent (Salinsky, 2010). In recent years, there has been a call for LHDs to take a more strategic approach to population health improvement, with calls for accreditation and quality improvement, evidence-based practice, and better community engagement as LHDs become their community's chief health strategist, working to address chronic disease and social determinants of health (Public Health Leadership Forum, 2014). However, many LHDs lack the scientific capacity and skillsets for these activities (Sosnowy, Weiss, Maylahn, Pirani, & Katagiri, 2013).

Academic health departments (AHDs) are formal partnerships between academic institutions and public health practice organizations and have been advanced as a way to improve public health practice, teaching, and research. AHDs may include formal agreements, shared personnel and resources, training for students and public health employees, as well as collaborative approaches to research and public health practice (Council on Linkages Between Academia and Public Health Practice, 2011). AHDs have been shown to improve community health assessment, clinical services, evaluation, education, and research (Akintobi, Dawood, & Blumenthal, 2014; Livingood et al., 2007; Swain, Bennett, Etkind, & Ransom, 2006). AHDs may also help LHDs achieve public health accreditation (Erwin & Keck, 2014). However, AHDs may represent a higher-level of collaboration than what is typically experienced. Data from the National Association of County and City Health Officials' (NACCHO's) 2016 National Profile of LHDs showed substantial variation in the types of activities that LHDs engaged in with academic institutions with 75% of LHDs accepting students as trainees or interns but less than 25% participating in advisory or consulting roles (NACCHO, 2016).

Collaboration between LHDs and schools and programs of public health (SPPH) (defined as academic public health programs accredited by or seeking accreditation from the Council on Education for Public Health) may be of strategic importance. LHDs may benefit from enhanced capacity to deal with resource reductions, and from expertise to assist with public health accreditation and evidence-based practice (Sosnowy et al., 2013; Ye, Leep, & Newman, 2015). SPPH may benefit by gaining access to host sites for student practicum and to local communities which can enhance their ability to conduct and translate research into practice (Colgrove, Fried, Northridge, & Rosner, 2015; Salinsky, 2010). Improving collaborative relationships between LHDs and SPPH may be an important means to achieve these types of benefits. However, NACCHO shows that only 31% of LHDs have formal partnerships with SPPH, and fewer appear to be engaged in strategic initiatives (NACCHO, 2016).

A better understanding of the barriers and facilitators to collaboration is needed to improve the effectiveness, efficiency, and long-term outcomes for both LHDs and SPPH. Currently, research suggests that factors, such as geographic proximity, organizational capacity, executive and workforce characteristics, trust, reciprocity, communication, and goal and process formalization may influence how closely organizations work together (Huxham, 1996; Muscio, 2013; Oliver, 1990). Yet, little is known about why LHDs and SPPH collaborate. Most research has focused on how LHDs and SPPH collaborate, and many studies have been limited to case story and document review methods (Akintobi et al., 2014; Conte, Chang, Malcolm, & Russo, 2006; Livingood et al., 2007; Swain et al., 2006). More in-depth analysis could reveal important elements of collaboration and opportunities for growth. This study aimed to fill these gaps by identifying LHD characteristics associated with the degree of collaboration and exploring in depth insight from LHD officials and faculty from SPPH about why these factors influenced their collaboration.

Methods

Design

The research team consisted of members with expertise and experience in local health department leadership, epidemiology, health promotion, as well as quantitative and qualitative research. We conducted a mixed-methods study using two distinct but interactive phases (Creswell, 2009). Quantitative data were used to identify factors associated with the degree of collaboration, and qualitative data were used to explore how these and other factors influenced the degree and outcomes of collaboration. Equal priority was given to the quantitative and qualitative data to allow for different but complementary data (Creswell, 2009). The study was reviewed by University of Illinois at Chicago's institutional review board and deemed exempt (Research Protocol #2015-0458).

Phase 1 – Quantitative Survey

Questionnaire. Questions were selected to match the NACCHO's 2008 National Profile of LHDs survey that examined LHD interaction with academic institutions (NACCHO, 2009). Eight yes/no questions were included that asked participants if the LHD they worked for collaborated with SPPH: a) to accept student as trainees, interns, or volunteers; b) to offer students practicum opportunities; c) for LHD staff to serve as faculty for SPPH; d) to conduct program evaluation; e) to conduct research; f) to receive consulting services; g) to serve on an SPPH advisory group; and h) to have faculty from an SPPH serve on a LHD advisory group. Pilot testing was conducted among LHD executives. The survey was finalized when no significant recommendations for modification were provided.

Data collection and participants. Executives from the 2,000 LHDs that completed NACCHO's 2013 National Profile of LHDs survey were recruited for the study. Their email addresses were identified using NACCHO's directory of LHDs, contact lists compiled by state health departments or state associations of LHDs, or by reviewing LHD websites (NACCHO, 2015). Executives were emailed up to five times between July and October 2015, with a link to the web survey administered using Qualtrics®.

Statistical analysis. Stata version 15 was used to analyze quantitative data. The dependent variable, degree of collaboration, was measured based on the sum of the number of collaborative strategies LHDs used with SPPH. Collaborative strategies were based on the survey questions and included: a) student learning activities (internships and practicum), b) short-term projects (consulting, evaluation, and research), c) adjunct-faculty, and d) advising (LHD advises SPPH, or SPPH advises LHD). The degree of collaboration ranged across a continuum from low collaboration (one collaborative strategy) to high (four collaborative strategies).

Data from our survey were linked with data from NACCHO's 2013 National Profile of LHDs survey to measure independent variables, which included: a) the distance between LHDs and the nearest SPPH, b) the size

of the population served by LHDs, c) the number of LHD employees, d) if LHDs had a formal agreement with a SPPH, e) the LHD executive's highest degree, f) if the LHD executive had a Master or Doctorate of Public Health Degree, and g) whether or not LHDs employed at least one physician, environmental health specialist, epidemiologist, health educator, or information systems specialist (NACCHO, 2014).

Stata's multiple imputation commands were used because 32% ($n = 200$) of the participants were missing data. Among the participants missing data, approximately half were missing data for three or fewer variables, and approximately half were missing data for four to seven variables. In addition, complete case analysis was found to be inappropriate because the missing completely at random assumption was violated (Grace-Martin, n.d.). This was assessed by testing the association of missing or not missing data with the degree of collaboration. Missing data were associated ($p < 0.05$) with the degree of collaboration for cases in which the LHD executive had a Master or Doctorate of Public Health Degree and for cases in which LHDs employed at least one physician, environmental health specialist, epidemiologist, health educator, or information systems specialist. The imputation process included all variables included in the analysis and 30 imputed data sets were generated.

Ordinal logistic regression was conducted yielding crude and adjusted odds ratios to assess for the effect of LHD characteristics on the degree of collaboration. Crude odds ratios were examined for each variable, and those with a p -value ≤ 0.10 were included in the multivariable model, based on model building strategies from Heeringa, West, and Berglund (2010). A p -value of ≤ 0.05 was used to determine statistically significant differences in the degree of collaboration between groups. The proportional odds assumption was tested using Stata's `omodel` logit command.

Phase 2 – Group Interviews

After the quantitative phase was completed, group interviews were held with LHD officials and faculty from SPPH that had collaborated with one another. Purposeful sampling was designed to ensure participation from high (four collaborative strategies) and low (one collaborative strategy) collaborators as well as to ensure variation in the proximity between LHDs and SPPH and the size of the population served by LHDs. Executives from LHDs that met the selection criteria were emailed to request their participation. Those that agreed were asked to identify key informants from the LHD and SPPH that were most involved in their collaboration.

Group interviews were held from March to July 2016, using a telephone conference call. This was deemed an appropriate method given that most public health officials have capacity for and experience with conference calls, but some might not have experience with web conferencing. Participants were provided questions a week prior to the interview to allow them to prepare. To maximize participation during the interview, calls were limited to five participants and the interviewer called on each participant, specifically, for each question. The interviewer also used verbal cues, like “tell me more”, to indicate that he had heard the discussion and was engaged in their experience (Allen, 2014). Every interview was recorded and transcribed verbatim to support analysis. Interviews were facilitated using a semi-structured interview guide. This was developed, based on a literature review about interorganizational collaboration and academic and public health collaboration, as well as the research team's experience working in LHD leadership (Huxham, 1996; Muscio, 2013; Neri, Ballman, Lu, Greenlund, & Grunbaum, 2014). The questions focused on the collaborative process, collaborative outcomes, and barriers and facilitators to collaboration.

Data analysis was supported by Atlas.ti version 7.5. The lead researcher analyzed every transcript to code the data and identify themes. To reduce bias, a second researcher also analyzed two of the eight transcripts to assess the data for additional codes and themes, and the entire research team deliberated about the codes, themes, and meaning of key quotations. Interview participants were also provided a draft report to allow them an opportunity to review the findings and provide feedback.

Results

Quantitative Results

Of the 2,000 individuals surveyed, there were 618 (31%) valid responses. The degrees of collaboration were fairly evenly distributed, with 18.8%, 21.8%, 18.4%, 17.0%, and 23.9% LHDs using zero, one, two, three, and four collaborative strategies with SPPH, respectively. LHD characteristics were similar among the survey's respondents and the sampling frame (**Table 1**).

Bi-variate analysis showed that all LHD characteristics assessed were associated with the degree of collaboration. Multivariable analysis showed that having a formal agreement with a SPPH (Adjusted Odds Ratio

Table 1: Characteristics of the Survey Sample and Sampling Frame.

Characteristics	Survey		Sampling Frame ^a	
	n	Percent (95% CI)	n	Percent (95% CI)
Degree of collaboration				
0 collaborative activities	116	18.8% (15.9%–22.1%)	–	–
1 collaborative activity	135	21.8% (18.8%–25.3%)	–	–
2 collaborative activities	114	18.4% (15.6%–21.7%)	–	–
3 collaborative activities	105	17.0% (14.2%–20.2%)	–	–
4 collaborative activities	148	23.9% (20.7%–27.5%)	–	–
Distance between LHD and nearest SPPH				
≥84 miles	154	24.9% (21.7%–28.5%)	513	25.7% (23.8%–27.6%)
48 to 83 miles	155	25.1% (21.8%–28.7%)	528	26.4% (24.5%–28.4%)
24 to 47 miles	152	24.6% (21.4%–28.2%)	476	23.8% (22.0%–25.7%)
≤23 miles	157	25.4% (22.1%–29.0%)	482	24.1% (22.3%–26.0%)
Missing	–	–	1	0.1% (0.0%–0.4%)
Size of population served by LHD				
<100,000	438	70.9% (67.2%–74.3%)	1,479	74.0% (72.0%–75.8%)
100,000 to 399,999	132	21.4% (18.3%–24.8%)	364	18.2% (16.6%–20.0%)
≥400,000	48	7.8% (5.9%–10.2%)	157	7.9% (6.7%–9.1%)
Number of LHD employees				
≤10	163	26.4% (23.0%–30.0%)	550	27.5% (25.6%–29.5%)
11 to 24	142	23.0% (19.8%–26.5%)	495	24.8% (22.9%–26.7%)
25 to 68	148	23.9% (20.7%–27.5%)	477	23.9% (22.0%–25.8%)
≥69	147	23.8% (20.6%–27.3%)	420	21.0% (19.3%–22.8%)
Missing	18	2.9% (1.8%–4.6%)	58	2.9% (2.2%–3.7%)
LHD executive's education				
Bachelor's Degree or Less	253	40.9% (37.1%–44.8%)	836	41.8% (39.7%–44.0%)
Master's Degree	283	45.8% (41.9%–49.7%)	857	42.9% (40.7%–45.0%)
Doctorate	82	13.3% (10.6%–16.0%)	307	15.4% (13.8%–17.0%)
LHD executive has a MPH or DrPH				
Yes	144	23.3% (20.1%–26.8%)	421	21.1% (19.3%–22.9%)
No	445	72.0% (68.3%–75.4%)	1468	73.4% (71.4%–75.3%)
Missing	29	4.7% (3.3%–6.7%)	111	5.6% (4.3%–6.6%)
LHD has a formal agreement with a SPPH				
Yes	232	37.5% (33.8%–41.4%)	–	–
No	386	62.5% (58.6%–66.2%)	–	–
LHD employs ≥1 physician				
Yes	222	35.9% (32.2%–39.8%)	773	38.7% (36.5%–40.8%)
No	270	43.7% (39.8%–47.6%)	769	38.5% (36.3%–40.6%)
Missing	126	20.4% (17.4%–23.8%)	458	22.9% (21.1%–24.8%)

(contd.)

Characteristics	Survey		Sampling Frame ^a	
	n	Percent (95% CI)	n	Percent (95% CI)
LHD employs ≥1 environmental health specialist				
Yes	484	78.3% (74.8%–81.4%)	1544	77.2% (75.3%–79.0%)
No	74	12.0% (9.6%–14.8%)	261	13.1% (11.6%–14.6%)
Missing	60	9.7% (7.6%–12.3%)	195	9.8% (8.5%–11.1%)
LHD employs ≥1 epidemiologist				
Yes	173	28.0% (24.6%–31.7%)	562	28.1% (26.2%–30.1%)
No	298	48.2% (44.3%–52.2%)	907	45.4% (43.2%–47.5%)
Missing	147	23.8% (20.6%–27.3%)	531	26.6% (24.7%–28.5%)
LHD employs ≥1 health educator				
Yes	383	62.0% (58.1%–65.7%)	1152	57.6% (55.4%–59.8%)
No	138	22.3% (19.2%–25.8%)	507	25.4% (23.5%–27.3%)
Missing	97	15.7% (13.0%–18.8%)	341	17.1% (15.5%–18.8%)
LHD employs ≥1 information systems specialist				
Yes	158	25.6% (22.3%–29.2%)	488	24.4% (22.6%–26.3%)
No	313	50.6% (46.7%–54.5%)	974	48.7% (46.5%–50.9%)
Missing	147	23.8% (20.6%–27.3%)	538	26.9% (25.0%–28.9%)

Notes: Sample N = 618; Sampling Frame N = 2,000.

^a The 2013 National Profile of Local Health Departments Survey conducted by the National Association of County and City Health Officials served as the sampling frame.

Abbreviations: LHD, Local Health Department; SPPH, School or Program of Public Health; MPH, Master of Public Health; DrPH, Doctor of Public Health.

(AOR) = 5.50, 95% Confidence Interval (CI) = 3.89–7.78), being located ≤23 miles from the nearest SPPH (AOR = 3.79, 95% CI = 2.31–6.20), serving ≥400,000 people (AOR = 3.00, 95% CI = 1.13–7.94), employing ≥69 employees (AOR = 2.23, 95% CI = 1.15–4.34), and employing at least one epidemiologist (AOR = 1.64, 95% CI = 1.01–2.67) or one health educator (AOR 1.53, 95% CI = 1.00–2.32) were associated with higher degrees of collaboration (**Table 2**).

Qualitative Findings and Themes

Eight group interviews were held, including 15 LHD officials (mean = 1.9) and 10 faculty members from SPPH (mean = 1.3). All group interviews lasted at least 90 minutes. Five high collaborating and three low collaborating LHDs and SPPH were included. The population served by LHDs ranged from roughly 15,000 to 1,000,000. Distance ranged from roughly five miles to 100 miles. In addition, five schools of public health, two Master of Public Health programs, one Bachelor of Public Health program, and one medical school were included. Five groups were from the Midwest, and three were from the South (**Table 3**). Themes that emerged from the qualitative data are described next.

Issues related to proximity and community size. Participants in the group interviews reported challenges that arose from the distance between the LHD and SPPH. This was exacerbated when LHDs resided in small communities. Discussion focused mostly on how long commute times and a lack of short-term housing created barriers to providing student learning activities, a primary reason why SPPH collaborate with LHDs (Kovach, Welter, Seweryn, & Torres, 2018). When asked about finding housing, one faculty member said:

[Students] are only going to be [at the LHD] for five weeks. So, okay, do you rent an apartment, get furniture. There's not much available in these communities. Then you have to know somebody in the community or you end up having to beg somebody at the LHD to live in their basement.

This sentiment was held by most faculty members. In addition, some faculty members thought that their students were hesitant to work with LHDs that served smaller communities because they lacked the amenities young people desire.

Table 2: Association Between Local Health Department Characteristics and the Degree Of Collaboration.

Local Health Department Characteristics	OR	95% CI	AOR	95% CI
Distance between LHD and nearest SPPH				
≥84 miles	–	–	–	–
48 to 83 miles	1.15	0.77–1.71	0.87	0.57–1.34
24 to 47 miles	2.18**	1.45–3.26	1.18	0.76–1.85
≤23 miles	7.76**	5.06–11.89	3.79*	2.31–6.20
Size of population served by LHD				
≤99,999	–	–	–	–
100,000 to 399,999	3.50**	2.43–5.03	0.86	0.52–1.43
≥400,000	28.66**	13.48–60.94	3.00*	1.13–7.94
Number of LHD employees				
≤10	–	–	–	–
11 to 24	0.94	0.63–1.41	0.76	0.48–1.19
25 to 68	2.91**	1.95–4.35	1.58	0.96–2.60
≥69	9.91**	6.39–15.37	2.23*	1.15–4.34
LHD has a formal agreement with a SPPH				
No	–	–	–	–
Yes	6.92**	5.03–9.52	5.50**	3.89–7.78
LHD executive's education				
≤Bachelor's	–	–	–	–
Master's	2.98**	2.19–4.06	1.30	0.88–1.90
Doctorate	5.96**	3.69–9.62	1.09	0.60–1.97
LHD executive has a MPH or DrPH				
No MPH or DrPH	–	–	–	–
MPH or DrPH	3.17**	2.23–4.49	1.50	0.98–2.29
LHD employs ≥1:				
Physician	3.08**	2.21–4.91	1.10	0.74–1.63
Environmental Health Specialist	3.80**	2.46–5.87	1.54	0.92–2.52
Epidemiologist	4.04**	2.79–5.85	1.64*	1.01–2.67
Health Educator	3.62**	2.51–5.21	1.53*	1.00–2.32
Information systems specialist	3.47**	2.38–5.05	1.31	0.82–2.10

Notes: N = 618. Multiple imputation was used to create 30 imputed datasets.

* P < 0.05. ** P < 0.001.

Abbreviations: OR, odds ratio; AOR, adjusted odds ratio; CI, confidence interval; LHD, local health department; SPPH, school or program of public health; MPH, Master of public health; DrPH, Doctor of Public Health.

Considering these challenges, participants with experience collaborating across long distances thought it was important to promote work between SPPH and LHDs serving small and remote communities. When asked about why they collaborated with a remote LHD, one faculty member said:

In public health education, it's challenging because we feel it's so critical for our students to understand public health in its most genuine terms, and that is vulnerability, inequity, remoteness, lack of access to services, and yet it's so hard to get our students to be willing to leave the large city...

Table 3: Characteristics of the Group Interview Participants.

Group Interview	Participants		Population ^a	Distance	Degree of Collaboration ^b	Type of SPPH	Geographic Location
	LHD	SPPH					
One	2	1	≈400,000	≈75	4 (high)	SPH	Midwest
Two	2	2	≈300,000	>5	4 (high)	SPH & Medical School	South
Three	3	1	≈1,000,000	>5	4 (high)	SPH	South
Four	1	1	≈1,000,000	≈100	1 (low)	SPH	South
Five	1	1	≈15,000	≈50	1 (low)	MPH Program	Midwest
Six	3	2	≈30,000	≈100	4 (high)	SPH	Midwest
Seven	2	1	≈80,000	>5	4 (high)	BPH Program	Midwest
Eight	1	1	≈25,000	≈100	1 (low)	MPH Program	Midwest

Notes:

^a The LHD population was rounded to the nearest thousand to support confidentiality.

^b The degree of collaboration was based on the number of collaborative strategies used by LHDs. The survey measured four collaborative strategies. The sample was limited to LHDs with four or one collaborative strategy.

Abbreviations: LHD, local health department; SPPH, school or program of public health; SPH, school of public health, MPH Program, Master of Public Health Program, BPH, Bachelor of Public Health Program.

If public health is anything, it's equity. Geographic and population-based equity across the whole country. Even if you live in a remote county, you are just as worthy of receiving public health services as if you are in the capital city.

This discussion shows that faculty members recognize that small and remote communities experience important public health challenges and think that it is important for them and students to learn about and engage with these LHDs. Proposed solutions for overcoming these barriers included providing students with stipends or paid internships, identifying free or affordable local housing, allowing students to telecommute, and seeking shared funding for tangible collaborative projects.

Issues related to organizational capacity. Participants in group interviews also reported issues related to organizational capacity. Collaboration was most successful when both LHDs and SPPH employed someone to coordinate their partnership. Collaboration coordinators served as a single point of contact and helped create a systematic process for their collaboration. When asked what differentiates a good collaborating LHD, one faculty member said: "They have that system and a dedicated person to go to, who understands the whole concept of expanding a student's in-class experience. So that's unique and not every health department has that." In fact, all LHDs and SPPH with a high-degree of collaboration employed individuals with responsibility for coordinating their collaboration. Most of the collaboration coordinators tended to have experience in their partner's field, with LHD coordinators often having a formal public health education, and SPPH coordinators often having previous employment in governmental public health.

Faculty also reported a desire to work with high-performing LHDs because they and their students would have access to innovative public health practices, and public health performance is highly correlated with LHD capacity (Turnock et al., 1994). When asked what makes a good LHD collaborator, one faculty member said:

[The LHD is a good collaborator because it] has been on the cutting edge... The planning models and accreditation process... I hate to have to say this out loud, but there are some health departments that are not as forward thinking. So, when I'm thinking of sending a student, I want them to go somewhere where they will be challenged, and they can see how things are done well.

Issues related to goal and process clarity. Group interviews also revealed the importance of goal and process clarity for reaching higher-levels of collaboration. Among the group interviews, only one LHD and SPPH had a formal work plan which described their goals and responsibilities. The LHD and SPPH involved in this group interview also reported the most success. When asked about their work plan, the LHD official from this group said:

We have a work plan that's a specific set of activities and expectations that each of us has – that we'll all contribute. So that takes it from the realm of just sort of aspirational, which is what we were, to something more pragmatic and tangible.

Participants from this group spent considerable time describing their work plan that improved collaboration by creating a long-term vision and short-term goals as well as helped them to build and to sustain momentum by holding all partners accountable. They also said that this helped to promote better resource sharing which allowed the LHD and SPPH to conduct community-wide surveys, to hold community listening sessions and to develop a community health leadership council.

While most participants recognized the value of clarifying shared goals and collaborative processes, many also said it was a challenge to complete. When asked about developing a collaborative strategy, one faculty member said:

We have time to set strategies when we go help! We absolutely do that for individual projects. Big scale projects, it's kind of hard for us to do. It's not like either one of us has a lot of time to sit around and think about 'let's plan these out.' I wish we could! But it's hard enough for us to find the time when we know we have stuff to do.

Although the LHD and SPPH involved in this group interview did not have a formal strategy for their collaboration, they were both involved in their community health assessment and community health improvement plan, which guided much of their collaborative work at the time of the study.

Discussion

Collaboration between LHDs and SPPH has been found to improve a variety of public health functions. By sharing and recombining resources, collaboration may help lead to new and strategic ways to address public health challenges, such as promoting more scientific and evidence-based practice and promoting education and research that is easily translated into practice (Kovach et al., 2018; Lasker, Weiss, & Miller, 2001). The findings from this study show that collaboration between LHDs and SPPH is relatively widespread. Most LHDs were already engaged with SPPH to some degree, and almost a quarter of LHDs were highly engaged. Increasing the number of LHDs and SPPH that are highly engaged may be important to fully realizing the benefits of collaboration and enhancing the overall national public health system.

While collaboration was widespread, opportunities for improvement were evident. Collaboration was much less prevalent between SPPH and less well-resourced LHDs. This is a missed opportunity because these smaller, mostly rural, LHDs make up the majority of LHDs and the communities served by these LHDs experience large health disparities (Meit & Knudson, 2017; NACCHO, 2016). By collaborating with SPPH, these LHDs could bolster their capacity to better engage their community to identify and define community needs and develop local solutions based on community strengths (Meit & Knudson, 2017). While collaboration was infrequent, opportunities for expansion may exist. Participants from SPPH and small and remote LHDs both stated a desire to improve their collaboration and identified it as an ethical issue in need of solutions. The most common barriers were related to commute times and lack of short-term housing. Both issues created challenges for providing student learning activities, which has been identified as a primary reason why SPPH collaborate with LHDs (Kovach et al., 2018). Some participants discussed creative solutions to these problems, such as allowing students to live in rental properties owned by the LHD, conducting internships through telecommuting, or SPPH providing stipends to students for the sole purpose of placing them with a remote LHD. However, it is not clear how likely these solutions could be brought to scale. Funding from the Federal Government or foundations could be used to ensure that these types of practices could be implemented on a broader scale with the caveat that they are intended to help forge a more strategic type of partnership. Furthermore, statewide initiatives to foster collaboration between rural LHDs and SPPH could be established by state health departments, public health associations, or public health training or research institutes.

Organizational capacity was another issue identified. Collaboration has been advanced as a means to bolster organizations' capacity; however, this study suggests that LHDs and SPPH need a sufficient level of existing capacity to collaborate (Huxham, 1996). Collaboration was most successful when both LHDs and SPPH had a point of contact to coordinate their partnership. Again, under-resourced LHDs struggled to assign a person with these duties, placing yet another responsibility on the executive. Creative solutions to build sufficient capacity for collaboration are needed. LHDs could work through existing partnerships, such

as public health preparedness regions or a network of local government and social service agencies. This type of arrangement could lead to regional academic health departments, and shared regional resources could be used to build sufficient capacity as well as provide more opportunities to support collaboration with the SPPH. Furthermore, the findings showed that employing epidemiologists and health educators was associated with higher degrees of collaboration. Regional arrangements to support collaboration with SPPH could also justify hiring people with a formal public health education, something many LHDs serving small and rural communities often lack.

Finally, there is much room for increasingly focused and strategic collaboration. Most LHDs and SPPH lacked shared goals or guidelines for their collaboration. Even among those with a memorandum of understanding or a contract, there appeared to be relatively little shared vision for what they wanted to achieve, long-term, through their partnership. This is important because the LHDs and SPPH with clearly stated goals and with formal plans were more likely to successfully implement new initiatives as well as address critical issues and difficult challenges. Previous research suggests that having clear goals facilitates successful collaboration by ensuring that partners do not diverge from the shared vision, improving the ability to delegate, and helps to monitor progress which reinforces collaborative benefits and promotes sustainability (Huxham, 1996; Vangen & Huxham, 2011).

Barriers to creating shared goals or a collaborative agenda included time and capacity. Another barrier may also be the fact that neither LHDs or SPPH have authority or responsibility to ensure that goals are clarified (Vangen & Huxham, 2011). LHDs and SPPH may also be satisfied with the nature of the partnership and do not want to upset the relationship, even if more ambitious goals could be achieved (Vangen & Huxham, 2011). Leadership training could help to advance these collaborative relationships between LHDs and SPPH. Specific emphasis on vision, strategic planning, and leadership, through influence not authority, may be important areas of focus (Winston & Patterson, 2006; Zaheer, Mcevily, Perrone, & Barney, 1998).

Limitations

There are several limitations. The survey response rate was low making the survey prone to selection bias. However, there were not statistically significant differences between LHD characteristics as measured in our survey and the sampling frame (**Table 1**). In addition, 32% of respondents were missing data which can bias the results if not missing completely at random. We chose to use multiple imputation to deal with this problem because 200 observations would have been missed had we used complete case analysis. However, it should be noted that both complete case analysis and multiple imputation can lead to biased estimates. Also, the survey was cross-sectional and causality cannot be attributed. Furthermore, group interviews may not have identified all possible barriers and facilitators, although input was purposefully solicited from a variety of LHDs and SPPH with different types of collaborative relationships. Finally, there was little discussion about barriers emerging from SPPH in the group interviews. There may have been a power imbalance, and LHD officials may not have felt comfortable raising issues that emerged from SPPH. Future studies should consider whether to include participants from LHDs and SPPH in the same interview.

Conclusion

This study has important policy and practice implications in support of improving LHD and SPPH collaboration. In general, greater overall strategic intent is needed throughout the public health community to bridge the strengths of public health practice and academic institutions. More specifically, greater collaboration between SPPH and LHDs serving small and remote populations is needed, because this could help to address health disparities and improve overall public health performance throughout the United States. To help bolster collaborations in these areas, under resourced LHDs could leverage the resources of existing collaborations to build sufficient capacity to support academic collaboration. Furthermore, state health departments, public health institutes, or public health associations should set a statewide agenda to focus on building partnerships that leverage the complimentary resources of academic institutions and public health practice organizations to advance population health and health equity. As collaboration is built between LHDs and SPPH, they should ensure that a shared vision and strategy for their partnership is developed to make sure that both of their needs are being met, to promote sustainability and to work towards ever more important goals.

Successful collaboration is difficult and requires strong leadership and the ability to influence without authority. To improve collaboration, LHD officials and faculty from SPPH may require improved strategic skills and leadership training to help facilitate a process for leading change. Funding is needed to support these types of initiatives and to expand academic and public health practice partnerships. Looking to the

future, public health scholars and practitioners should work to determine what role online public health degree programs can play to promote collaboration across distances. They can identify and test alternative AHD models, such as the regional AHD. Finally, they may promote shared visioning and strategic planning between more LHDs and SPPH partnerships. This study highlights the need and opportunities for LHDs and SPPH to lead efforts towards improved population health and health equity together.

Competing Interests

The authors have no competing interests to declare.

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How to cite this article: Kovach, K. A., Welter, C. R., Seweryn, S. M., & Torres, G. (2019). Barriers and Facilitators to Collaboration Between Local Health Departments and Schools and Programs of Public Health – A Mixed-Methods Study. *Collaborations: A Journal of Community-Based Research and Practice*, 2(1): 14, 1–11. doi:10.33596/coll.38

Published: 14 May 2019

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