Local Health Department and Hospital Collaboration Around Community Health Needs Assessment to Improve Health Outcomes

Oluwaseyi O. Isehunwa, PhD, MPH, MBChB; Aram Dobalian, PhD, JD, MPH; SangNam Ahn, PhD, MPSA; George Relyea, MA, MS; Erik L. Carlton, DrPH, MS

The objectives of this study were to examine the relationships between local health department (LHD) and nonprofit hospital collaboration around community health needs assessment (CHNA), levels of collaboration, and selected community health outcomes. Data were obtained from multiple sources including the National Profile of Local Health Departments. Results showed that high levels of LHD-hospital collaboration around CHNA were associated with lower self-reported poor or fair health, lower years of potential life lost per 100 000 population, and lower premature age-adjusted mortality per 100 000 population. More research is needed to examine the influence of collaboration around CHNA on community health.

Key words: collaboration, community health, local health department, nonprofit hospitals

SINCE THE PASSAGE of the Patient Protection and Affordable Care Act of 2010, nonprofit hospitals in the United States (US) have been required to conduct a regular community health needs assessment (CHNA) to maintain their federal tax-exempt status.[1,2] At the same time, nonprofit hospitals are mandated to seek input from community members, including at a minimum a state, regional, or local health department (LHD).[2] Because of the strategic role and expertise of public health departments, their collaboration with nonprofit hospitals on their CHNAs has the potential to transform and improve the health of populations including those living in impoverished communities.[3,4]

Author Affiliations: *Harvard/MGH Center on Genomics, Vulnerable Populations, and Health Disparities, Department of Medicine, Massachusetts General Hospital, Boston, Massachusetts Boston, Massachusetts (Dr Isehunwa); Division of Health Systems Management and Policy, University of Memphis School of Public Health, Memphis (Drs Dobalian and Ahn); Division of Epidemiology, Biostatistics, and Environmental Health, University of Memphis School of Public Health, Memphis (Mr Relyea); and Department of Health Policy, Management & Leadership, West Virginia University School of Public Health, Morgantown (Dr Carlton).*

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Correspondence: *Oluwaseyi O. Isehunwa, PhD, MPH, MBChB, Harvard/MGH Center on Genomics, Vulnerable Populations, and Health Disparities, 50 Staniford St, Ste 802, Boston, MA 02114 (oisehunwa@gmail.com).*

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Studies have shown an increasing number of LHDs collaborating with nonprofit hospitals around their CHNA.[5,6] Recently, Carlton and Singh[6] found that LHDs that collaborated with nonprofit hospitals around their CHNAs were more likely to engage in the hospitals' implementation activities. In addition, LHDs' engagement in hospitals' implementation activities was associated with more hospital investment in community health initiatives.[6] These findings suggest that the potential for LHD-hospital collaboration, beginning with CHNAs, could have a noticeable effect on population health.

As attention to completing CHNAs grows, examining the relationship between LHD-hospital collaboration around CHNAs and community health outcomes becomes even more important.[6-8] The US still fares poorly on key population health metrics such as life expectancy and infant mortality rates,[9] driven primarily by social, economic, and environmental conditions, and less by medical care.[10-12] The lack of collaboration or coordination between public health and health care systems has further contributed to the inability to achieve enormous and sustainable gains in improving population health.[7-9,13,14] It has been postulated that many US communities would benefit from a synergistic relationship between LHDs and hospitals particularly given their unique roles in addressing complex health problems and with the current policy landscape.[4,5] Many LHDs have experienced a decrease in their budget in recent years, and their collaboration with nonprofit hospitals could increase funds available for population health initiatives.[15] More specifically, a high level of collaboration between LHDs and hospitals could facilitate a better

focus on the social determinants of health and address many of the underlying determinants of poor health.[16]

Therefore, in this study, we examine LHD-hospital collaboration and the levels of collaboration around CHNA in relation to community health outcomes. To the best of our knowledge, this study is the first national study to examine the relationship between LHD-hospital collaboration around CHNA and selected community health outcomes. Our study is guided by Donabedian's structure-process-outcome model.[17] While primarily used in health services research for evaluating quality in health care settings,[18,19] Donabedian's model has also provided a framework for assessing the performance of LHDs and the relationship between LHDs' practice and health outcomes.[20-23] For instance, according to Donabedian's model, LHDs structure (eg, LHDs' characteristics) would support processes (eg, LHD-hospital collaboration), and such processes could subsequently influence health outcomes (eg, health status). Based on this conceptual framework, we hypothesized that LHDs' collaboration with nonprofit hospitals around CHNA would be associated with better community health outcomes. Furthermore, we hypothesized that compared with lower levels of LHD-hospital collaboration, higher levels of LHD-hospital collaboration around CHNA would be associated with better community health outcomes.

METHODS

Data sources

We obtained data from multiple data sets: 2016 National Profile of Local Health Departments (Profile Study), 2018 County Health Rankings data, and the 2016-2017 Area Health Resources Files all merged using the 5-digit Federal Information Processing Standards county code. The Profile survey is a national survey conducted by the National Association of County and City Health Officials (NACCHO) that examines LHDs' infrastructure and practice.[24] The NACCHO Profile survey consists of a core questionnaire sent to all LHDs in the US and 2 or 3 separate modules sent to a randomly selected sample stratified by the number of people (population) LHDs serve.[24] Since 1990, the NACCHO has conducted 8 profile studies with a response rate ranging from 72% to 88%.[24] The County Health Rankings & Roadmaps program collects data on health outcomes in almost all counties in the US.[25] The Area Health Resources Files comprises county, state, and national-level data.[26] The Area Health Resources Files data contain information in 8 main areas including socioeconomic and population characteristics.[26]

Sample population

Our study sample included LHDs with at least 1 nonprofit hospital within the LHD jurisdiction. The 2016 Profile Study was sent out to all LHDs in 48 states and District of Columbia, except for Hawaii and Rhode Island, which do not have LHDs, with a response rate of 78% (1930 LHDs out of 2533 LHDs responded to the survey).[27] Of the 1930 LHDs that responded to the survey, 1443 LHDs were eligible having at least 1 nonprofit hospital within their jurisdiction. However, only 296 LHDs were randomly selected and asked to report on 8 collaborative activities with nonprofit hospitals around CHNAs. Thus, we examined the collaboration between LHDs and nonprofit hospitals around CHNA using data from 1443 LHDs but examined their levels of collaboration around CHNA using data provided by 296 random LHDs (see Supplemental Digital Content Appendix A1, available at: http://links.lww.com/FCH/A28).

MEASURES

Dependent variables

We examined 5 outcomes that are widely used measures of population health.[28,29] They are as follows:

1. Self-reported fair or poor health measured as a continuous variable and defined as the percentage of adults within a county who report fair or poor health from the question "In general, would you say that your health is excellent, very good, good, fair, or poor?"
2. Poor physical health days measured as a continuous variable, and defined as the "average number of days a county's adult respondent reports that physical health was not good" from the question "Thinking about your physical health, which includes physical illness, and injury, for how many days during the past 30 days was your physical health not good?"
3. Poor mental health days measured as a continuous variable and defined as "the average number of days a county's adult respondent reports that mental health was not good" from the question "Thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"
4. Age-adjusted premature death measured as a continuous variable and defined as "the years of potential life lost before age 75 per 100 000 US population age-adjusted."
5. Age-adjusted premature mortality rates measured as a continuous variable and defined as

"the number of deaths among residents under the age of 75 per 100 000 population."

Independent variables

The main independent variables of interests were as follows: (1) LHD-hospital collaboration around CHNA assessed on the basis of the following question: "Which of the following describes the extent of your LHD's engagement with nonprofit hospitals on the most recent community needs assessment (CHNA) developed by the hospital?" This question was asked to LHDs having at least 1 nonprofit hospital serving residents of their jurisdiction (core questionnaire of the 2016 Profile Study). Local health department-hospital collaboration was categorized into 3 groups based on the following response categories: (*a*) my LHD collaborated or is currently collaborating with 1 or more nonprofit hospitals on its CHNA; (*b*) my LHD is currently discussing with 1 or more nonprofit hospitals potential future collaboration on a CHNA; and (*c*) my LHD has not engaged in discussion or collaboration with a nonprofit hospital on CHNA. Local health department administrators were instructed to select only one of the applicable categories. (2) Levels of LHD-hospital collaboration around CHNA assessed on the basis of the following question: "Which of the following describe how your LHD is collaborating with a nonprofit hospital on its CHNA?" This question was asked to a statistical random sample of LHDs (module questionnaire of the 2016 Profile Study sent to a subset of LHDs) that selected the response "LHD collaborated or is currently collaborating with one or more nonprofit hospitals on its CHNA" to the previous question on LHD-hospital collaboration around CHNA. Local health department administrators were instructed to select all that applies to the following 8 collaborative activities: (*a*) LHD and nonprofit hospital jointly conducted an assessment that serves as both the LHD's CHA and the hospital's CHNA; (*b*) LHD coordinated joint efforts by multiple hospitals to pool resources and information for a CHNA; (*c*) LHD assisted in engaging community organizations and residents in CHNA process; (*d*) LHD served as a neutral facilitator to ensure a collaborative CHNA process; (*e*) LHD provided technical assistance to hospital on how to design and implement a CHNA; (*f*) LHD shared local data resources on health status and/or social determinants of health; (*g*) LHD provided technical assistance on data collection, analysis, synthesis, or interpretation; and (*h*) LHD provided input on strategies to improve community health (see Supplemental Digital Content Appendix A2, available at: http://links.lww.com/FCH/A28). Local health departments that gave affirmative responses in each of the collaborative activities with nonprofit hospitals on their CHNA were given a score of 1 for each activity. Thus, the minimum and maximum scores that could be obtained were 0 and 8, respectively. Levels of collaboration were categorized into 3 groups: those below 50 percentile (low), which corresponded to scores between 0 and 2; those within 50 to 75 percentile (medium), which corresponded to scores between 3 and 5; and those above 75 percentile (high), which corresponded to scores between 6 and 8.

Control variables

We adjusted for several potential confounders including LHD location (metro, nonmetro [urban], rural), type of jurisdiction served (city, county, city-county, multicounty), LHD with a board of health (yes, no), LHD per capita expenditure (per capita expenditure below the median, per capita expenditure above the median, unknown), type of governance (local, state, shared), and full-time equivalents of LHD staff per 10 000 LHD population (first quartile, second quartile, third quartile, fourth quartile, unknown). Guided by other previous literatures,[30,31] community-level/environmental factors were also controlled for including the number of primary care physicians per 1000 population, uninsured rate of people younger than 65 years, total number of hospitals, unemployment rate, median household income, percentage of the population not proficient in English, percentage of adults with obesity, percentage of adults smoking, percentage of females, percentage of non-Hispanic Blacks, percentage of Hispanics, and percentage of Asians.

Statistical analyses

The unit of analysis was an LHD. Bivariate analyses comparing collaboration and levels of collaboration around CHNA by LHD structural/organizational factors were conducted using the χ^2 test. We utilized 10 linear mixed-regression models to examine the associations between LHD-hospital collaboration around CHNA, levels of LHD-hospital collaboration around CHNA, and the 5 outcomes of interest. We modeled the natural logarithm of premature mortality rate and year of potential life lost rate in our regression analyses because the data did not follow a normal distribution. All regression models controlled for LHDs' structural factors, community factors, and clustering at the state level. Statistical analysis was conducted using SAS version 9.4.[32]

RESULTS

Table 1 presents LHDs' structural characteristics by collaboration. Of the 1443 LHDs across the

TABLE 1. Characteristics of LHDs Included in the Study With at Least 1 Nonprofit Hospital Serving Within the LHD Jurisdiction by Collaboration (n = 1443)[a]

	Collaborated/ Currently Collaborating, N (Weighted %)	Discussing Collaboration, N (Weighted %)	Not Currently Discussing or Collaborating, N (Weighted %)	*P*[b]
LHD total	1106 (80.1)	107 (7.9)	153 (11.9)	<.0001
LHD by location				<.0001
Metro	585 (50.6)	55 (49.3)	77 (48.6)	
Urban (nonmetro)	403 (38.1)	33 (32.3)	41 (26.9)	
Rural	112 (11.3)	18 (18.5)	35 (24.2)	
LHD per capita expenditure				.0007
Below median	350 (31.1)	39 (35.1)	40 (25.3)	
Above median	459 (41.8)	48 (46.5)	50 (33.3)	
Unknown	297 (27.1)	20 (18.4)	63 (41.4)	
LHD governance				<.0001
Local	873 (79.5)	85 (80.5)	100 (66.3)	
State	126 (11.2)	9 (7.5)	43 (27.3)	
Shared	107 (9.4)	13 (12.0)	10 (6.5)	
LHDs by jurisdiction				.0011
City	115 (10.6)	15 (14.4)	29 (19.6)	
City-county or multicity	54 (4.7)	1 (0.9)	3 (1.7)	
County	822 (74.8)	79 (74.4)	114 (74.9)	
Multicounty	115 (9.8)	12 (10.3)	7 (3.8)	
LHD local board of health				.003
Yes	800 (74.1)	65 (64.2)	94 (63.0)	
No	288 (25.9)	39 (35.8)	57 (37.0)	
FTE on LHD staff per 10 000 population				.01
First quartile	157 (13.7)	18 (15.8)	36 (22.7)	
Second quartile	252 (22.4)	21 (19.2)	19 (12.1)	
Third quartile	243 (21.7)	20 (18.0)	42 (26.8)	
Fourth quartile	359 (34.1)	41 (40.3)	48 (32.9)	
Unknown	95 (8.2)	7 (6.7)	8 (5.5)	

Abbreviations: FTE, full-time employee; LHD, local health department.
[a]From National Profile of Local Health Departments.
[b]*P* value based on χ^2 test.

US with at least one nonprofit hospital serving within the LHD jurisdiction, 1106 (80.1%) collaborated/currently collaborating, 107 (7.9%) were discussing collaboration, and 153 (11.9%) were not currently discussing or collaborating with nonprofit hospitals on their CHNA. Local health departments that had collaborated or were currently collaborating with nonprofit hospitals around CHNA were more likely to be in metro areas, be locally governed, serve 1 county jurisdiction, have 1 or more local boards of health, or have greater number of full-time staff per 10 000 population.

Table 2 presents LHDs' structural characteristics by their levels of collaboration with nonprofit hospitals around CHNA. Of the random statistical sample of 296 LHDs surveyed to assess their engagement in collaborative activities with nonprofit hospitals around CHNA, 131 (46.2%), 108 (36.0%), and 57 (17.8%) had low, medium, and high levels of collaboration, respectively, with nonprofit hospitals around their CHNA. Local health

TABLE 2. Characteristics of LHDs With at Least 1 Nonprofit Hospital Serving Within the LHD Jurisdiction by Levels of Collaboration (n = 296)[a]

	Low Collaboration, N (Weighted %)	Medium Collaboration, N (Weighted %)	High Collaboration, N (Weighted %)	*P*[b]
LHD total	131 (46.2)	108 (36.0)	57 (17.8)	<.0001
LHD by location				.9590
Metro	83 (55.1)	73 (57.4)	36 (50.6)	
Urban (nonmetro)	38 (35.4)	28 (32.4)	16 (37.6)	
Rural	9 (9.5)	7 (10.1)	5 (11.8)	
LHD per capita expenditure				.8630
Below median	41 (29.0)	37 (33.0)	15 (25.2)	
Above median	54 (42.4)	46 (42.5)	26 (44.1)	
Unknown	36 (28.6)	25 (24.5)	16 (30.7)	
LHD governance				.1469
Local	93 (72.3)	84 (80.1)	48 (87.5)	
State	16 (12.1)	13 (11.4)	3 (5.0)	
Shared	22 (15.5)	11 (8.5)	6 (7.6)	
LHDs by jurisdiction				.2975
City	17 (12.7)	13 (13.0)	1 (2.9)	
City-county or multicity	8 (6.6)	7 (6.8)	2 (1.7)	
County	90 (70.0)	78 (73.0)	48 (83.7)	
Multicounty	16 (10.7)	10 (7.3)	6 (11.6)	
LHD local board of health				.0723
Yes	83 (64.1)	73 (71.2)	44 (81.7)	
No	47 (35.9)	33 (28.8)	12 (18.3)	
FTE on LHD staff per 10 000 population				.5447
First quartile	18 (13.6)	11 (9.9)	7 (9.3)	
Second quartile	25 (17.3)	27 (23.5)	14 (25.4)	
Third quartile	27 (18.7)	31 (27.2)	13 (23.1)	
Fourth quartile	45 (39.7)	28 (31.6)	19 (36.7)	
Unknown	16 (10.8)	11 (7.8)	4 (5.5)	

Abbreviations: FTE, full-time employee; LHD, local health department.
[a]From National Profile of Local Health Departments.
[b]*P* value based on χ^2 test.

departments involved in high collaboration with nonprofit hospitals around CHNA had fairly similar structural characteristics, with LHDs involved in medium or low collaboration with nonprofit hospitals around CHNA.

Table 3 presents results of linear mixed-regression analyses. After adjusting for potential confounders, communities with a high level of collaboration between LHDs and nonprofit hospitals around CHNA had significantly lower percentage of adults with self-reported poor or fair health ($\beta = -.68$, SE = 0.21, $P < .01$), age-adjusted years of potential life lost rate per 100 000 population ($\beta = -.07$, SE = 0.03, $P < .05$), and premature age-adjusted mortality rate per 100 000 population ($\beta = -.06$, SE = 0.22, $P < .05$) compared with communities where there was a low level of collaboration between LHDs and hospitals around CHNA. No significant differences were observed in communities with medium levels of collaboration between LHDs and nonprofit hospitals around CHNA and the 5 community health outcomes measured compared with communities with low levels of LHD-hospital collaboration around CHNA. Also, no significant differences were found between LHDs that collaborated or those discussing collaboration compared

TABLE 3. Linear Mixed-Regression Models: Associations Between Levels of LHD-Hospital Collaboration Around Community Health Needs Assessment and 5 Community Health Outcomes[a]

	% Self-Reported Poor/Fair Health β (SE)	Physical Healthy Days β (SE)	Mental Health Days β (SE)	Years of Potential Life Lost β (SE)	Premature Mortality Rate β (SE)
Levels of LHD-hospital collaboration					
Low collaboration (reference)	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference
Medium collaboration	– .20 (0.16)	– .04 (0.03)	– .04 (0.02)	– .01(0.02)	– .001 (0.02)
High collaboration	**– .68 (0.21)***	– .05 (0.04)	– .04 (0.03)	**– .07 (0.03)****	**– .06 (0.22)****
LHDs by location					
% Rural (reference)	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference
% Urban (nonmetro)	.12 (0.29)	.07 (0.05)	.02 (0.05)	.05 (0.04)	.05 (0.03)
% Metro	.40 (0.32)	**.15 (0.05)***	.07 (0.05)	.05 (0.05)	**.07 (0.03)****
LHD per capita expenditure					
LHD per capita expenditure < median (reference)	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference
LHD per capita expenditure > median	.24 (0.22)	.03 (0.04)	.04 (0.03)	– .003 (0.03)	– .003 (0.02)
LHD per capita expenditure unknown	.15 (0.22)	.03 (0.04)	.01 (0.03)	.03 (0.03)	.02 (0.02)
Governance					
Local (reference)	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference
State	.15 (0.47)	.03 (0.10)	.14 (0.10)	.02 (0.05)	.0002 (.04)
Shared	.03 (0.63)	– .02 (0.18)	– .03 (0.19)	– .02 (0.05)	– .02 (.04)
LHDs by jurisdiction					
County (reference)	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference
City	– .11 (0.35)	– .08 (0.06)	.02 (0.06)	.02 (0.05)	.03 (0.04)
City-county or multicity	– .15 (0.47)	– .09 (0.08)	.06 (0.08)	.01 (0.06)	.01 (0.05)
Multicounty	– .54 (0.31)	– .08 (0.06)	– .07 (0.05)	– .001 (0.04)	– .004 (0.03)

(*continues*)

TABLE 3. Linear Mixed-Regression Models: Associations Between Levels of LHD-Hospital Collaboration Around Community Health Needs Assessment and 5 Community Health Outcomes[a] (*Continued*)

	% Self-Reported Poor/Fair Health β (SE)	Physical Healthy Days β (SE)	Mental Health Days β (SE)	Years of Potential Life Lost β (SE)	Premature Mortality Rate β (SE)
Has a local board of health (yes) reference = No	.20 (0.19)	.01 (0.03)	.02 (0.03)	.03 (0.03)	.004 (0.02)
FTE on LHD staff per 1000					
First quartile (reference)	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference
Fourth quartile	.25 (0.31)	.07 (0.05)	.005 (0.05)	− .04 (0.04)	− .01 (0.03)
Number of PCP per 1000	.06 (0.29)	.02 (0.05)	.03 (0.05)	− .06 (0.04)	**− .08 (0.03)****
Uninsured rate of people <65 y	**15.31 (3.69)*****	**2.38 (0.70)*****	**1.52 (0.66)****	**1.30 (0.44)***	**.70 (0.33)****
Total number of hospitals	− .01 (0.01)	− .002 (0.002)	.002 (0.002)	**.004 (0.002)****	**.004 (0.001)****
Unemployment rate	**21.14 (5.74)*****	1.50 (0.99)	1.77 (0.92)	**2.32 (0.79)***	**2.32 (0.60)*****
Median household income					
First quartile (reference)	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference	0.00 Reference
Fourth quartile	**− 2.43 (0.38)*****	**− .37 (0.07)*****	**− .24 (0.06)*****	**− .11 (0.05)****	**− .11 (0.04)***
Percentage of adults smoking	**62.87 (4.64)*****	**10.41 (0.83)*****	**9.19 (0.77)*****	**3.72 (0.60)*****	**3.67 (0.45)*****
Percentage of adult obesity	**9.74 (2.66)*****	.70 (0.46)	− .09 (0.43)	.20 (0.36)	**.63 (0.27)****
Percentage not proficient in English	1.76 (6.98)	− 1.80 (1.24)	**− 3.19 (1.16)***	**− 3.78 (0.94)*****	**− 3.49 (0.71)*****
Percentage of females	− 5.18 (3.42)	.06 (0.58)	**2.73 (0.54)*****	.52 (0.49)	**.86 (0.37)****
Percentage of African Americans	**4.84 (1.03)*****	− .01 (0.18)	− .33 (0.17)	**.30 (0.14)****	**.23 (0.11)****
Percentage of Hispanics	**10.62 (1.80)*****	**.76 (0.32)****	.46 (0.30)	.27 (0.23)	.31 (0.18)
Percentage of Asians	6.09 (3.33)	.19 (0.56)	.25 (0.52)	− .41 (0.48)	− .05 (0.36)

Abbreviations: FTE, full-time employee; LHD, local health department; PCP, primary care physicians.
[a]From 2016 Profile Study of the National Association of County and City Health Officials; Area Health Resources File; 2018 County Health Ranking.
*$P < .01$; **$P < .05$; ***$P < .001$; adjusted for clustering at the state level.

with those not engaged in discussion or collaboration in any of the 5 community health outcomes (results not presented).

DISCUSSION

In this study, approximately 80% of LHDs collaborated or were collaborating with nonprofit hospitals around their CHNA in 2016. This represents close to a 25% increase since 2013 when only about 56% of LHDs collaborated with nonprofit hospitals around their CHNA.[5] Despite this increase, only about 18% of LHDs collaborated at high levels with nonprofit hospitals on their CHNA, while the majority of LHDs were engaged either at a low level (46%) or a medium level (36%). In line with previous findings by Singh and Carlton,[5] LHDs' collaboration with nonprofit hospitals around CHNAs appeared to be influenced by LHD structural characteristics. However, the percentage of LHDs involved in high levels of collaboration with nonprofit hospitals around CHNA did not appear to vary by LHDs' structural characteristics. It is possible that other organizational or contextual factors such as leadership support, trust, mission, and/or hospital perspectives could be important considerations in facilitating higher levels of collaboration around CHNA.[4,33]

Contrary to our hypotheses, we found no significant differences in all 5 outcomes assessed by collaboration. However, we found significant differences in three community health outcomes by levels of collaboration. More specifically, compared with communities with low levels of LHD-hospital collaboration around CHNA, communities with high levels of LHD-hospital collaboration around CHNA had lower rates of fair or poor health, reduced age-adjusted years of potential life lost rates, and reduced premature age-adjusted mortality rates.

Although, to our knowledge, no prior study has specifically investigated the impact of collaboration between LHDs and nonprofit hospitals around CHNA on outcomes, existing studies on other forms of collaboration have suggested that collaboration could influence health outcomes.[30,34-36] For instance, Mays and colleagues[34] using a longitudinal study design found a significant reduction in deaths from preventable diseases including cardiovascular disease and diabetes between 1998 and 2014 in communities where multisectoral networks including public health agencies and hospitals were engaged in population health activities. A recent qualitative study using a positive deviance approach also found that higher performing communities were engaged in diverse forms of collaboration including collaboration between LHDs and nonprofit hospitals around CHNA.[35] A previous study also found that LHDs' provision of mental health preventive care services and health promotion activities in Maryland was associated with a decrease in preventable hospitalizations, pointing to the fact that better collaborative interventions or strategies with hospitals could improve community mental health.[30]

Possible mechanisms through which collaboration around CHNA between LHDs and nonprofit hospitals could affect community-level health care use and health outcomes can only be speculative. Collaboration around CHNA provides an opportunity to identify community needs, target high-risk or high-need populations, create more meaningful population health-related initiatives, and promote sharing of data and other resources.[16,37-39] Bias et al[38] comparing 3 completed health needs assessment by stakeholders and the general population in 3 communities in West Virginia found that community input in the completion of CHNA provided additional information on the needs of the community, otherwise overlooked, and influenced the appropriate implementation strategies or plans. Similarly, Powell and colleagues[40] in their study found that mental health was one of the main health needs identified following the completion of CHNAs by nonprofit hospitals in Philadelphia. By conducting a regular CHNA, nonprofit hospitals are better positioned to gain insights into many of the underlying causes of health. Gaining such information could provide unique opportunities to address specific priorities within the community critical to improving population health[38] With LHDs' involvement in nonprofit hospitals' CHNA, there is the possibility for both LHDs and nonprofit hospitals to find common areas to align resources, which may subsequently lead to efficient and effective delivery of care, and overall improved population health.[41]

This study has several limitations, and findings should be interpreted with caution. First, the cross-sectional design of our study limited our ability to establish a temporal relationship and to infer causality. Second, data from this study were limited to the LHDs' perspectives. It is possible that hospital' perspectives on collaboration or levels of collaboration around CHNA will differ from LHDs' perspectives. Third, although this study controlled for a wide range of potential confounding variables, other variables such as leadership support, and hospital characteristics such as the size of the hospital, hospital operating margin, and hospital systems affiliations, were not included in this study. Fourth, the size of our LHD sample to assess levels of collaboration with nonprofit hospitals around CHNA was relatively small and future studies with large sample sizes may be warranted.

Despite the limitations, the findings from this study suggest some potential policy implications. The policy environment facilitating collaboration between LHDs and nonprofit hospitals around CHNA may potentially improve population health. Encouraging a high level of collaboration around CHNA between LHDs and nonprofit hospitals including joint implementation strategies, sharing of data, and other resources could have a positive impact on many US communities.

Our study findings also have possible implications for practice. Both hospital and public health leaders may want to consider scaling up their levels of collaboration with each other. Hospital leaders not currently involving LHDs in their CHNA or engaging LHDs minimally may consider making greater efforts to use LHDS more actively. In addition, LHDs' leaders may also want to consider becoming more engaged in hospitals' CHNA process.

In conclusion, our study suggests that high levels of collaboration between LHDs and nonprofit hospitals around CHNA may lead to better health outcomes. We observed an association between high levels of collaboration between LHDs and nonprofit hospitals around CHNA and 3 of 5 community health outcomes. Further research is needed to examine the influence of LHD-hospital collaboration around CHNA using longitudinal data and with patient or individual-level analyses. In addition, future research should explore specific collaborative activities that predict better health outcomes.

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