Fall 2018

Characteristics Associated with Local Health Departments' Completion of Community Health Assessment, Community Health Improvement Plan, and Strategic Planning

Abraham Deng Ater

CHARACTERISTICS ASSOCIATED WITH LOCAL HEALTH DEPARTMENTS' COMPLETION OF COMMUNITY HEALTH ASSESSMENT, COMMUNITY HEALTH IMPROVEMENT PLAN, AND STRATEGIC PLANNING

by

ABRAHAM DENG ATER

(Under the Direction of Gulzar H. Shah)

ABSTRACT

Local health departments engage in community health assessment, community health improvement plan, strategic planning to systematically monitor health, identify risk factors, and to set strategic priorities to improve population health outcomes. Successful completion of these three processes within the last five years is also paramount as they are required for accreditation by the Public Health Accreditation Board. The main purpose of this study was to analyze characteristics of local health departments that are associated with completion of community health assessment, community health improvement plan, strategic planning, and accreditation processes. This cross-sectional study drew data from the 2016 NACCHO profile of local health departments. Results revealed that health educator, female top executive, full-time work status, having higher number of full-time equivalents, higher per capita expenditure, and completion of all three processes were strongly associated with completion of these four processes. The findings suggest that public health officials should be more strategic thinkers in their planning processes and decision makings in areas of policy, environmental, and system changes.

INDEX WORDS: Accreditation, Community health assessment, Community health improvement plan, Local health departments, Strategic planning.

CHARACTERISTICS ASSOCIATED WITH LOCAL HEALTH DEPARTMENTS' COMPLETION OF COMMUNITY HEALTH ASSESSMENT, COMMUNITY HEALTH IMPROVEMENT PLAN, AND STRATEGIC PLANNING

by

ABRAHAM DENG ATER

B.S., University of Arizona, 2006

M.P.H., University of Arizona, 2010

A Dissertation Submitted to the Graduate Faculty of Georgia Southern University

in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PUBLIC HEALTH

STATESBORO, GEORGIA

CHARACTERISTICS ASSOCIATED WITH LOCAL HEALTH DEPARTMENTS' COMPLETION OF COMMUNITY HEALTH ASSESSMENT, COMMUNITY HEALTH IMPROVEMENT PLAN, AND STRATEGIC PLANNING

by

ABRAHAM DENG ATER

Major Professor:	Gulzar H. Shah
Committee:	William A. Mase
	Jingjing Yin

Electronic Version Approved:

December 2018

DEDICATION

To Uncle Monykuany Deng Ater, the then village chief who sent me to unknown place to search for an education. You should have been proud of what you had asked me for to accomplish and bring home. To my fellow Lost Boys of Sudan who had lost their lives and dreams during our pursuit for education.

ACKNOWLEDGMENTS

I would like to express the deepest appreciation to my committee chair Professor Gulzar Shah, who has the talent and expertise on the topic. He continually and convincingly showed an aptitude spirit on research and mentorship, and an enthusiasm with regard to teaching. Without his guidance and persistent assistant this dissertation would not have been completed on time. I would also like to thank my committee members, Drs. William Mase and Jingjing Yin, who had provided me with friendly guidance, thought-provoking suggestions, and the technical expertise in comparative literature and modern technology.

TABLE OF CONTENTS

Page

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

DEFINITION OF KEY TERMS

The definition of common terms used in this study is established here to facilitate better understanding of the research, as shown below:

Association of State and Territorial Health Officials (ASTHO). National non-profit organization representing public health agencies in the United States, the U.S. Territories, and the District of Columbia.

Community Health Assessment (CHA). Regular and systematic collection, analysis, and making information available on the health of a community, including statistics on health status, community health needs, epidemiologic and other studies of health problems, and an analysis of community strengths and resources, (NACCHO, 2016).

Community Health Improvement Plan (CHIP). This is a long-term, systematic effort to address health problems, (NACCHO, 2016).

Community Health Needs Assessment (CHNA). This is a requirement from ACA that non-profit hospitals must conduct a health needs assessment at least once every three years purposely to maintain their tax-exempt statuses, (NACCHO, 2016).

Epidemiologist/Statistician. Conducts on-going surveillance, field investigations, analytic studies and evaluation of disease occurrence and disease potential to make recommendations on appropriate interventions. May also collect data and report vital statistics. (e.g. epidemiologist, biostatistician, public health scientist or researcher), (NACCHO, 2016).

Health Educator. Develops and implements educational programs and strategies to support and modify health-related behaviors of individuals and communities and promotes the effective use

of health programs and services. (e.g., health educator, health education coordinator/specialist), (NACCHO, 2016).

LHD Top Executive. The highest-ranking employee with administrative and managerial authority at the level of LHD, (NACCHO, 2016).

Local Health Department (LHD). An administrative or service unit of local or state government, concerned with health, and carrying some responsibility for the health of a jurisdiction smaller than the state, (NACCHO, 2016).

National Association of County and City Health Officials (NACCHO). National non-profit membership association representing the nation's local health departments.

Patient Protection and Affordable Care Act (ACA). Contentious legislation signed into law in 2010 by President Barack Obama to expands coverage to an additional 30 million people by increasing Medicaid eligibility and providing federal subsidies to those enrolled in state and federal health insurance exchanges, (Feldstein, 2015).

Public Health Accreditation Board (PHAB). A non-profit organization charged with administering the national public health department accreditation program, (PHAB, 2013).

Shared Governance System. Governance structure, which is under both state and local authorities.

State Governance System. All health departments are units of state government.

Strategic Planning (SP). A process for defining and determining an organization's roles, priorities, and direction over three to five years, (PHAB, 2013).

CHAPTER 1

INTRODUCTION

Background and Significance

Engagements of local health departments (LHDs) in community health assessment (CHA), community health improvement plan (CHIP), strategic planning (SP), and accreditation processes are closely examined in this study. Through the National Association of County and City Health Officials (NACCHO), LHDs participate in CHA, CHIP, and SP to systematically monitor health, investigate disease outbreak, identify risk factors contributing to poorer health outcomes, and to set strategic priorities that would lead to health outcomes improvement in the long-term (PHAB, 2013). Successful completion of these three processes within the past five years by LHDs is also paramount as they are required by the Public Health Accreditation Board (PHAB) for accreditation and other departmental mandates and federal regulations, (PHAB, 2013).

The NACCHO profile study (2016) defines a local health department as an administrative or service unit of local or state government, concerned with health, and carrying some responsibility for the health of a jurisdiction smaller than the state. According to the Committee for the Study of the Future of Public Health view (IOM, 1988), LHDs have the responsibility and vital role to play for improving the health of the local community they serve. They recommended that "No citizen from any community, no matter how small or remote, should be without identifiable and realistic access to the benefits of public health protection, which is possible only through a local component of the public health delivery system" (IOM, 1988). Some of these responsibilities may include clinical programs and services like childhood and adult

immunizations, screening for contagious diseases, e.g. tuberculosis (TB), Human Immunodeficiency Virus or Acquired Immune Deficiency Syndrome (HIV/AIDS), etc., and providing treatment for some communicable diseases and chronic conditions. The existent of LHD in a community also helps state and federal authorities promptly identify and track reported health threats, such as anthrax, Lyme disease, etc., (MMWR, 1997). Through LHDs, authorities would allocate resources base on the health need of a local community. They must work to give voice to the local population and act as a liaison between the community and the outside jurisdictions, (IOM, 2002).

Community health assessment just one of several topic areas in the NACCHO's profile study of LHDs infrastructure and practice. Local health departments work with other community organizations within the jurisdiction served by a health department to improve disease surveillance in the community. Additionally, health departments use results to identify and investigate health problems and strengthen available resources. As a cross-cutting element of the public health infrastructure, community health assessments, which are developed at the Tribal, state, and local levels and cover the jurisdiction served by the public health departments are integral to community health improvement and strategic planning processes, (PHAB, 2013).

Community health improvement plan, defined by the profile study as a long-term, systematic effort to address health problems, is used by health and other government education and human service agencies, in collaboration with community partners, to set priorities and coordinate and target resources. It can be developed by LHD using the findings from CHA to improve public health programs and services that are integral to population health, (PHAB, 2013).

Local health departments can align and link this plan to their state and national health improvement plans for wider collaboration and health system strengthening across the state and nation. For instance, the 2012 Alachua County Community Health Improvement Plan aligns one of their goals to the state and national goal. Their goal is to "Prevent and control infectious disease", which is related to CDC and *Healthy People 2020 Objectives*, to "Reduce the rate of HIV transmission among adolescents and adults" by 2020, (CDC, n.d). Measurable improvement of these programs and services is likely achieved through the comprehensive development of a strategic planning.

Strategic planning is critically important, especially in this dynamic and ever-changing environment, to the public health leaders to plan and act strategically. Bryson (2011) defines it as a "deliberative, disciplined approach to producing fundamental decisions and actions that shape and guide what an organization (or other entity) is, what it does, and why." Organizations which systematically develop, and complete strategic planning could easily align available resources with the need of their communities. What they are is what they promote and what they are ready to provide to their residents when a need arises. One of the reasons of "why" they do it is to set strategic priorities, which "are the pathways by which we plan to achieve targeted improvements in public health outcomes," (ADHS, 2012). The Public Health Accreditation Board recommends that it has to be "understood by staff and implemented by the health department", (PHAB, 2013).

Community health assessment, community health improvement plan, and strategic plan are requirements for entering the public health accreditation process by a health department. The PHAB recommends that health departments that are preparing to apply for accreditation must begin work on these requirements, including completion of a CHA followed by CHIP, and designing agency-wide strategic planning for the department long-and-short range goals, (PHAB,

n.d.). Local health departments should also partner with local hospitals and other healthcare industries within their local jurisdictions to link population to needed medical services. These would include non-profit hospitals, which are required by the Patient Protection and Affordable Care Act (PPACA) to conduct Community Health Needs Assessment (CHNA) at least once every three years purposely to maintain their tax-exempt statuses. The CHNA, which have healthcare focus must take into account input from persons who represent the broad interests of the community served by the hospital, including those with special knowledge of or expertise in public health, (NACCHO, 2016). They must also adopt an implementation strategy to meet the community health needs, which could be done with input from the community stakeholders with expertise in public health, (Federal Register, 2014).

The main purpose for conducting these assessments and planning is to identify areas of community strengths and weaknesses so that policy, environmental, and systems changes can be adopted and implemented. The policy change may be related to laws, regulations, rules, protocols, and procedures, formulated by an LHD to influence behavioral change, such as banning of sugary food items on school lunches. Assessment on environmental change helps identify emerging health issues associated with physical, social, and economic risk factors, such as lack of sidewalk, youth violent, underage drinking, or high an uninsured rate in the local community. Assessment designed to adopt evidence-based systems change may embark on policy and environmental change overhaul. For example, a jurisdiction may introduce a telemedicine program in all its schools so that all school children are seen twice a year by a dentist without having to skip a class. A jurisdiction may introduce comprehensive school health education curricula in school systems. Evidence-based interventions designed to be self-sustaining are more likely to be effective than one-time interventions, (Holder, 2005).

Levels of engagement in CHA, CHIP, SP, and PHAB accreditation are examined to indicate the commitment of LHDs to their protection of the population they serve, from health threats. Data is analyzed from the NACCHO profile study to identify these levels of engagement among LHDs and their completion of these processes (CHA, CHIP, SP, and PHAB). The examination of engagements of LHDs in completing CHA, CHIP, and SP within the past five years are dependent on workforce, leadership, and financial characteristics. Likewise, the levels of engagement of LHDs in the PHAB accreditation process is dependent on completion of CHA, CHIP, and SP within the past five years. The workforce characteristics addressed by the profile study include 1) full-time equivalents (FTEs) employees, and 2) occupation employed by an LHD. Leadership characteristics include 1) tenure of the top executive, 2) work status (full-times or part-time, contractors), 3) gender, and 4) educational level attained by a top executive. The third independent variables examine financial characteristics of an LHD. This addressed per capita expenditures. These predictors or variables are crucial to LHDs regarding long-term commitment with the profile study and to the population health. The finding from this study will be of interest to both federal public health policy-makers and local health officials.

Purpose Statement

The main purpose of this study is to assess and analyze characteristics of local health departments that are associated with completion of community health assessment, community health improvement plan, strategic planning, and PHAB accreditation processes. Studies have shown that LHDs are faced with a lack of capacity and confidence to effectively perform CHA, CHIP, SP, and PHAB accreditation activities, but can produce higher-quality assessments when they collaborate with other community stakeholders and have parallel community assessment

activities (Singh & Carlton, 2017; Shah et al., 2015; Wetta et al., 2015; Wetta et al., 2014, Curtis, 2002).

Results from the current study of the LHDs engagement in CHA, CHIP, SP, and PHAB accreditation processes around the country shed light on some of the factors associated with the successful completion of these core public health functions. The information garnered includes LHDs' workforce characteristics, leadership characteristics, and financial characteristics. It utilized an in-depth analysis of previously collected data by the 2016 NACCHO profile study to ascertain the completion rates and examine the variations in the workforce, leadership, and financial characteristics related to LHDs engagement in the completion of CHA, CHIP, SP, and PHAB accreditation.

Research questions

1. What is the extent of LHDs' completion of CHA, CHIP, and SP that are current by national standards established by the Public Health Accreditation Board (PHAB)?
2. Which workforce characteristics of LHDs are associated with completion of CHA, CHIP, and SP?
3. Which leadership characteristics of LHDs are associated with completion of CHA, CHIP, and SP?
4. Which financial characteristics of LHDs are associated with completion of CHA, CHIP, and SP?
5. Do LHDs with current CHA, CHIP, and SP have higher odds of engaging in the PHAB accreditation program?

Hypothesis statements

The general hypothesis statements to be applied to each of the three dependent variables (completion of CHA, CHIP, and SP) with the help of statistical software include the following:

1. Workforce characteristics
    i. Total number of FTEs
        - Ha: Size of the workforce, indicated by FTEs, is positively associated with LHDs' completion of CHA.
        - Ho: Size of the workforce, indicated by FTEs, is not positively associated with LHDs' completion of CHA.
        - Ha: Size of the workforce, indicated by FTEs, is positively associated with LHDs' completion of CHIP.
        - Ho: Size of the workforce, indicated by FTEs, is not positively associated with LHDs' completion of CHIP.
        - Ha: Size of the workforce, indicated by FTEs, is positively associated with LHDs' completion of SP.
        - Ho: Size of the workforce, indicated by FTEs, is not positively associated with LHDs' completion of SP.

    ii. Occupation employed

        Health Educator

        - Ha: Local health departments with health educators are more likely to complete CHA than LHDs without health educators.

- Ho: Local health departments with health educators are not more likely to complete CHA than LHDs without health educators.
- Ha: Local health departments with health educators are more likely to complete CHIP than LHDs without health educators.
- Ho: Local health departments with health educators are not more likely to complete CHIP than LHDs without health educators.
- Ha: Local health departments with health educators are more likely to complete SP than LHDs without health educators.
- Ho: Local health departments with health educators are not more likely to complete SP than LHDs without health educators.

Epidemiologist/statistician.

- Ha: Local health departments with epidemiologist/statistician are more likely to complete CHA than LHDs without epidemiologist/statistician.
- Ho: Local health departments with epidemiologist/statistician are not more likely to complete CHA than LHDs without epidemiologist/statistician.
- Ha: Local health departments with epidemiologist/statistician are more likely to complete CHIP than LHDs without epidemiologist/statistician.
- Ho: Local health departments with epidemiologist/statistician are not more likely to complete CHIP than LHDs without epidemiologist/statistician.
- Ha: Local health departments with epidemiologist/statistician are more likely to complete SP than LHDs without epidemiologist/statistician.
- Ho: Local health departments with epidemiologist/statistician are not more likely to complete SP than LHDs without epidemiologist/statistician.

2. Leadership characteristics

    i. Tenure of the top executive

    - Ha: Tenure of the top executive is positively associated with LHDs' completion of CHA.
    - Ho: Tenure of the top executive is not positively associated with LHDs' completion of CHA.
    - Ha: Tenure of the top executive is positively associated with LHDs' completion of CHIP.
    - Ho: Tenure of the top executive is not positively associated with LHDs' completion of CHIP.
    - Ha: Tenure of the top executive is positively associated with LHDs' completion of SP.
    - Ho: Tenure of the top executive is not positively associated with LHDs' completion of SP.

    ii. Work status of the top executive

    - Ha: There is a statistically significant difference in completion of CHA by work status of the top executive.
    - Ho: There is no statistically significant difference in completion of CHA by work status of the top executive.

- Ha: There is a statistically significant difference in completion of CHIP by work status of the top executive.
- Ho: There is no statistically significant difference in completion of CHIP by work status of the top executive.
- Ha: There is a statistically significant difference in completion of SP by work status of the top executive.
- Ho: There is no statistically significant difference in completion of SP by work status of the top executive.

iii. Gender of top executive

- Ha: There is a statistically significant difference in completion of CHA by gender of the top executive.
- Ho: There is no statistically significant difference in completion of CHA by gender of the top executive.
- Ha: There is a statistically significant difference in completion of CHIP by gender of the top executive.
- Ho: There is no statistically significant difference in completion of CHIP by gender of the top executive.
- Ha: There is a statistically significant difference in completion of SP by gender of the top executive.
- Ho: There is no statistically significant difference in completion of SP by gender of the top executive.

iv. Educational attainment of the top executive

- Ha: There is a statistically significant difference in completion of CHA by educational attainment of the top executive.
- Ho: There is no statistically significant difference in completion of CHA by educational attainment of the top executive.
- Ha: There is a statistically significant difference in completion of CHIP by educational attainment of the top executive.
- Ho: There is no statistically significant difference in completion of CHIP by educational attainment of the top executive.
- Ha: There is a statistically significant difference in completion of SP by educational attainment of the top executive.
- Ho: There is no statistically significant difference in completion of SP by educational attainment of the top executive.

3. Financial characteristics

Per capita expenditures

- Ha: Higher per capita expenditure per 10,000 population is positively associated with LHDs' completion of CHA.
- Ho: Higher per capita expenditure per 10,000 population is not positively associated with LHDs' completion of CHA.
- Ha: Higher per capita expenditure per 10,000 population is positively associated with LHDs' completion of CHIP.

- Ho: Higher per capita expenditure per 10,000 population is not positively associated with LHDs' completion of CHIP.
- Ha: Higher per capita expenditure per 10,000 population is positively associated with LHDs' completion of SP.
- Ho: Higher per capita expenditure per 10,000 population is not positively associated with LHDs' completion of SP.

4. Completion of CHA, CHIP, and SP as independent variables
    - Ha: Local health departments which have completed CHA, CHIP, and SP within the last five years are more likely to engage in PHAB accreditation.
    - Ho: Local health departments which have completed CHA, CHIP, and SP within the last five years are not more likely to engage in PHAB accreditation.

Statement of the Problem

Assessment of public health is imperative to be conducted in a community to identify and learn about the health status of a population. Data collected through community health assessment are also critically important as they inform other two core functions of public health: policy development and assurance, (NACCHO, 2016). But this is complicated by the competing priorities and other constrained resources within an LHD as results from the focus group interviews conducted in 2012 and 2013 by Wetta and colleagues (2015) indicates.

In general, hindrance to continuous engagement in CHA, CHIP, SP, and PHAB accreditation exists at the health department management level. Studies find that lack of

leadership, funding, staff, time, and effort contributed to lack of participation in these core public health functions (Curtis, 2002; Wetta, et al., 2014; Beatty, et al., 2018). In addition, Wetta and colleagues (2014) findings revealed challenges (e.g. lack of personnel training) related to completion of PHAB accreditation and workforce development in rural health departments. These encumbering factors could threaten adoption and implementation of evidence-based interventions, policies, environmental and systems change in a community. This study examines issues related to engaging in completion of CHA, CHIP, SP, and PHAB accreditation by first determining the extent to which LHDs engage in completion of these three processes.

Delimitations

This study is quantitative in its scope and intended to accomplish the extent to which local health departments engage and complete community health assessment, community health improvement plan, strategic plan, and PHAB accreditation processes. In depth data analysis of previously collected data was carried out from the 2016 NACCHO profile study to ascertain the completion rates and examine the variations in workforce, leadership, and financial characteristics related to LHDs engagement in completion of CHA, CHIP, and SP. It further examines how completion of these three processes (CHA, CHIP, and SP) led to LHD engagement in PHAB accreditation.

Local health departments which do not meet the NACCHO profile definition of an LHD were excluded from this study. Such units or agencies includes tribal or states health departments, which operate under tribal authorities or include state's regional and local offices. Confining the study to extraction of the LHDs surveyed in the 2016 NACCHO profile study

enabled capturing of these independent variables in one study period. It also enabled research to be conducted with limited amount of financial resources and time framework. Therefore, methodological procedures related to longitudinal design are not used in the analyses of the data. In addition, this study yearns to elucidate the linkage between CHA, CHIP, and SP completion and LHDs' engagement in accreditation. Combining these three processes and examine their completion as one independent variable will help understand a general picture for formally participating in a PHAB accreditation process.

CHAPTER 2

LITERATURE REVIEW

Background and Historical Underpinnings

Public health is long rooted in social, economic, and environmental issues affecting communities. Local jurisdictions or concerned community members seek to detect health threats, e.g. cholera, bird flu, and to protect the public from these threats, (IOM, 1988). History has shown that it is done collaboratively to save the lives of many and to inform future interventions, (Varda, 2012; Levin, 2002). In the United States, the contemporary public health system has gone through numerous evolutions. As chronicled in the on-line exhibit version of the United States National Library of Medicine (1995), the present Public Health Service (PHS) was coined in 1912. Prior to this, Federal government responded to the evolving health needs of the country and established the Marine Hospital Service (MHS) in 1798. John Adams, the second president of the United States of America signed into law, in 1798, the "Act of the Relief of Disabled and Seamen", which was extended by the Congress to cover all officers and sailors in 1799. Century later, 1902, Congress passed an act requiring the Surgeon General to organize annual conferences of local and national health officials so that public health activities can be organized and coordinated at the state and national levels. The bill also required the name to be changed from Marine Hospital Service to Public Health and Marine Hospital Service (PHMHS) in 1902 to capture the wider scope of the public health system.

Public health continues to have a sweeping role in the fight for disease prevention and health promotion. Throughout 19th and 20th centuries, the PHS made its presence felt across the United States. In 1878, for example, the immunization programs were instituted and in 1964, the

Surgeon General, Luther Terry, released a landmark report laying out the finding that smoking tobacco cause lung cancer, (USPS, n.d.). The World Health Organization (WHO) embraced and echoed this report and later negotiated the WHO Framework Convention on Tobacco Control (WHO FCTC) in 2003 for tobacco control measures. This was eventually adopted by 168-member countries and was implemented to reduce continually and substantially the prevalence of tobacco use and exposure to tobacco smoke, (WHO, 2003; Tulchinsky & Varavikova, 2015).

Impetus for the nation's public health system reform led to strengthening of health departments and agencies by the PHS. The U.S. Public Health Service (USPHS) chronicled that in 1936, the Surgeon General, Thomas Parran, led the fight against the venereal disease, e.g. chlamydia, and paved the way for some modern public health agencies, including the Communicable Disease Center and Prevention, which is now known as the Centers for Disease Control and Prevention (CDC). Other local health departments started to ramp up their public health spending for the purpose of increasing lifespan and to stay abreast with emerging health threats. Mays and Smith (2011) find that all public health departments with increased spending on health issues like cardiovascular diseases and influenza have seen larger reductions in mortality. The CDC report in 2005 shows that life expectancy has increased by one year from birth in the United States and the rate of the leading causes of death are trending downward in many cases, (Johnson, et al., 2014).

Although public health emerged as a major pillar in improving the lives and well-being of population, other serious challenges remain to be solved. This 21st century is guilelessly unpredictable, and its ubiquitous change is alarming. Emerging major health threats from global warming to natural disasters which may come with infectious diseases may cause colossal damage to human health and other livestock. It may well threaten the substantial progress made

in the last two centuries. More evidence-based data is needed to reflect on the past achievement to track progress, to invest in growing population, workforce, and in health departments infrastructure. As public health community strive to collect this data, the

> integration of population health goals into the organization of health care delivery and financing cannot and should not be left to health care administrators alone. Social determinants of health, upstream prevention, and population health have only recently become watchwords in the health care sector; they have been the wheelhouse of public health experts for decades. Furthermore, local health departments have a powerful forum to connect with communities about the issues people care about. (Wiley and Matthews, 2017).

Engagement in the completion of the CHA, CHIP, SP, and PHAB accreditation processes by the LHDs would shore up their efforts to raise awareness on the increasing jurisdiction size and the associated health issues. Johnson and colleagues (2014) report that the number of death is recently increasing in part due to the extended lifespan and the growing population in the United States. Of specific example and contemporary greater health concern, sexually transmitted diseases (STDs) have been on the rise according to the nation's top public health agency, CDC. The Sexually Transmitted Disease Surveillance 2016 (September 2017) report indicated that more than 2 million cases of the three nationally reported STDs (chlamydia, gonorrhea, and syphilis) is the highest number ever recorded. Population growth has been linked to this surge. The top 50 most populous metropolitan areas show an increase of 6.2% of chlamydia infection between 2015 and 2016 according to this report. Proportion of STDs among gay, bisexual, and other men who have sex with men (collectively referred to as MSM) aged 40 and above is unpredictably high (STD Surveillance, 2017).

Local health departments need to conduct health assessments in their local jurisdictions to look at the factors that might be contributing to health improvements. For instance, the rapid advancement of medical technology and the improvement of health information technology (HIT), e.g., telemedicine, across the United States and around the globe are community health needs public health departments should embrace now than later. This could be a contributing factor to longer lifespan in population, especially in hard to reach areas. Studies have shown that telemedicine program is clinically effective and cost-effective than standard clinical practice (López-Torres et al., 2015; Gupta et al., 2017). It can also make accessibility, patient comfort, and the speed by which medical services are delivered more rapid (López-Torres et al., 2015). The remote communication between patients and medical providers using applications such as instant messaging, emails, video conferencing, digital photography and other technology, (Zhang, 2016) can promote prompt diagnosis and early treatment or intervention. In this sense, health departments should assess their local population to determine the size of the population using telemedicine.

Public health governance is mostly under state or local level with overarching powers from the federal government. The 10th Amendment enunciates the plenary power retained by the states (as quoted by IOM in *The Future of the Public's Health in the 21st Century*, 2002) that "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people." To fulfill this responsibility, LHD assessment of public health to monitor disease and to identify the population at risk is critical. State health department has the primary responsibilities for delivering health services to its state population and the "local responsibility for public health service is a primary essential of local government and should be so specified under state statute", (Emerson & Luginbuhl, 1945).

The Institute of Medicine echoed on the above recommendation and described the LHDs in its 1988 report as serving governmental presence at the local level, provide mechanism for implementation of needed services, and convey information on local needs. Their unique service to the local population carries them to the "front line" of public health agencies, like state health departments, which are generally responsible for public health protection from setting policies and standards to conducting inspection, (IOM, 1988).

Public health and healthcare could often be used interchangeably, but they have major differences. As adopted by IOM committee, public health is primarily concerned with the community and the social welfare of the general population in "fulfilling society's interest in assuring conditions in which people can be healthy" (IOM, 1988). For example, policy-makers would legislate policies to improve the financing and delivery of medical services to the population. Fineberg (2011) precisely summarizes the major distinction between health care and public health. First, public health focuses on population health, so that personal access to medical services is tied to policies deem necessary to promote the health of general population in the community. Second characteristic of the public health deals with disease prevention and health promotion. This could be carried out by community activists and other public health professionals. Third, health education is easily promoted through social and public policies, which is geared toward knowledge of health issues and how it would impact population and the whole community. The fourth one is the way specialization in public health is organized. For example, epidemiologists specialized in the study of disease outbreak in the community are analytically organized. In addition, those who are experts in global health deal with population health locally and globally. Those specialized in nutrition guidelines and other healthy eating habits, such as dieticians within community residents are organized by areas related to

substantive health issues. Fineberg (2011) fifth major characteristic of public health is the fact that life sciences deal with health issues related to population health. For example, recent disease outbreak of Zika virus from mosquito in the Americas has public health scientists focus on testing between the laboratories and the affected communities (Madad, et al., 2016). Six, interventions are carried out in the community to deal with health issues related to health behaviors and lifestyles, such as underage drinking, (Holder, 2005). For example, automobile fatality can be reduced by posting speed limit on the side of the streets with adequate presence of the law enforcement agents to stop violators. Farmer (2017) finds fatality rates was about 8% higher for each 5 miles per hour increase in the interstates and highways maximum speed limit. Likewise, Holder (2005) 30-day intervention trial shows 7% decreased in underage drinking.

In contrast to public health, Fineberg (2011) states that health care is primarily focuses on medicine and market strategy. The Institute of Medicine adopted and defined primary care or healthcare as

> the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community, (IOM, 2012).

These include hospitals, clinics, doctors, health insurance companies, and other healthcare centers and organizations. Service delivery to individual is the primary focus of healthcare. Second, instead of disease prevention and health promotion, Fineberg (2011) indicated that healthcare focuses on diagnosis, or treatment for the whole patient. The third difference is that healthcare optionally emphasized social sciences as part of medical education. In this case, social sciences such as psychology, are not necessarily required to provide medical education to

individuals. Fourth is the fact that specialization is organized by part of organs (urology, orthodontia); patient specialty (urologist, orthodontist); technical skills (radiology, phlebotomy); and pathophysiology and etiology (endocrinology, parasitic/infectious diseases). Fifth, healthcare is where biological sciences play a crucial role in meeting the needs of individuals. Any research conducted under medical paradigm is geared toward patient by moving samples between bedside and laboratory. Six, healthcare predominantly places emphasis on medical care. For example, a particular nursing homes, e.g., Midhurst Macmillan Specialist Palliative Care at Home Service provides early referral into palliative care to patients who are affected by a particular health issue, (Johnston, et al., 2018).

These paradigms are interrelated to population health in many ways. Their similarities are mostly geared toward serving the same population in the community. They both share similar goal of health improvement as they deal with health outcomes, determinants of health, and healthcare delivery (IOM, 2012). Health care organizations such as hospitals and health insurance companies provide access to care at affordable price to efficiently delivery medical services to the general population, (IOM, 2012). For example, the most recent passage and implementation of the Affordable Care Act is both social and market base, (Feldstein, 2015). This means that it promotes population health by providing health insurance to low income individuals and families. On the same token, it provides policy, which mandates that individual in the society have to buy health insurance or face penalty. At the same time, health insurance companies would make money as those who are otherwise healthy use less health insurance money, (Feldstein, 2015).

A competent workforce is necessary for completing this systematic core function of public health by LHD. Recognizing the potential for HIT and enhanced communication

strategies to improve overall population health, the *Healthy People 2020* includes a goal to "use health communication strategies and health information technology to improve population health outcomes and health care quality, and to achieve health equity" (Health People 2020, n.d.). Realization of this goal will require investment and implementation of new capabilities along with training of the current and future public health workforce. The cross-sectional study by O'Keefe and colleagues (2013) shows that confidence level for data collection was low (2.63 out of 5, population ≤ 25,000) for small LHDs compared to medium (3 out of 5, population = 25,000-250,000) and larger (4.77 out of 5, population >250,000) LHDs. The Institute of Medicine report, *The Future of the Public's Health in the 21st Century*, published in 2002 recommended that "The federal, state, and local government public health agencies should develop strategies to ensure and support public health worker competency in the public sector and to encourage competency development of private-sector public health workers," (IOM, 2002).

Public health workforce that is entirely devoted to serving the health and well-being of a community need has various level of training and expertise to conduct CHA, CHIP, and SP for an LHD. Effective competency requires appropriate training, skill, and a sizeable number so that LHD meet it regulatory mandates, accreditations, and other recommendations. O'Keefe and colleagues (2013) found that 100% of staff with advanced public health degrees serve in larger LHDs as opposed to smaller LHDs with more RNs and other nursing degrees. The average number of staff performing epidemiologic works within the LHDs was 2.4, 5.8, and 10.9 for small, medium, and large LHDs respectively, (O'Keefe et al., 2013). Similarly, the distribution of public health educators is roughly the same as in the field of epidemiology at 2.2, 3.8, and 15.3 for small, medium, and large LHDs (Glascoff et al., 2005). They also find that almost two

thirds of the workforce they survey have some or primarily administrative responsibilities that could carry out community health assessments with much needed skills. In addition, Yeager and colleagues (2015) find the odds ratios of being accredited or being interested in accreditation to be high among LHDs with most FTE employees than those with the fewest FTE employees in the 2013 NACCHO profile study.

The governance structure tasked with conducting health assessments at the state or local level can either be state, local, shared, or mixed. Health departments, which are considered decentralized or with the local mandates to protect and promote the health and well-being of local population could have tendency of completing health assessments. Finding from prior survey conducted by NACCHO shows that LHDs with local board of health were 1.53 times more likely to complete the CHAs than the state or shared governance, (Singh and Carlton, 2017). However, in the focus group and on-line survey conducted by Horney and colleagues (2017), 45 percent of LHDs are capable of conducting public health surveillance and epidemiological investigation compared to 50 percent of state and 5 percent of mixed health department structure. As IOM (2002) recommended in its 2002 report, LHDs should not just stay as passive recipients, but to be proactive in supporting community-led efforts to carry out its responsibility of protecting local population health.

Per capita spending is yet another good predictor for LHDs' completion of CHA, CHIP, and SP. Ronzio and colleagues (2004) indicate that spending on health, waste, and education show no relation with premature mortality as opposed to spending on fire, welfare, and police, which correlated to high mortality rates. The financial investment in health care system by the United States system of governments has undeniably contributed to the improvements in health outcomes. In 2000, an estimated 1.3 trillion dollars, roughly 13 percent of the nation's gross

domestic product (GDP), was spent on health-related activities, (IOM, 2002). These expenditures spiraled up by nine percent each year from 2000 to 2012, (Feldstein, 2015). This rapid increase in national health expenditure (NHE) is projected to reach 5 trillion dollars or 19.9 percent of GDP by 2022, (Cuckler, et al., 2013). Advances in HIT, e.g., telemedicine, may slam a break on this acceleration. The Veterans Affairs study by Russo and colleagues (2016) indicates that telemedicine visits saved taxpayers an average of $18,555 per visit each year and patients should not have to travel for an average of 145 miles to get medical services.

Community assessments and planning might very well steer the wheel toward recognizing this advancement so that needs can be identified, and resources can be properly allocated. At the same time, LHDs need to be cognizant of the cost and other flaws, which might come with the innovative technology. Some example includes over use of health care services, which could lead to more health care spending by local citizens, hence rise of NHE. The Centers for Medicare and Medicaid Services (CMS), which develops and produces short-term projections of health care spending using actuarial and econometric modeling methods, projects personal health care spending will peak 6 percent by 2025, (Keehan et al., 2016; CMS, 2017).

Challenges emerged from this landmark progress may have inadvertently resulted in unintended consequences. With the average lifespan continues to rise, the population to be protected from health threats may overwhelm existing resources. Local jurisdictions with increased population spend more on other community issues, such as community policing, but this spending is strongly associated with premature mortality, (Ronzio et al., 2004). The protection of history is paramount, albeit the unpredictable stains in the surge of public health progress is inevitable. This study is specifically exploring engagement in completion of CHA, CHIP, SP, and PHAB accreditation processes by the public health agencies to identify and

address astonishments in the daintiness success of public health so that the momentum of our nation's health evolution is not demeaned by the unforeseen change.

Community Health Assessments

Community health assessment enables local population along with their policy leaders to obtain information pertaining to their health and the wider range of factors which impact their health. The NACCHO profile study defines it as a regular and systematic collection, analysis, and making information available on the health of a community, including statistics on health status, community health needs, epidemiologic and other studies of health problems, and an analysis of community strengths and resources, (NACCHO, 2016). However, LHDs have been reluctant to respond to assessments at a higher rate and some studies show that it has been less than 80 percent since its inception in 1990, (Wilson, et al., 2014, NACCHO, 2016).

It is an integral part of the public health service at the local level. The Public Health Accreditation Board illustrates its significance in Standard 1.1, Measure 1.1.2 T/L: A of Tribal/local community health assessment, that

> The Tribal or local community health assessment provides a foundation for efforts to improve the health of the population. It is a basis for setting priorities, planning, program development, funding applications, policy changes, coordination of community resources, and new ways to collaboratively use community assets to improve the health of the population. A community health assessment provides the general public and policy leaders with information on the health of the population and the broad range of factors that impact health on the population level as well as existing assets and resources to

> address health issues. The health assessment provides the basis for development of the Tribal/ local community health improvement plan. (PHAB, 2013).

The stated significance of covering the population health, risk factors associated with health issues or poor health outcome, and community health resources elucidate the need to conduct it periodically. Its development involves a systematic collection and analysis of data and information to provide a sound basis for decision-making and action, (PHAB, 2013).

Successful completion of CHA by LHD is beneficial both to a health of a community and for a long-term effectiveness of a health department. One of its benefits is that it leads to evident-based intervention programs in a community. Solet and colleagues (2009) indicated that it leads to identification of new, locally relevant issues, partnerships, policy, and program development. Almost three-quarters (72%) of communities which successfully completed assessments, initiated intervention process, (Curtis, 2002). It is more favorable if there is a formal training, competency, and skills at an LHD (Chen et al., 2012). Secondly, completion of assessment and planning foster inter-organizational collaborations as well as encourage and support ongoing, effective partnerships (Somerville, et al., 2012, Wahowiak, 2017). Local health departments who completed CHA are more than twice (2.46) likely to collaborate with other organizations, (Singh & Carlton, 2017). The other main benefit is that completing health assessment provides basis for the development of the other two PHAB requirements (i.e. health improvement and strategic plans) for accreditation. Its data inform community decision-making, prioritization of health problems, and the development, implementation, and evaluation of community health improvement plans, (NACCHO, 2016).

Desirable characteristics of good assessments embolden health departments to continuously pursue community improvement and strategic planning. Former CDC director, William Roper, advice the American public health system that

> communities need dynamic leadership from public health officials and their agencies. To enhance leadership skills and expand the leadership role of public health agencies, focused personal leadership development activities, including Public Health Leadership Institute, and national conferences will provide a vision of the future role of public health agencies, (Ropper, et al., 1992).

That vision within a health department is one of the desirable characteristics that is essentially taken up by the leadership team to envision the future of a community health. Curtis (2002) stresses that leadership skills for improved communication and collaboration help sustained community health assessment and planning. Lindsey Wahowiak (2017) echoes this and indicates that characteristics of a good CHA include improved care and health at a lowest cost possible as outlined in ACA's goals.

The other desirable characteristics of assessment is its "collective impact" on a community, which includes collaboration and community partnership to combat public health problems, (Rosenbaum, 2013). Solet and colleagues (2009) find this partnership and collaboration as an attractive and energizing characteristic of an effective CHA. For instance, during their assessment of asthma in King County, Washington, data shows disproportional elevated level of asthma among children, which led to its recognition as an emerging public health issue. This eventually energized existing (e.g. American Lung Association of Washington) and new partners to provide additional funding to fight asthma in this community. Community health assessment should be designed as a collaborative effort between health departments and

other community stakeholders to learn about community, thus providing the basis for development of community health improvement plan at the local level, (PHAB, 2013).

Community Health Improvement Plan

Local health departments who successfully completed CHA may use findings from this process to complete community health improvement plan. They would use them to set priorities and target available resources to develop plans for improving health issues identified in the CHA process, (PHAB, 2013). The NACCHO profile study defined CHIP as a long-term, systematic effort to address health problems, (NACCHO, 2016). These health problems are described in detail in CHIP to show ways in which local health department and the community it serves will work collaboratively to improve the health of the population of the jurisdiction it serves, (PHAB, 2013). It further indicates that it is a "community-driven" measure, where PHAB (2013) stresses that it cannot be effective without the other community stakeholders' involvement.

These stakeholders' involvement may embark on wider collaboration and effective disease-fighting effort, which could lead to better health outcomes. The significance of the CHIP is to provide

> …guidance to the health department, its partners, and stakeholders for improving the health of the population within the health department's jurisdiction. The plan reflects the results of a collaborative planning process that includes significant involvement by key sectors. Partners can use a community health improvement plan to prioritize existing activities and set new priorities. The plan can serve as the basis for taking collective action and can facilitate collaboration. (PHAB, 2013).

Improvement of population health and prioritization of activities related to existing and new health issues prompt local public health leaders to formulate policies and develop CHIP. According to Luo and colleagues (2013), completion of CHIP is significantly associated with providing policy development and plans for disease control, e.g., obesity. Develop policies and plans is one of the ten essential public health services that support individual and community health efforts like the obesity control.

Public health needs to promote quality of life, healthy development, and healthy behaviors across all life stages in a community, as stated in the *Health People 2020 Framework* (2010) overarching goals. Therefore, a shared decision-making power should be embraced by agency leadership to interpret analyzed data and to garner resources or develop policies aim to improve population's health. This could potentially shed light on factors associated with successful completion of CHIP and fosters desirable characteristics and benefits of good assessment and planning.

Many factors potentiate successful completion of CHIP by health departments. Wetta and colleagues (2015) indicate that while the main motivators of engaging in CHA and CHIP are federal mandate and PHAB accreditation requirements, community leadership, partnership, and parallel community assessment activities promote participation in these processes. Other community characteristics, which include financial resources, problem solving, shared decision-making power, improve people skills in accessing and interpreting data, potentiate assessment completion, (Curtis, 2002). Additionally, public health workforce experience predicts and improves LHDs' performance in completing CHIP (Hajat et al., 2009).

Likewise, health departments who use this requirement to participate in the PHAB accreditation have seen far-reaching benefits of stimulated quality and performance improvement

(98% of times), identified departments weaknesses and strengths (96% of times), and improve management process (90% of times), (Kronstadt et al., 2016). Lastly, successful completion of CHIP has been found to be associated with LHDs' engagement in the PHAB accreditation (Shah et al., 2015).

Strategic Planning

Local health departments need to develop and implement strategic plan to direct resources and link population to those resources. As Bryson (2011) describes, organizations produce fundamental decisions and actions with a concrete visionary plan. This means health departments identify mission, vision, guiding principles/values, priorities, and goals and objectives with measurable and time-framed targets, (PHAB, 2013).

Completion of strategic plan is very significant in defining health department long-term horizon. The Public Health Accreditation Board indicates that it

> defines and determines the health department's roles, priorities, and direction over three to five years. A strategic plan sets forth what the department plans to achieve as an organization, how it will achieve it, and how it will know if it has achieved it. The strategic plan provides a guide for making decisions and allocating resources to pursue its strategies and priorities. (PHAB, 2013).

Pursuing these strategies and priorities elucidates that the department is integrating all identified and planned priorities across programs and internal divisions. For instance, Arizona Department of Health Services (ADHS) strategic plan for fiscal year 2014-2018 includes "implementing best practices and align resources with key priorities" to help them conduct a focused research to

identify innovative solutions to public health problems (ADHS, 2012). They embedded these cross-cutting strategic priorities in their strategic plan to allow them to measure their performance and achieve targeted results. Expected outcomes for each department is different but should depend on the execution of the strategic objectives outlined in the strategic map. The performance measures embedded under each objective could be used to track the department progress annually. Each measure is designed to capture the quality of work completed by the department. As LHDs completed SP and gather data on each strategic priority on a yearly basis, they will continue to identify areas of improvement and make those adjustments in line with essential public services (PHAB, n.d).

Additionally, it is critical to complete the strategic plan to assess the external environment of the department. The forces and trends which could threaten health department to implement and achieve its expected outcome from the outlined priorities should be part of the strategic map. This is where scenario analysis comes in as a "process of constructing alternate futures of a business' external environment." (Simpson, 1992). For example, an LHD, which set a strategic priority in its SP to reduce violent crime in a community would embed a scenario analysis, which would postulate set of plausible or probable future states of change beyond their control. This would serve as input to strategic planning process and remain embedded in each of the strategic priorities (Venable et al., 1993).

Completion of the above three processes (CHA, CHIP, and SP) ease PHAB accreditation process. The PHAB (2013) requires LHDs who are applying for accreditation to have completed all the three processes (CHA, CHIP, and SP). However, McLees and colleagues (2014) find that only 15% of awardees in their study had completed all three processes and only 14% completed two of the three processes. Continuous data collection and planning is traced to be significant in

how LHDs responded to profile study surveys, (Singh & Carlton, 2017). These authors find that LHDs who are committed and have completed the past three years assessments are 2.46 times more likely to collaborate with other health entities and complete upcoming assessments. However, state health departments completed only 48 percent within the last three years, (ASTHO, 2011). But this same report indicated that completion rate was 71 percent for state departments serving larger population compared to 44 percent and 31 percent for state departments serving smaller and medium-size population respectively. Study findings alluded to the fact that developing agency-wide strategic plan has higher odds (2.3 times) of engaging in PHAB accreditation than completing CHIP (1.4 times) and CHA (0.9 times), (Kronstadt et al., 2016; Shah et al., 2015).

PHAB Accreditation

The public health department accreditation is very critical in keeping health agencies to high standards. It is administered by the Public Health Accreditation Board, which was established in 2007 to improve quality of practice and performance within public health department, (PHAB, 2011). It was incorporated by multiple partners and stakeholders including the American Public Health Association (APHA), the Association of State and Territorial Health Officials (ASTHO), National Association of County and City Health Officials (NACCHO), the National Association of Local Boards of Health (NALBOH), the National Indian Health Board (NIHB), the National Network of Public Health Institutes (NNPHI), and the Public Health Foundation (PHF), (PHAB, 2011).

The board of incorporators defined it as a measurement of health department performance, issuance of recognition of achievement, and the continual development, revision,

and distribution of public health standards (PHAB, n.d). These standards encompass the three core public health functions of health assessment, policy development, and assurance of public health services that health department ought to provide, (PHAB, 2013). The PHAB Accreditation Standards and Measures Version 1.0 was adopted in July 2011, with the revised version 1.5 released in December 2013, (PHAB, 2011; PHAB, 2013). In March 2013, only 11 health departments became the first in the nation to achieve accreditation status, (PHAB, 2013). In February 2018, this number soared to 220, in which 188 were awarded to LHDs for a five-year accreditation, (PHAB, n.d).

Prior to this effort, the Institute of Medicine recommended that public health agencies need to develop plans and accredit public health programs in their region to improve performance, (IOM, 2003). All partners and stakeholders would need to work together for assuring that population health is addressed, and services are provided, (IOM, 1988). Local health departments "that networked, coordinated, or cooperated with other organizations were 2.84 times more likely to be engaged in accreditation", (Shah et al., 2015). The PHAB accreditation process is rigorous, as health department has to go through seven steps before it is awarded a five-year accreditation status: (1) Pre-application, (2) Application, (3) Documentation Selection and Submission, (4) Site Visit, (5) Accreditation Decision, (6) Reports, and (7) Reaccreditation (PHAB, 2011). These rigorous steps help a health department reap many benefits, (CDC, 2017; MMWR, 2016). These reports highlighted a wide variety of PHAB accreditation benefits to health departments. It include 1) stimulated quality and performance improvement opportunities, 2) allowed better identification of strengths and weaknesses, 3) document health departments capacity to deliver the core functions and 10 Essential Public Health Services, 4) stimulated greater accountability and transparency, 5) improved the

management processes used by the leadership team in the health department, 6) improved accountability to external stakeholders, 7) better communication with the Board of Health or governing entity, 8) increased cross-department collaboration, 9) improved competition for funding opportunities, and 10) show higher credibility/reputation among their community partners.

Barriers to engagement in the PHAB accreditation process are likewise critical. Studies by Beatty and colleagues (2018) and by Shah and colleagues (2015) reported similar top three reasons for not pursuing PHAB accreditation by LHDs. The first reason most respondents (72%) reported according to Shah and colleagues (2015) was that accreditation process requires more staff time and effort, which exceeds the benefits. Second, 54% of LHDs cannot afford accreditation fees, (Shah et al., 2015). The third barrier is that standards for engaging in accreditation exceed the capacity of the LHD (39%), (Shah et al., 2015).

Conceptual Framework

Assessment is one of the three core functions of public health labeled by the IOM as a government role. In its 1988 report, *The Future of Public Health*, IOM recommends every health agency to conduct health assessment. The other two core functions to be implemented by all levels of government agencies are policy development and assurance. Policy development, which is defined by the committee as the promotion of scientific knowledge base in decision-making and developing public health policy, establishes national health objectives and advocates equitable distribution of resources at the federal, state, and local levels. With the recommendation of assurance, the IOM committee encourage health agencies to assure that

services agreed upon goals and objectives are provided equitably to every member of a community, (IOM, 1988).

Assessment is the framework for public health that likely demonstrates a shift from just prevention to disease detection as it makes data available for better prediction of future health issues. The IOM recommendation to conduct assessment "regularly and systematically collect, assemble, analyze, and make available information on the health of the community, including statistics on health status, community health needs, and epidemiologic and other studies of health problems" (IOM, 1988), is to stay abreast with unforeseen health issues. This would also help local authorities in identifying available resources to deal with these issues. The Core Public Health Functions Steering Committee (1994) adopted the Public Health Core Functions and 10 Essential Services as shown in Figure 1. These became the foundation for the nation's public health strategy for preventing disease and promoting healthy living.

As the first core function of public health, assessment encompasses two main essential services. These were based on the IOM recommendation to collect and analyze information about health problems for public to know. Essential service of monitoring health status to identify community health problems fits well with community health assessment. This conceptual framework enables state and local health departments to monitor their available resources before meeting any regulatory mandates and accreditations, (IOM, 1988).

Figure 1: The Essential Public Health Services and Core Functions

Source: Public Health Functions Steering Committee, 1994.

Diagnose and investigate health problems and health hazards in the community is the second essential service of public health identified by the committee in its 1994 report. After diagnosed with health issues, public health professionals would investigate food-, vector-, or water-borne disease outbreaks, e.g., Zika virus. To further elaborate, the detection of ZIKA RNA (Ribonucleic acid) by PCR (Polymerase chain reaction) in breast milk samples raises concern that transmission by breastfeeding is possible, (Besnard et al., 2014). Zika virus took toll in the late 2015 in Puerto Rico and after three months of investigation by CDC and Puerto Rico Department of Health, a total of 155 cases were identified and 30 of them were confirmed as

having the disease, (Thomas et al., 2016). In the wake of this crippling disease, New York Health + Hospitals implemented a Zika Preparedness and Response Action Plan (Zika Action Plan) to monitor the health of its local citizens, (Madad et al., 2016). This assessment plan was managed internally and supported by the New York City Department of Health and Mental Hygiene (DOHMH) and the New York State Department of Health, (Madad et al., 2016).

Health assessment helps in predicting the future state of health threat when health departments identify its context. Godet (1982) states very well that the

> future is emerging, but its details are unknown. Despite these unknowns, it is necessary to take decisions today which will commit us in the future. Often our ability to predict future events is limited, and in the lack of precise information, we might find it necessary to gamble. This must be done, however, without mortgaging the future. We need freedom of action. The future is unpredictable, increasingly changing, and uncertain.

In light of this suggestion, health departments should remain cognizant of the speed of change around us. Godet made it clear from his view that we should act from the present to tackle the future and shape the plausible events. Venable and colleagues (1993) state it as monitoring and identifying issues with high probability and high impact through scenario analysis model, shown in Figure 2 below. This means that once health department identified issues as indicated in the model, it leads to wider implication for strategic and contingency planning. It would engage top administrators to think and plan for the future of the entire organization. The model also indicates that all health departments are interconnected one way or another. For instance, pressure to reduce Federal deficit, which could result in reduced appropriation across the board may lead to state health departments to reduce funding to the local health departments, thus reduction on the number FTEs hired locally, (Venable et al., 1993).

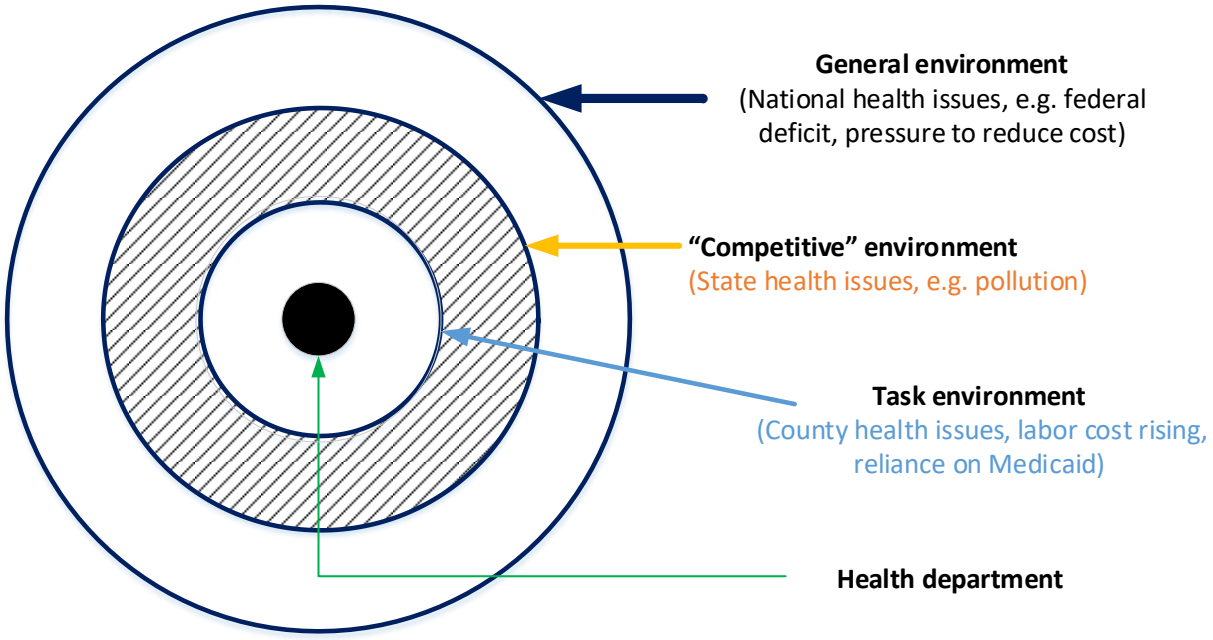

Figure 2: Environment of Health Department
Source: Venable et al., 1993

Health assessment and planning in areas involving societal, environmental, or policy changes help LHDs investigate disease outbreaks, address health issues, and set directions and targets time-frame. For example, the measles outbreak in 2003 in Pennsylvania boarding school with approximately 663 students found that students who received measles vaccine outside the United States had higher measles attack rate than those vaccinated in the United States, (Yeung et al., 2005). Health departments and policy makers could have a better understanding of analogous situations if health assessment data on demographics, health status, immunization status, etc. was available.

Changing geared toward health policy also need to be monitored to avoid health surprises on the local population. Take the most recent passage of the Patient Protection and Affordable Care Act (ACA), (Feldstein, 2015) and the current debate on another health care overhaul to repeal and replace the ACA. The unforeseen flaws, e.g., advancement in the medical technology

and it subsequent cost-containment (Henderson, 2015) in the reform can easily be forecasted and predicted in the assessment. Ambiguity and uncertainty about cost of care remain high in this debate of another health care overhaul. Despite the promise made by President Obama (as quoted in the book by Feldstein, 2015) that ACA will "bend the cost curve down" and "not add a dime to the deficit", affordable financing remains a mystery. With the expansion of the Medicaid, ACA aims to extend health coverage to low-income families and other individuals who cannot afford due to other reasons. Each state would have to expand Medicaid Program with mutual cost sharing with the federal government. Blavin (2012) argues that introduction of cost-containment in the legislation could reduce the upward healthcare spending. But implementation of the legislation is encountering steep battle in term of quality, affordability, and access to care (Feldstein, 2015). Health departments across the country, who are tasked to protect local population against health threats, including lack of insurance, have to monitor these changes and prepare the steering wheel for any sharp turn ahead.

Summary

Data-informed decision-making is critical for innovative public health interventions, (Honeycutt et al., 2015; Brownson et al., 2011). Engagement in community health assessments to identify evidence-based disease burden can serve as a data-driven approach to optimize allocative efficiency and to ensure population access to public health programs and services, (IOM, 1998; Brownson et al., 2011). Local health departments can use it as a basis for setting priorities, planning, budgeting, making policy and system changes, and coordination of assets and other resources, (PHAB, 2013; Brownson et al., 2011). To cope with the dynamic change of health environment, it is critically important for health organizations to continually adopt and

implement changes related to health policy, environment, and system, (IOM, 1998; Brownson et al., 2011). This would reduce parochialism and ambiguity about emerging health threats both internally and externally, (Venable et al., 1993). They should also seek to identify strengths and resources available within health departments and stakeholders to address CHA, CHIP, and SP processes.

Participation in the CHA, CHIP, and SP processes should be accounted for by the health department leadership as a logical approach to address both internal and external environments, (Venable et al., 1993). The association of input to output encompasses factors such as staff, finance, and time that are necessary in predicting the intended outcomes, e.g. completion of CHA. For instance, Gutilla and colleagues (2017) developed a logic model to outline their data collection process and intended outcomes, which eventually lead them to effectively disseminate assessment data and findings. In addition, Evidence-based intervention needs to focus on a sequential rationale of cause and effect for the targeted health issue, (Brownson et al., 2011). The facilitators identify in this study may determine the levels and likelihood of engagement, but not necessarily the actual completion of CHA, CHIP, or SP. This study will add to the empirical studies with evidence-based intervention strategies by identifying the LHD's characteristics that are necessary in conducting these crucial core functions of public health. It will provide suggestions and recommendations to local health officials on which of the identified characteristics would be best to be targeted to increase LHDs engagement in these crucial processes overtime. But local health officials and other key decision-makers need to be aware with the idea that completion of these assessments "point the way to action, not as (an) end in itself", (Brownson et al., 2011).

CHAPTER 3

RESEARCH METHODOLOGY

Study Design

This study employs cross-sectional data analysis methods for analyzing data from the 2016 NACCHO National profile study. Survey data representing LHDs across the country was self-administered. Human participant protection was not required because it used secondary data based on a survey conducted on LHDs across the United States. Thus, the exemption status for the research was approved by the Institutional Review Board of Georgia Southern University.

Data Source and Target Population

The data used in this study represent secondary data obtained from the 2016 NACCHO profile study for the LHDs. The National profile of Local Health Departments (profile study) is a survey used to develop a comprehensive and accurate description of LHD infrastructure and practice in the United States. LHDs representatives were asked retrospectively if they had conducted health assessments and planning over the years to meet public health accreditation and other federal mandates for non-profit hospitals (Federal Register, 2014) in their local jurisdictions. Description of LHDs look at the multiple factors, which could predict the likelihood of engaging in CHA, CHIP, and SP processes. The analyses of these data took into account factors known to be associated with engagement and completion of CHA, CHIP, and SP. These factors include leadership, workforce, and financial characteristics, (Wetta et al., 2015; Curtis, 2002). It also includes completion of processes associated with engagement in PHAB accreditation, (Shah, et al., 2015; McLees et al., 2014). Many questions or topics are collected

annually to allow robust examination of the relationship between LHDs and CHA, CHIP, SP, and PHAB accreditation completion.

Prior to 2016, NACCHO conducted seven surveys on LHDs, starting in 1990. It was conducted once every three years with response rates as 77% (1990), 72% (1993), and 88% (1996) and then again, every three years from 2005 (80%), 2008 (83%), 2010 (82%), 2013 (79%), to 2016 (76%). The average completion rate for these surveys is 80 percent. Wilson and colleagues (2014) also find this response rate to be the same at 80 percent. Rates are sliding downward for the whole survey, which may be indicative of reluctant engagement in the assessment and planning processes by LHDs. Of a slight relief, participation by LHDs in all three processes (CHA, CHIP, and SP) has been on the rise within the last three profile studies- 2010 (20%), 2013 (30%), and 2016 (44%), (NACCHO, 2016). Questions related to level of engagement in PHAB accreditation process by LHDs were added in the 2013 NACCHO profile study. In 2013, the percentage of LHDs formally engaged in PHAB accreditation process was six percent. This number increase to 21% in the 2016 profile study, (NACCHO, 2016), the study period for this research.

The National Association of County & City Health Officials (NACCHO, 2016) identified approximately 2,800 agencies or units that meet the profile definition of an LHD: administrative or service unit of local or state government, concerned with health, and carrying some responsibility for the health of a jurisdiction smaller than the state. They are classified into four. The first governance system of health departments is decentralized or local health department, indicating all LHDs in a state are units of local government. The second category is the centralized or state health department, indicating that all health departments are units of state government. The third category is the shared governance system, which is under both state and

local authorities. The fourth category is a mixed governance system indicating that LHDs within a state have more than one governance structure, i.e. decentralized, centralized, or shared. The 2016 NACCHO profile study did not identify mixed governance in its report, but identified about 77 percent as decentralized governance, 15 percent centralized, and 8 percent as shared. The geographic jurisdictions served by the LHDs is largely county-based, which encompassed more than two-thirds (69%) of the surveyed LHDs. Other LHDs serve city or town (20%), multi-county (8%), or multi-city (3%). Only 6 percent of all LHDs classified as large serve about half (51%) of population, 33 percent of medium size LHDs serve about 39 percent, 62 percent of small size LHDs serve only 10 percent. A larger proportion (83%) of smaller LHDs have local board of health compared to 52 percent of larger LHDs, (NACCHO, 2016).

The profile study questionnaire sent a set of core questions to all LHDs identified as study population. In addition, some LHDs were randomly selected to receive one of the two sets of supplemental questions (or modules). The total number of LHDs for which surveys were sent to was 2,533 with response from 1930 LHDs on 48 states. The two states (Hawaii and Rhode Island) excluded have state health departments operating on behalf of LHD without sub-state units. To compensate and adjust for the disproportionate response rate by LHDs population size, proportional weight for this core questionnaire variables were used. The 2016 NACCHO profile study calculated this variable by dividing the proportion of LHDs in that population category among the full study population by the proportion of LHDs in that population category among all survey respondents. However, unweighted frequency of LHDs count responding to the survey was used.

This secondary data analysis paved the way to access the work of the best agencies and scholars around the country and all over the world. The data used in this study are believed to be

of high quality as they were collected by a well-trusted organization (NACCHO) and funded by the leading government public health agencies (e.g. CDC) and other distinguished private foundations (e.g. Robert Wood Johnson Foundation). Data collected involved large sample size with stratified sampling of LHDs, which is believed to be representative of the nation's public health departments (greater external validity).

Variables

Dependent variables

The four main dependent variables (completion of CHA, CHIP, SP, and engagement in PHAB accreditation) were extracted from the Core Questionnaire section of the 2016 NACCHO profile study. The first three dependent variables, which measure the extent of LHDs' completion of CHA, CHIP, and SP have the same response categories and similar survey questions. Thus, they were operationalized similarly.

To measure the completion of CHA, survey question: "Has a community health assessment been completed for your LHD's jurisdiction?" was used. Similarly, CHIP and SP were measured using survey questions: Has your LHD participated in developing a health improvement plan for your community?" and "Has your LHD developed a comprehensive, agency-wide strategic plan?" respectively. Response categories on all three variables are; [1] Yes, within the last three years; [2] Yes, more than three but less than five years ago; [3] Yes, five or more years ago; [4] No, but plan to in the next year; and [5] No. These responses were operationalized and categorized as dichotomous variables for bivariate and multivariate analysis. Response categories (1) and (2) were combined to show CHA, CHIP, or SP completed within the

last five years and response categories (3), (4), and (5) were combined to show CHA not completed within the past five years by LHDs.

The fourth dependent variable assessed levels of engagement in PHAB accreditation based on the completion of CHA, CHIP, and SP by an LHD. Respondents were asked to answer survey question: "Which of the following best describes your LHD's participation in the Public Health Accreditation Board's (PHAB's) national accreditation program for LHDs?" Response categories include; [1] My LHD has been accredited by PHAB; [2] My LHD has submitted an application for PHAB accreditation; [3] My LHD has registered in e-PHAB in order to pursue accreditation; [4] My LHD plans to apply for PHAB accreditation, but has not yet registered in e-PHAB; [5] My LHD has not decided whether to apply for PHAB accreditation; [6] My LHD has decided NOT to apply for PHAB accreditation; [7] My LHD is part of a PHAB-accredited centralized state integrated local public health department system; [8] The state health agency has registered in e-PHAB in order to pursue accreditation as an integrated system that includes my LHD; [9] The state health agency plans to apply for PHAB accreditation as an integrated system that includes my LHD, but has not yet registered in e-PHAB; and [10] Do not know. These survey responses were reordered and categorized into three ordinal responses. Categories combined to reflect that an LHD was accredited or engaged in the PHAB accreditation in the 2016 NACCHO profile study were (1), (2), (3), (7), and (8). Those combined to show planning or undecided in the accreditation process were categorized from (4), (5), and (9). Finally, LHDs who were not engaged in the accreditation process were grouped from the response categories (6) and (10).

Independent variables

The independent variables for this study were analyzed to determine the extent of LHD engagement in the assessments, planning, and PHAB accreditation. Other independent variables (i.e. jurisdiction size and type of governance) known to be associated with LHD performance (Erwin et al., 2014; Santerre, 2009) were included in the regression model.

i. Workforce Characteristics

Workforce characteristics include two variables. The first one is total number of FTEs employed by an LHD. The survey question measuring current number of FTEs is "What is the total Full-time Equivalents (FTEs) workforce at your LHD?" This question includes all kind of employees (full-time, part-time, and contractual) employed by an LHD. Full-time equivalent employees were counted as 1 in the survey and part-time were counted as 0.5 This continuous variable was categorized on a quartile bases (lowest, 2nd, 3rd, and highest) for the analyses.

The second variable under workforce characteristics is occupation employed by an LHD. Employment category according to workforce primary job responsibilities or function was used here to look at two occupations LHD employed. These categories include epidemiologist/statistician and health educator from survey question: "Does your LHD currently employ staff in this classification?" for [1] yes or [0] no response.

ii. Leadership Characteristics

This study analyzed four categories of LHD's top executives, which is defined by the 2016 NACCHO profile study as the highest-ranking employee with administrative and managerial authority. The variables examined were tenure of top executive, work status of top executive, gender of top executive, and educational attainment of top executive. Respondents

were asked questions about the tenure of top executive: “What date did the top executive assume this position?” Question about top executive work status: “What is the work status for the top executive?” asked respondents whether the top executive is either “Full-time”, coded as 1, or “Part-time” coded as 2. The gender of the top executive is either “Male”, coded as 1, or “Female”, coded as 2 from the question: “What is the gender of the person in the top executive position?” Top executive educational attainment: “Indicate all degrees that your top executive holds (not just the highest degree)” included “Associate Degree”, “Bachelor’s Degree”, “Master’s Degree”, and “Doctoral Degree”. Since each degree category had multiple types, they were combined and operationalized in the SAS data step into just four categories (Associates, Bachelors, Masters, and Doctoral).

iii. Financial Characteristics

Financial characteristics looked at per capita expenditures per 10,000 populations from the “Funding” section of the survey. It examined the relationship between completion of CHA, CHIP, and SP by an LHD. Total expenditure was extracted from the survey question: “What were the LHD’s total expenditures and total revenues for the most recently completed fiscal year?” To obtain the per capita expenditure, total LHD expenditure was divided by the total jurisdiction population. The size of population in each LHD jurisdiction was added as a continuous variable.

iv. Completion of CHA, CHIP, and SP as independent variable

The fourth independent variable was measured with the three processes (CHA, CHIP, and SP) to determine LHDs’ level of engagement in PHAB accreditation. These variables included dichotomized variables for CHA, CHIP, and SP completed (yes, within the last five years) or not

completed (no, or not within five years). The combined categorical questions to indicate CHA is completed include [1] Yes, within the last three years and [2] Yes, more than three but less than five years ago. Those combined to indicate CHA is not completed include [3] Yes, five or more years ago, [4] No, but plan to in the next year, and [5] No. The combined categorical questions to indicate CHIP is completed include [1] Yes, within the last three years and [2] Yes, more than three but less than five years ago. Those combined to indicate CHIP is not completed include [3] Yes, five or more years ago, [4] No, but plan to in the next year, and [5] No. The combined categorical questions to indicate SP is completed include [1] Yes, within the last three years and [2] Yes, more than three but less than five years ago. Those combined to indicate SP is not completed include [3] Yes, five or more years ago, [4] No, but plan to in the next year, and [5] No. Descriptive statistics of LHDs completion of these three processes was used to assess correlation to PHAB accreditation. Most variables were recoded from the original 2016 NACCHO code book to assist with analysis. Table 1 was used as a guide for all variables in the analysis.

Table 1: Variables in the Analysis

Variable Name	Variable Code	Variable Description	Response Category	Variable Coding
Completion of CHA	c7q147	completed CHA within the last five years by LHD	No, or not within five years	0
			Yes, within last five years	1
Completion of CHIP	c7q149	completed CHIP within the last five years by LHD	No, or not within five years	0
			Yes, within last five years	1
Completion of SP	c7q217	completed SP within the last five years by LHD	No, or not within five years	0
			Yes, within last five years	1
	c13q401	Levels of engagement	Accredited or engaged	1

Accreditation and engagement in PHAB accreditation		with PHAB accreditation by LHD including those already accredited	Planning or undecided	2
			Not engaged	3
Workforce Characteristics				
Total number of FTEs	c5q37	Total number of Full-time Equivalents (FTEs) employed by an LHD, including regular full-time, part-time, and contractual employees.	Lowest quartile (< 10.00)	1
			2nd quartile (10.00 - 24.99)	2
			3rd quartile (25.00 - 74.99)	3
			Highest quartile (> 74.99)	4
Epidemiologist/Statistician	c5q47a	Indicates number of epidemiologists or statisticians currently employed by an LHD	No	0
			Yes	1
Health educator	c5q48a	Indicates number of health educators currently employed by an LHD	No	0
			Yes	1
Leadership characteristics				
Tenure of top executive	c4q24	Time of the top executive since assuming his or her position at LHD	<2 years	1
			2-5 years	2
			6-10 years	3
			11 or more years	4
Work status for top executive	c4q26	Full-time or part-time work status of the top executive	Part-time	0
			Full-time	1
Gender of top executive	c4q29	Gender of the person in the top executive position	Female	0
			Male	1

Educational attainment of top executive	4q31a, c4q31b, c4q31c	Top executive who holds any kind of an associate degree (e.g. AD, AA, etc.)	Associates	1
	c4q32a, c4q32b, c4q32c, c4q32d	Top executive who holds any kind of a bachelor's degree (e.g. BS, BAN, etc.)	Bachelors	2
	c4q33e, c4q33f, c4q33a, c4q33b, c4q33c, c4q33d	Top executive who holds any kind of a master's degree (e.g. MPH, MBA, etc.)	Masters	3
	c4q34a, c4q34b, c4q34c, c4q34d, c4q34e, c4q34f, c4q34g, c4q34h, c4q34i	Top executive who holds any kind of a doctoral degree (e.g. DrPH, JD, etc.)	Doctoral	4
Financial characteristics				
Per capita expenditures	c3q15	Annual LHD total expenditure per 10,000 population	Total expenditures	N/A
Completion of CHA, CHIP, and SP	N/A	completion of all three processes (CHA, CHIP, and SP) by an LHD is used as an independent variable to show likelihood of engaging in PHAB accreditation	Not completed	0
			Completed	1

Abbreviations: CHA, Community health assessment; LHD, Local health department; CHIP, Community health improvement plan; SP, Strategic planning; PHAB, Public Health Accreditation Board; FTEs, Full-time Equivalents; AD, Associate Degree; AA, Associate in Arts; BS, Bachelor of Science; BAN, Bachelor of Arts in Nursing; MPH, Master of Public Health; MBA, Master of Business Administration; DrPH, Doctor of Public Health; JD, Juris Doctor.

Data Analyses

Survey data from the 2016 NACCHO profile study were initially analyzed for all numeric and continuous variables using descriptive statistics to show the distribution of variables with LHD as the unit of analysis. For each of the five research questions, multiple regression models were used. Prior to applying models to the data, some variables where categorized and formatted in the SAS data step. For example, continuous variable (tenure of top executive), which is a date field was categorized into four categories (< 2 years, 2-5 years, 6-10 years, and 11 or more years).

To address the first research question: "What is the extent of LHDs' completion of CHA, CHIP, and SP that are current by national standards established by the Public Health Accreditation Board (PHAB)?", a frequency plot was run to request descriptive statistics. This showed frequencies and proportions of LHDs participating and completing all four (CHA, CHIP, SP, and PHAB) processes.

Variables for the workforce characteristics (total number of FTEs and occupation employed) were compared in the research question: "Which workforce characteristics of LHDs are associated with completion of CHA, CHIP, and SP?" Bivariate analysis was first conducted to determine the level of significance. Then, logistic regression model was used to calculate odds ratios of LHDs completion of CHA, CHIP, and SP, since the outcome of interest was categorized as a binary variable. These odds were compared between the two variables to identify which

workforce characteristics were more likely to be associated with the completion of CHA, CHIP, and SP.

Leadership characteristics of LHD were analyzed to examined tenure, gender, work status, and educational level of the top executive. The research questions: "Which leadership characteristics of LHDs are associated with completion of CHA, CHIP, and SP?" was asked to compare these characteristics. Bivariate analysis and a logistic regression were conducted to estimate associations between top executive tenure, gender, work status, and educational attainment and completion of CHA, CHIP, and SP. The population served by LHDs was categorized according to the 2016 NACCHO profile definition of LHD jurisdiction sizes. That is LHDs were classified as small if they serve fewer than 50,000 people, medium if they serve populations between 50,000 and 499,999 people, and large if they serve 500,000 or more people. Generalized logit (LINK=GLOGIT) models were fit to nominal data of tenure, gender, work status, and educational attainment to make odds ratio available for all predictors of CHA, CHIP, or SP completion.

The fourth research question is: Which financial characteristics of LHDs are associated with completion of CHA, CHIP, and SP? Bivariate analysis and a logistic regression were conducted were also used to estimate associations between per capita expenditure per 10,000 population and completion of CHA, CHIP, or SP. This continuous variable was calculated by dividing an annual total expenditure of an LHD by the total residents within the jurisdiction.

Analysis on the level of engagement in PHAB accreditation were conducted to answer research question: "Are LHDs who completed CHA, CHIP, and SP, more likely to engage in PHAB accreditation program?" Frequency plot was used to look at the distribution of LHDs' engagement in PHAB accreditation by completion of all three processes. The probability

modeled is PHAB equals “Engagement in the PHAB accreditation”. Generalized logit (LINK=GLOGIT) model was fit to look at the nominal response variable of PHAB accreditation and to make odds ratio available for the predictor variable for completing all three processes (CHA, CHIP, and SP).

All the analyses were conducted, using SAS 9.4 for Windows to request frequencies and proportions for completing CHA, CHIP, SP, and PHAB accreditation by LHDs. Most results were presented with adjusted odds ratios and corresponding 95% confidence intervals. The SAS Surveylogistic procedure was used with weight to fit the generalized logit model, which contrasted each response category against the reference category. Statistical significance was set at 0.05 and any test of p-value less than 0.05 was boldfaced.

CHAPTER 4

RESULTS

Overview

The 2016 profile study was conducted by NACCHO on 2533 LHDs. With 76% (1930) response rate to NACCHO survey, the analyses in this study included only this number. The results are presented in three parts. The first part is the descriptive statistics for all variables in the study. This describes each characteristic as it applies to LHDs in a table or graph. It simply shows the unweighted number and weighted percent of LHDs with brief summary paragraphs.

The second part of this result section is the descriptive statistics for the research questions in the study. Each of the five research questions guiding this study is presented in a table or graph. Summary paragraphs are provided to explain the nature of the data and to describe how they are related to the outcomes of interest. These study questions include; 1) What is the extent of LHDs' completion of CHA, CHIP, and SP that are current by national standards established by the Public Health Accreditation Board (PHAB)?; 2) Which workforce characteristics of LHDs are associated with completion of CHA, CHIP, and SP?; 3) Which leadership characteristics of LHDs are associated with completion of CHA, CHIP, and SP?; 4) Which financial characteristics of LHDs are associated with completion of CHA, CHIP, and SP?; and 5) Are LHDs who completed CHA, CHIP, or SP, more likely to engage in the PHAB accreditation program?

The third part is the inferential statistics by LHD characteristics, which visualizes the probability of observed difference between independent and dependent variables. Each characteristic, i.e. workforce, leadership, financial, and other LHD characteristics for the level of PHAB accreditation is tabled and graphed with odds ratio, 95% confident intervals, and p-values.

The cross-tabulated data are followed by paragraphs providing inferential explanation associated with each variable.

Descriptive Statistics for All Variables

General description of this study is numerically and graphically displayed below in a table and graph to visually prognosticate types of conclusions and recommendations to be drawn at the end. Table 2 shows the unweighted estimates and weighted percentages of some features of LHDs in the study. This indicated the extent of LHDs' completion of CHA, CHIP, and SP that are current by national standards established by the Public Health Accreditation Board through various predictors. A total of 1930 LHDs were involved in the analysis. Most health departments were categorized as local or decentralized health departments (71.98%). Those indicated having a centralized or state governance structure were the second largest (19.60%), followed by the shared health department (8.42%).

Population size served by LHDs was not equally distributed. The proportion of LHDs serving small (<50,000) size jurisdictions was 61.62%. The second largest number of LHDs (32.73%) served medium (49,999-499,999) size jurisdictions. Those serving larger (500,000+) size jurisdictions were the least (5.65%).

Accreditation and engagement in PHAB accreditation process, which was assessed using "Level of engagement in the PHAB accreditation", shows a total of 1813 LHDs without missing status. Those indicated that they were "Accredited or engaged" in the PHAB accreditation were 20.13%. Those categorized as "Planning or undecided" were 52.54%, while those "Not engaged" were 27.34% of the LHDs.

The proportion of LHDs participating in all three processes (CHA, CHIP, and SP) was 56.58%. Of this proportion, a little more than three-quarters (75.10%) had completed CHA, CHIP, and SP within the last five years. Less than a quarter (24.90%) had not completed these processes within the last five years. When each of these processes was analyzed separately, 78.36% had completed CHA within the last five years compared to 21.64% of LHDs which had not done so within the last five years. Regarding the other two processes, 67.19% and 53.45% of LHDs had completed CHIP and SP within the last five years respectively. Proportion showing "No, or not within the last five years" was 32.81% for CHIP and 46.55% for SP.

Workforce characteristics assessed two of the categories of public health workers employed by LHDs. Larger proportion (96.63%) of LHDs had a status employment either in epidemiologist/statistician or health educator. Those who indicated that they currently employed an epidemiologist/statistician were 26.39% and those who did not were 73.61%. The LHDs who employed health educators were 55.27% compared to 44.73% which did not. Continuous variable, "LHD total FTEs employed" was computed to get means, Figure 3. All LHDs employed a total of 71,963.93 FTEs, ranging from 0 – 5512 FTEs. Their average employment was 50.10 FTEs per LHD with the median at 14.85. But the distribution by each process (CHA, CHIP, SP, or all three) showed that the average for LHDs who had completed all three processes was 78.98 FTEs compared to 20.70 FTEs for LHDs who had not completed them. With each process, LHDs employed an average of 57.54 FTEs for CHA completed compared to 24.22 FTEs for CHA not completed, 61.69 FTEs for CHIP completed compared to 27.59 FTEs for CHIP not completed, and 71.78 FTEs for SP completed compared to 27.38 FTEs for SP not completed. When categorized in quartiles it showed that 38.55% of LHDs had 10 or fewer FTEs (lowest quartile). The proportion of LHDs in the second quartile (10.00-24.99 FTEs) was

27.03%. In the third quartile, 20.27% of LHDs had between 25.00 and 74.99 FTEs. Only 14.15% of LHDs was in the highest quartile (75.00 or more FTEs).

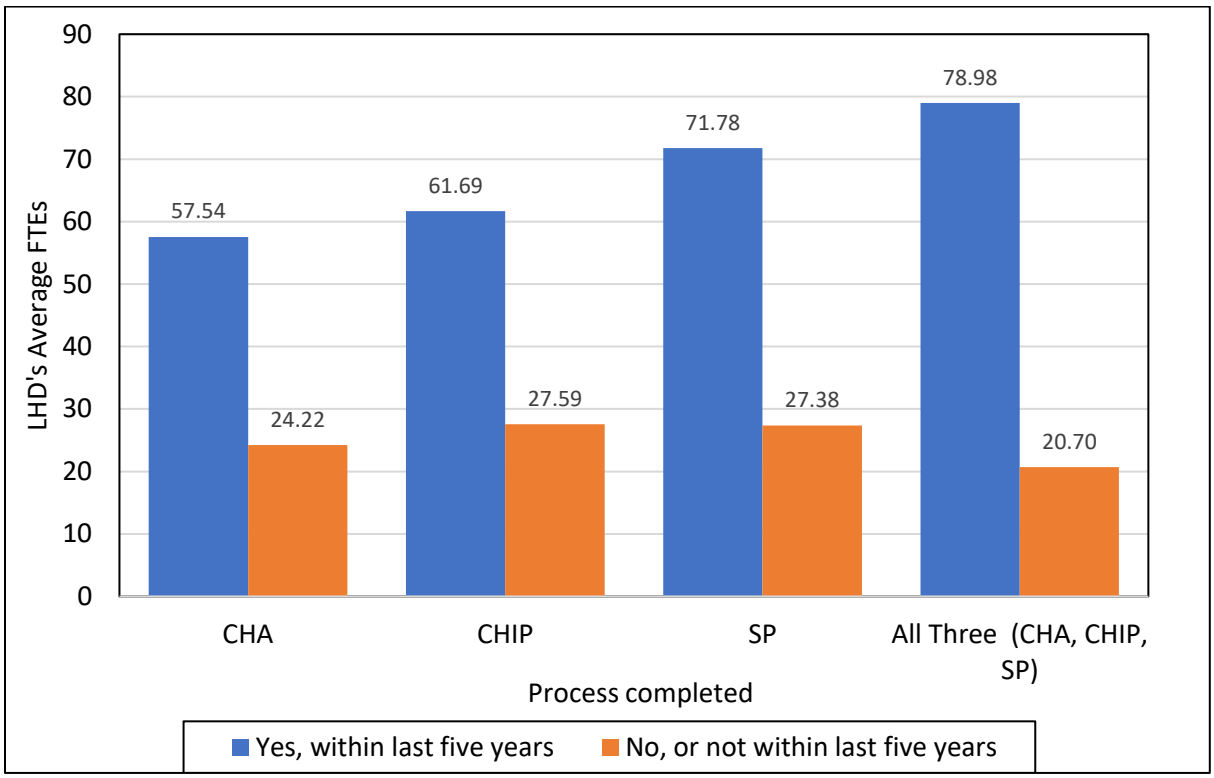

Figure 3: Full-time Equivalents Employed by LHD Engagement in CHA, CHIP, or SP or in All Three Processes.
Abbreviations: LHD, Local health department; FTEs, Full-time equivalents; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning.
Note: LHD Total FTEs = 71,963.93 FTEs; Overall mean = 50.10 FTEs.

Leadership characteristics of LHDs, which assessed four variables showed various descriptive statistics, as displayed in Table 2. But first, Figure 4 shows that the mean tenure for serving at the LHD's top level was 6.94 years with the median tenure at 3.61 years. The longest serving top executives had 48 years with several serving for less than a year. Mean length of LHD top executives' tenure was 6.85 years for those who had completed all three processes compared to 7.48 years for those who had not completed all three processes in the last five years. It was 7.05 years for CHA completed compared to 6.67 years for CHA not completed. LHDs

reported CHIP and SP completed had top executives serving for 6.91 years and 6.60 years on average respectively, but the mean tenure was higher for those not completed CHIP (7.05 years) and SP (7.34 years) in the last five years.

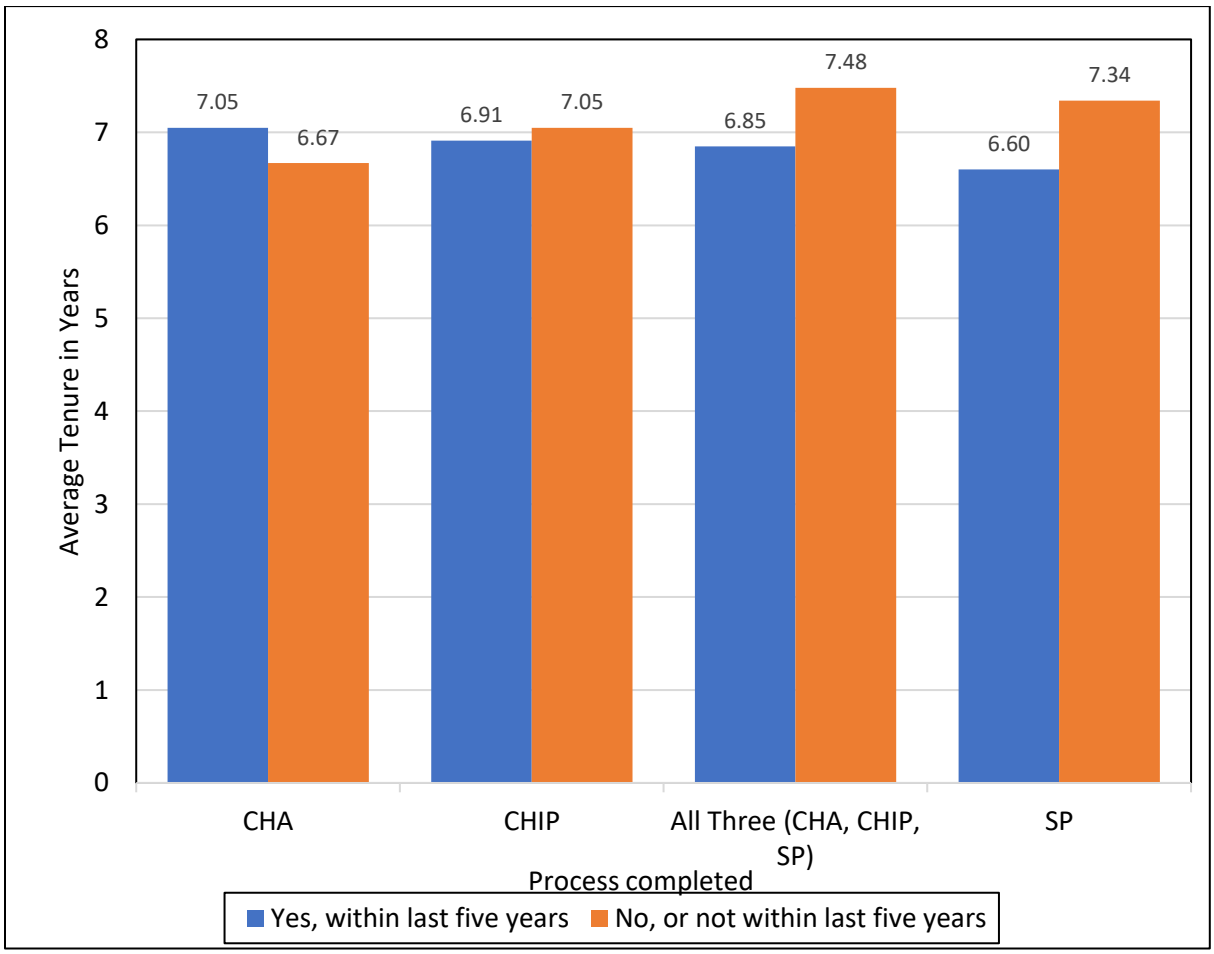

Figure 4: Top Executives Average Tenure by LHD Engagement in CHA, CHIP, or SP, or in All Three processes.
Abbreviations: LHD, Local health department; FTEs, Full-time equivalents; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning.
Note: Overall mean = 6.94 years

When categorized in quartiles, the proportion of LHDs with top executives assuming positions less than two years, from the date of survey was 28.59%. Those in their leadership positions between two and five years were 29.29%, those in positions between six and ten years were 18.23%, and those in positions for 11 or more years were 23.89%. The work status of the

top executives showed that 96.79% of LHDs who responded to survey was assessed. LHDs with full-time work status were 93.22% compared to just 6.78% with part-time work status. The gender of the top executive was 61.85% female and 38.15% male. The proportion of the top executives holding associate degrees was 8.19%, but 29.89% had bachelor's degrees, 46.18% had master's degrees, and 15.75% had doctoral degrees, including medical and juris doctoral degrees, (Table 2).

Table 2: Descriptive Statistics for Variables in the Analysis, 2016 NACCHO Profile Study

LHD Characteristics	**N, unweighted or Mean**	**Percent[a], weighted[b] or SD**
Governance structure		
State health department	377	19.60
Local health department	1385	71.98
Shared health department	168	8.42
Population Size		
Small (<50,000)	1109	61.62
Medium (49,999-499,999)	692	32.73
Large (500,000+)	129	5.65
Level of engagement in the PHAB accreditation		
Accredited or engaged	390	20.13
Planning or undecided	947	52.54
Not engaged	476	27.34
Completed all three processes (CHA, CHIP, SP)		
Yes, within last five years	834	75.10
No, or not within five years	258	24.90
CHA completed		
Yes, within last five years	1487	78.36
No, or not within five years	395	21.64
CHIP completed		
Yes, within last five years	1279	67.19
No, or not within five years	601	32.81
SP completed		
Yes, within last five years	1032	53.45
No, or not within five years	853	46.55
Have Epidemiologist/statistician employed		

Yes	536	26.39
No	1329	73.61
Have Health Educator employed		
Yes	1070	55.27
No	795	44.73
LHD total FTEs employed		
Lowest quartile (< 10.00)	633	38.55
2nd quartile (10.00 - 24.99)	476	27.03
3rd quartile (25.00 - 74.99)	383	20.27
Highest quartile (> 74.99)	287	14.15
Tenure of the top executive		
< 2 years	505	28.59
2-5 years	520	29.29
6-10 years	322	18.23
11 or more years	412	23.89
Work status of the top executive		
Full-time	1749	93.22
Part-time	119	6.78
Gender of the top executive		
Male	725	38.15
Female	1133	61.85
Degree the top executive holds		
Associates	135	8.19
Bachelors	516	29.89
Masters	853	46.18
Doctorate	303	15.75
Graduate Degree	1156	61.92
Per capita expenditures	$529,563.10	$898,058

Abbreviations: NACCHO, National Association of County and City Health Officials; LHD, Local health department; PHAB, Public Health Accreditation Board; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning; FTEs, Full-time Equivalents.

[a]Percentages may not total to 100 due to rounding.

[b]Data are weighted in core questionnaire to compensate for varying non-response by size of population.

The financial characteristics of LHDs include just the per capita expenditure, which was calculated as total LHD expenditure divided by the total population of an LHD. Univariate analysis showed a total number of 1286 LHDs with status report. In general, LHDs spent

529,563.10 dollars per 10,000 population on average with a median distribution of $380,308.10 and a standard deviation of $898,058. The minimum spending was $12,763 and the maximum was $27,826,445. Figure 5 depicted a right-skewed distribution, showing that majority (mode) of LHDs spent less than 600,000 dollars per 10,000 population.

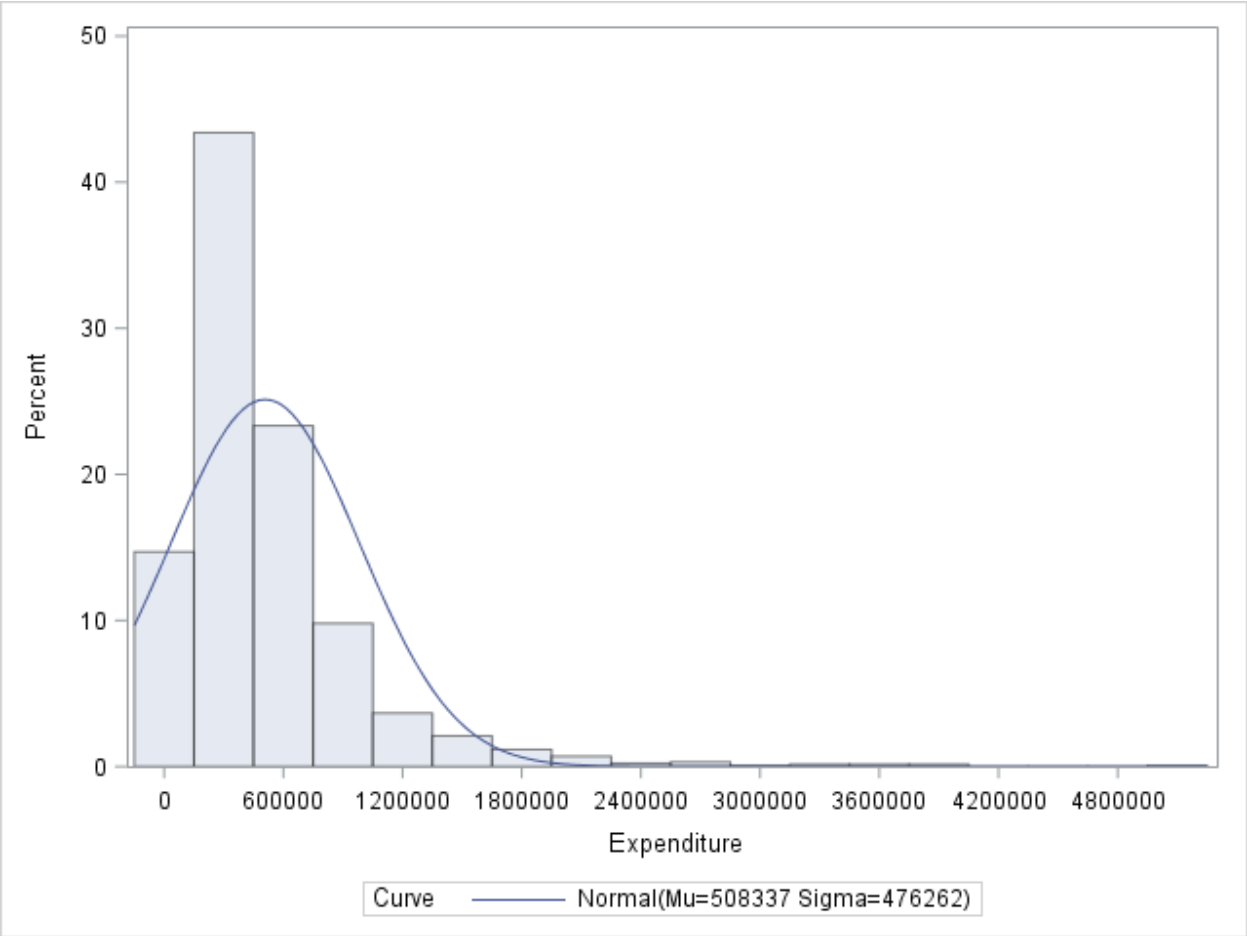

Figure 5: Per capita Expenditure per 10,000 population
Note: The average and standard deviation are different because the values above six million dollars were eliminated to improve the shape and normality of the figure.

Bivariate Analyses for the Research Questions

Which workforce characteristics of LHDs are associated with completion of CHA, CHIP, and SP?

Table 3 shows the distributions of independent variables of workforce characteristics by LHDs completion of CHA, CHIP, or SP or all three processes. In general, bivariate analyses showed that the p-value was <0.0001 for all outcome measures.

Of the 354 LHDs who employed epidemiologists/statisticians, 87.92% had completed all three processes (CHA, CHIP, and SP) within the last five years compared to just 12.08% who reported no or not within the last five years. The 714 of LHDS who reported that they did not employ epidemiologists/statisticians, 69.72% had completed all three processes within the last five years compared to 30.28% who had not completed them within the last five years.

When the bivariate analysis was carried out on each process, the majority (86.26%) of LHDs who had epidemiologists/statisticians on staff had completed CHA within the last five years. The remaining proportion (13.74%) of LHDs who had epidemiologists/statisticians on staff did not complete CHA within the last five years. Also, higher proportion (75.44%) of LHDs who did not employ epidemiologists/statisticians had completed CHA than not (24.56%). Similar outcomes were observed for LHDs participation in CHIP process. A larger proportion (78.23%) of LHDs was shown to have CHIP completed if they employed epidemiologists/statisticians compared to 21.77% who did not complete CHIP within the last five years. LHDs who did not have epidemiologists/statisticians on staff and completed CHIP within the last five years were 63.30% and those who did not complete CHIP were 36.70%. Participation in SP was a little lower for LHDs who employed epidemiologists/statisticians. The distribution showed that 67.62% of LHDs had completed SP and 32.38% had not completed SP within the last five years if they had epidemiologists/statisticians on staff. Participation in SP process was about split in half (48.35% for completion, 51.65% for non-completion) if LHDs did not have epidemiologists/statisticians on staff.

The second independent variable under workforce characteristics is whether one or more health educators were employed by an LHD. A higher proportion (88.35%) of LHDs who employed health educators had completed all the three processes (CHA, CHIP, and SP) and only 11.65% had not completed all three processes within the last five years. On the other hand, more than fifty percent (54.50%) of LHDs who had health educators on staff had completed all three processes while 45.50% had not completed them within the last five years. The completion rates for CHA within the last five was 85.77% if a health educator was employed and 30.92% without a health educator employed. More than two-thirds (69.08%) of LHDs without health educators on staff had completed CHA and 14.23% of LHDs who employed health educators had not completed CHA within the last five years. There was a total of 1250 LHDs completing CHIP within the last five years. Higher proportion, 77.96%, of LHDs who employed health educators had completed CHIP and only 22.04% of them had not completed CHIP within the last five years. The proportion of LHDs who had completed CHIP without health educators on staff was 54.03% compared to 45.97% of those who did not complete CHIP within the last five years. About two-thirds (66.32%) of the 1070 LHDs with health educators on staff had completed SP compared to a third (33.68%) of those who did not complete SP within the last five years. Of the total number (795) of LHDs without health educators on staff, 37.35% had completed SP and 62.65% had not completed SP within the last five years.

Full-time equivalent distributions showed that the lowest proportion (53.52%) of LHDs who had completed all three processes (CHA, CHIP, and SP) within the last five years were in the lowest quartile (<10 FTEs). Less than a half (46.48%) had not complete them within the last five years in the lowest quartile. Over three quarters (77.83%) of LHDs in the second quartile (10.00-24.99 FTEs) had completed all three processes compared to just 22.17% of those who had

not completed all three processes within the last five years. In the third quartile (25.00 - 74.99 FTEs), 87.18% had completed all three processes compared to just 12.82% who had not. Finally, LHDs who had 75 or more FTEs (highest quartile), showed a completion rates of 93.09% compared to 6.91% with no completion status of all three processes within the last five years.

Engagement in each process by quartile also showed that the proportion of LHDs who completed each process increased as the number of FTEs increased. Specifically, 68.97% of LHDs in the lowest quartile had completed CHA and 32.03% had not completed CHA within the last five years. For the LHDs who employed 10.00 to 24.99 FTEs, 79.63 % had completed CHA compared to 20.37% of LHDs who had not completed CHA within the last five years. In the third quartile (25.00 - 74.99 FTEs), 83.16% of LHDs had completed CHA and 16.84% and had not within the last five years. In the highest quartile, more than ninety percent (90.94%) had completed CHA compared to just 9.06% for those who had not within the last five years. The LHDs completing CHIP with fewer than 10 FTEs (lower quartile) were 53.40% and 46.60% had not completed it within the last five years. In the second quartile (10.00 – 24.99 FTEs), 70.82% of LHDs had completed CHIP and 29.18% had not within the last five years. In the third quartile, 75.66% and 24.34% of LHDs reported “Yes” and “No” CHIP completed within the last five years respectively. Finally, in the highest quartile, 80.93% of LHDs had completed CHIP and 19.07% had not completed CHIP within the last five years. Only 36.88% of LHDs who employed less than 10 FTEs (lower quartile) had completed SP compared to 63.12% of LHDs who had not within last five years. In the second quartile, 54.57% of LHDs had completed SP and 45.43% had not in the last five years. In the third quartile, 63.06% of LHDs had completed SP and 36.94% had not within the last five years. For LHDs who employed 75 or more FTEs

(highest quartile), 74.61% had completed SP and 25.39% had not completed SP within the last five years.

Table 3: Workforce characteristics of LHDs associated with completion of CHA, CHIP, and SP, 2016 NACCHO Profile Study

	Completed all three processes (CHA, CHIP, SP)		**CHA completed**		**CHIP completed**		**SP completed**	
Workforce Characteristics	Yes, (%) or p	No, (%) or p	Yes, (%) or p	No, (%) or p	Yes, (%) or p	No, (%) or p	Yes, (%) or p	No, (%) or p
Epidemiologist/statistician employed	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Yes, within last five years	87.92	12.08	86.26	13.74	78.23	21.77	67.62	32.38
No, or not within five years	69.72	30.28	75.44	24.56	63.3	36.7	48.35	51.65
Health Educator employed	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Yes, within last five years	88.35	11.65	85.77	14.23	77.96	22.04	66.32	33.68
No, or not within five years	54.50	45.50	69.08	30.92	54.03	45.97	37.35	62.65
LHD total FTEs	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Lowest quartile (< 10.00)	53.52	46.48	68.97	31.03	53.4	46.6	36.88	63.12
2nd quartile (10.00 - 24.99)	77.83	22.17	79.63	20.37	70.82	29.18	54.57	45.43
3rd quartile (25.00 - 74.99)	87.18	12.82	83.16	16.84	75.66	24.34	63.06	36.94
Highest quartile (> 74.99)	93.09	6.91	90.94	9.06	80.93	19.07	74.61	25.39

Abbreviations: LHD, Local health department; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning; FTEs, Full-time equivalents; NACCHO, National Association for County and City Health officials.
Note: Statistical test used for p-value was Chi-Square

Which leadership characteristics of LHDs are associated with completion of CHA, CHIP, and SP?

The leadership characteristics of LHDs associated with completion of CHA, CHIP, or SP, or all three processes were analyzed and presented in Table 4. The research question assessed different levels of the top executives of LHDs and their engagement in the assessments and planning processes (CHA, CHIP, and SP). Bivariate analyses for engaging in each of these three processes by LHD characteristics is also shown in the table. Leadership characteristics for the tenure of the top executive of an LHD had a $p = 0.0227$ for participating in all three processes (CHA, CHIP, and SP), $p = 0.0140$ for participating in CHA, $p = 0.0138$ for participating in CHIP, and $p = 0.0048$ for participating in SP. The bivariate analysis for the work status of the LHD's top executive assessed completion of CHA, CHIP, SP, or all three processes as well. The overall p-value for completing these processes by an LHD was <.0001 for a full-time or part-time top executive. The bivariate analyses for the gender of top executive had a $p < .0001$ for participating either in all three processes or in CHA alone. It had $p = 0.0001$ for participating in CHIP and $p = 0.4365$ for participating in SP alone. The degree top executive holds within an LHD was associated with completion of all the three processes ($p < .0001$), CHA ($p = 0.0033$), CHIP ($p = 0.0003$), and SP ($p < .0001$) within the last five years.

When categorized by number of years an LHD's top executive stayed in position, 72.87% of LHDs with top executives serving for less than two years had completed all three processes within the last five years compared to just 27.13% of those who had not. Completion of all three processes by tenure of the top executive in leadership position for 2-5 years was 78.35% compared to 21.65% for those who did not complete them within the last five years. For LHDs with the top executives in leadership positions for 6-10 years, 82.68% reported all three

processes completed within the last five years compared to just 17.32% of those who had not. And finally, for LHDs with the top executives in positions for 11 or more years, 71.49% had completed all three processes within the last five years compared to 28.51%.

Table 4 also represents the proportions of LHDs completing each process by number of years of top executives in positions. LHDs who had top executives serving for less than two years had 74.99% of them with CHA completed and 25.01% with no CHA completed within the last five years. Completion of CHA by tenure of the top executive in leadership position for 2-5 years was 79.17% compared to 20.83% for those who did not complete it within the last five years. For LHDs with the top executives in leadership positions for 6-10 years, 84.52% reported all three processes completed within the last five years compared to just 15.48%. Lastly, LHDs with the top executives in positions for 11 or more years, 79.37% had completed all three processes within the last five years compared to 20.63%. With the CHIP process, about two-thirds (63.65%) of LHDs had CHIP completed with the top executive serving for less than two years and 36.35% of LHDs had not completed CHIP within the last five years in this category. Over seventy percent (70.29%) had completed CHIP within the last five years and 29.71% had not completed the process in the 2-5 years range. For LHDs with the top executives in leadership positions for 6-10 years, 73.39% reported CHIP completed within the last five years compared to about a quarter (26.61%). And finally, for LHDs with the top executives in positions for 11 or more years, 65.78% had completed CHIP within the last five years compared to about a third (34.22%). The LHDs reported SP completed with tenure of top executive of less than two years were 51.81% compared to 48.19% for those who did not within the last five years. LHDs who had completed SP with top executives serving for 2-5 years were 57.64% and those who did not complete this process within the last five years were 42.36%. Within the third level (6-10 years),

58.51% had completed SP and 41.49% had not completed SP within the last five years. In the final level, 47.63% had completed SP and 52.37% had not completed SP within the last five years.

Work status of the top executive showed that a total of 821 LHDs had completed all three processes (CHA, CHIP, and SP). The full-time work status showed that majority (78.03%) of these LHDs had completed all three processes (CHA, CHIP, and SP) and 21.97% had not done so within the last five years. The distribution of these three processes by part-time work status showed that 36.59% had completed all three processes and 63.41% had not completed these three processes within the last five years.

Analysis was also done on just LHDs participating in each process. Engagement in CHA alone showed that 79.47% of LHDs with top executives having full-time work status had completed CHA and 20.53% had not completed CHA within the last five years. With part-time work status, 63.97% of LHDs had completed CHA and 36.03% had not completed CHA within the last five years. Likewise, participation in CHIP process by LHDs showed similar outcomes. The full-time work status showed that more than two-thirds (69.07%) of LHDs had completed CHIP and about a third (30.93%) had not done so within the last five years. The part-time work status showed that less than a half (47.29%) of LHDs had completed CHIP and more than a half (52.71%) had not completed CHIP within the last five years. Engagement in SP process within the last five years showed yet another similar distribution. The full-time work status showed that a little more than a half (55.74%) of LHDs had completed SP and the remaining proportion (44.26%) had not done so within the last five years. The part-time work status showed that about a quarter (25.01%) of LHDs had completed SP and three-quarters (74.99%) had not completed SP within the last five years.

The gender of the top executive at the LHD showed that those with more females than males were engaged in CHA, CHIP, and SP. The distribution by having a female top executive showed that higher proportion (80.15%) of LHDs had completed all three processes (CHA, CHIP, and SP) and 19.85% had not done so within the last five years. On the other hand, the distribution of these three processes by male top executive was about two-thirds (68.76%) for completion and 31.24% for non-completion within the last five years.

Analysis was also done on just LHDs participating in each process. Engagement in CHA alone showed that 81.64% of LHDs with female top executives had completed CHA and 18.36% had not completed CHA within the last five years. But the distribution by male gender showed that less than three-quarters (73.17%) of LHDs had completed CHA and 26.83% had not completed CHA within the last five years. Likewise, participation in CHIP process by LHDs showed similar outcomes. The female gender of the top executive showed that more than two-thirds (70.88%) of LHDs had completed CHIP and about a third (29.12%) had not done so within the last five years. The distribution by male gender showed about two-thirds (62.28%) to about a third (37.72%) of LHDs had completed and not completed CHIP within the last five years respectively. Engagement in SP process within the last five years showed about even distributions. Female gender of the top executive showed that a little more than a half (54.59%) of LHDs had completed SP and the remaining proportion (45.41%) had not done so within the last five years. Similar distributions with male gender of the top executive were observed. A little more than a half (52.72%) of LHDs had completed SP and less than a half (47.28%) had not completed SP within the last five years.

The distribution by the degree top executive holds showed lower number of LHDs completed CHA, CHIP, and SP compared to other leadership characteristics. Specifically, LHDs

who had top executives holding associate degrees had 54.01% of them with all three processes (CHA, CHIP, and SP) completed within the last five years compared to 45.99% of LHDs who had not completed them. The distribution by having a bachelor's degree showed that 72.94% had completed all three processes and 27.06% had not done so within the last five years. In relation to other degrees top executives hold, LHDs with top executives holding master's degrees had higher proportion (82.56%) for completing all three processes than not (17.44%) within the last five years. And finally, for LHDs with the top executives holding doctoral degrees, 73.35% had completed all three processes within the last five years compared to 26.65%.

The proportion of LHDs who had engaged in each process is also shown in Table 4. Level of engagement in CHA showed that 69.59% of LHDs with top executives holding associate degrees had completed CHA and 30.41% had not completed CHA within the last five years. For LHDs with the top executives holding bachelor's degrees, 78.49% reported CHA completed within the last five years compared to about a fifth (21.51%) reported no or not within the last five years. LHDs with top executives who hold master's degrees showed 82.08% had CHA completed and 17.92% had no CHA completed within the last five years. Lastly, LHDs with the top executives holding doctoral degrees, showed 76.34% had CHA completed and 23.66% had no completed CHA within the last five years. With the CHIP process, only 58.24% had completed CHIP and 41.76% had not completed CHIP with the last five years with top executive holding associate degrees. About two-thirds (64.27%) of LHDs with top executive holding bachelor's degrees had completed CHIP and 35.73% had not completed CHIP within the last five years. For LHDs with the top executives holding master's degrees, 72.80% reported CHIP completed and 27.20% reported no completed CHIP within the last five years. Distribution of doctoral degrees of the top executives showed about two-thirds (66.24%) had completed CHIP

and about a third (33.76%) had not completed CHIP within the last five years. The proportion of LHDs who had reported SP completed with the degree of the top executive as associate was 39.29 % compared to 60.71% for reporting "No, or not within the last five years". LHDs who had completed SP with top executives holding bachelor's degrees were 46.77% and those who did not complete this process within the last five years were 53.23%. With the master's degree distribution, 61.17% had completed SP and 38.83% had not completed SP within the last five years. In the final degree attainment level (doctoral degree), 56.09% had completed SP and 43.91% had not completed SP within the last five years.

Table 4: Leadership characteristics of LHDs associated with completion of CHA, CHIP, and SP, 2016 NACCHO Profile Study

	Completed all three processes (CHA, CHIP, SP		**CHA completed**		**CHIP completed**		**SP completed**	
Leadership Characteristics	Yes, (%) or p	No, (%) or p	Yes, (%) or p	No, (%) or p	Yes, (%) or p	No, (%) or p	Yes, (%) or p	No, (%) or p
Tenure of the top executive	0.0227	0.0227	0.0140	0.0140	0.0138	0.0138	0.0048	0.0048
< 2 years	72.87	27.13	74.99	25.01	63.65	36.35	51.81	48.19
2-5 years	78.35	21.65	79.17	20.83	70.29	29.71	57.64	42.36
6-10 years	82.68	17.32	84.52	15.48	73.39	26.61	58.51	41.49
11 or more years	71.49	28.51	79.37	20.63	65.78	34.22	47.63	52.37
Work status of the top executive	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Part-time	36.59	63.41	63.97	36.03	47.29	52.71	25.01	74.99
Full-time	78.03	21.97	79.47	20.53	69.07	30.93	55.74	44.26
Gender of the top executive	<.0001	<.0001	<.0001	<.0001	0.0001	0.0001	0.4365	0.4365
Male	68.76	31.24	73.17	26.83	62.28	37.72	52.72	47.28
Female	80.15	19.85	81.64	18.36	70.88	29.12	54.59	45.41
Degree top executive holds	<.0001	<.0001	0.0033	0.0033	0.0003	0.0003	<.0001	<.0001
Associates	54.01	45.99	69.59	30.41	58.24	41.76	39.29	60.71
Bachelors	72.94	27.06	78.49	21.51	64.27	35.73	46.77	53.23
Masters	82.56	17.44	82.08	17.92	72.8	27.2	61.17	38.83
Doctoral	73.35	26.65	76.34	23.66	66.24	33.76	56.09	43.91

Abbreviations: LHD, Local health department; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning; NACCHO, National Association for County and City Health officials.
Note: Statistical test used for p-value was chi-square.

Which financial characteristics of LHDs are associated with completion of CHA, CHIP, and SP?

Table 5 shows summary statistics for completion of CHA, CHIP, SP, or all three processes by LHDs per capita expenditure. Chi-square test outcome showed that LHD per capita expenditure per 10,000 populations was associated with completion of all three processes in the last five years ($p = 0.0042$). Univariate analysis showed that the distribution of LHD spending on CHA, CHIP, SP, or all three processes was widespread and right-skewed. As shown in Table 5, the average per capita expenditure per 10,000 population by LHDs is higher than their median spending. Those reported completing all three processes (CHA, CHIP, and SP) showed wider distribution and higher per capita expenditure (Standard Deviation [SD] = 1206353; mean = 600860.4; median = 423982.9) compared to those reported no, or not within the last five years (SD = 475510; mean = 428828.2; median = 291673.9). With the percentile ranking, 25% of LHDs who had completed all three processes within the last five years had a spending of less than $261,432.6 than had those who reported no, or not within five years ($130,480.9). The same was true for those in the third percentile ($682,784.3 for Yes, within last five years and $572,659.7 for No, or not within five years).

Similar distribution was also seen with participation in individual processes. LHDs per capita expenditure per 10,000 populations was highly associated with completion of CHA within the last five years ($p = 0.0009$). The distribution was wider (SD = 973633) for LHDs reported CHA completed within the last five years with average expenditure (mean = 555784.7) higher than those who did not (SD = 418854; mean = 412350.2). The median ($395,090.1) was also

higher for CHA completed than not ($302,097.5). Likewise, 25% of LHDs reported CHA completed within the last five years spent below $235,341.1 compared to $130,480.9 for those who did not. At the 75th percentile, those reported CHA completed within the last five years spent more than $658,250.9 compared to $568,585.4 spending for those who reported no, or not within the last five years.

There was association between LHDs per capita expenditure per 10,000 populations and completion of CHIP within the last five years ($p < .0001$). The spread showed that it was wider for CHIP completed (SD = 1040369) compared to no completion (SD = 419326) in the last five years. The mean for those reported CHIP completed within the last five years was $577,555.2 compared to $423,520.1 for those not completing CHIP. The median was higher ($409,481.6) for CHIP completed than not completed (307,283.9) within the last five years. With the lowest quantile, 25% of LHDs who reported CHIP completed within the last five years spent below $245,332.2 compared to $144,178.1 for those who did not. At the 75th percentile, those reported CHIP completed within the last five years spent more than $682,784.3 compared to $550,266.6 spending for those who reported no, or not within the last five years.

With the last process, LHDs per capita expenditure per 10,000 populations was associated with completion of SP within the last five years ($p = 0.0287$). The spread showed that it was wider for SP completed (SD = 1118519) compared to no completion (SD = 485697) in the last five years. The average spending for those reported SP completed within the last five years was $571,981.6 compared to $474,648.0 for those not completing SP. The median was higher ($404,024.1) for SP completed than not completed ($334,684.0) within the last five years. With the lowest quantile, 25% of LHDs who reported SP completed within the last five years spent below $248,176.2 compared to $169,012.6 for those who did not. At the 75th percentile, those

reported SP completed within the last five years spent more than $658,200.5 compared to $604,510.9 spending for those who reported no, or not within the last five years.

Table 5: Summary statistics for completion of CHA, CHIP, and SP by LHDs per capita expenditure, 2016 NACCHO Profile Study

LHD Characteristics	No. of LHDs	Mean	SD	Q1 (25%)	Median (50%)	Q3 (75%)	P-Value
Completed all three processes (CHA, CHIP, SP)							
No, or not within five years	149	428828.2	475510	130480.9	291673.9	572659.7	
Yes, within last five years	607	600860.4	1206353	261432.6	423982.9	682784.3	0.0042
CHA completed							
No, or not within five years	223	412350.2	418854	130480.9	302097.5	568585.4	
Yes, within last five years	1049	555784.7	973633	235341.1	395090.1	658250.9	0.0009
CHIP completed							
No, or not within five years	377	423520.1	419326	144178.1	307283.9	550266.6	
Yes, within last five years	891	577555.2	1040369	245332.2	409481.6	682784.3	<.0001
SP completed							
No, or not within five years	550	474648.0	485697	169012.6	334684.0	604510.9	
Yes, within last five years	723	571981.6	1118519	248176.2	404024.1	658200.5	0.0287

Abbreviations: CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning; LHD, Local health department; NACCHO, National Association for County and City Health Officials.
Note: Statistical test used for p-value was Chi-Square test.

Are LHDs who completed CHA, CHIP, or SP, more likely to engage in PHAB accreditation program?

Figure 6 represents the distribution of participating in all three processes (CHA, CHIP, and SP) by LHD's engagement in the PHAB accreditation process. Of all 1930 LHDs in the survey, 47% were missing data. More than ninety percent (90.81%) of LHDs who were

accredited or engaged in the accreditation process had completed all three processes within the last five years and 9.19% had not completed them. LHDs who were "Planning or undecided", reported that 71.68% had completed all three processes and 28.32% had not within the last five years. About two-thirds (63.63%) of LHDs who had "Not engaged" in the accreditation process reported that they had completed all three processes within the last five and about a third (36.37%) reported "No, or not within five years".

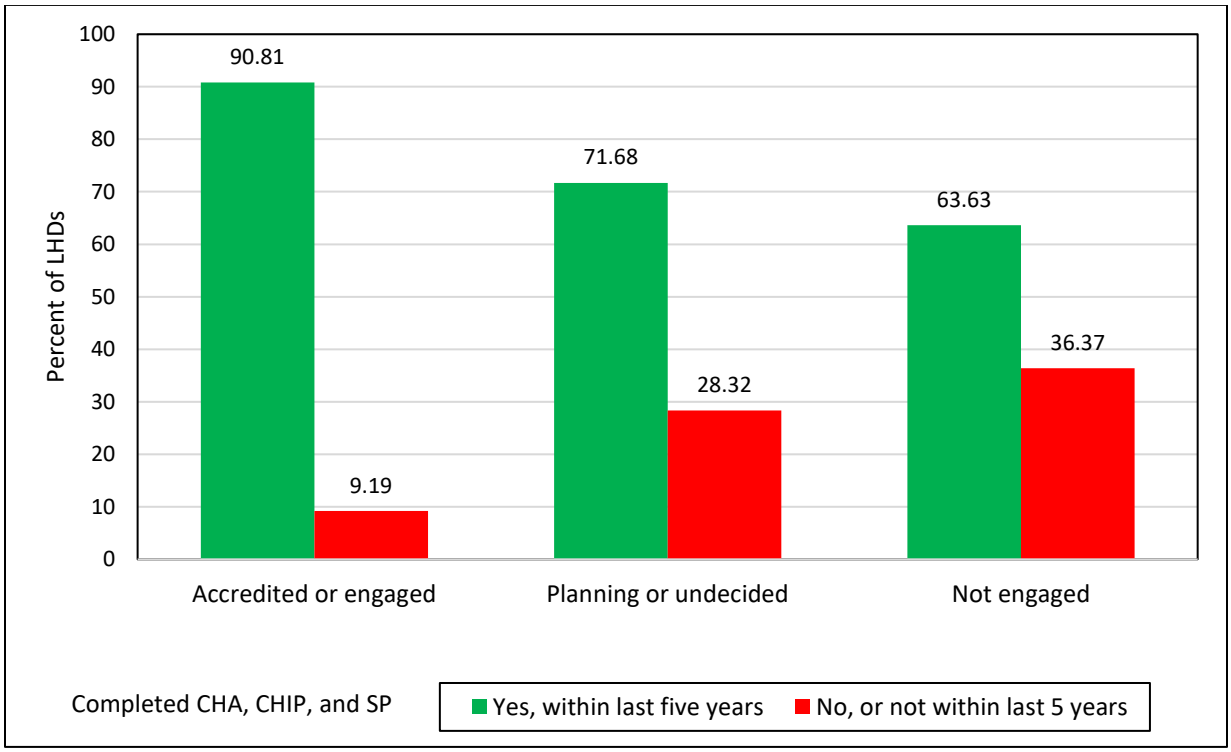

Figure 6: Proportion of LHDs participating in PHAB accreditation by current CHA, CHIP, and SP Process.
Number of LHDs = 1043
Abbreviations: LHD, Local health department; PHAB, Public Health Accreditation Board; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning.

Table 6 shows the distribution of participating in PHAB accreditation by LHD characteristics. Chi-square test showed that the p-value (<.0001) for governance structure, population size, engaging in CHA, CHIP, SP, and in all three processes was statistically

significant. This indicated that LHDs who completed all three processes (CHA, CHIP, and SP) are more likely to be engaged in the PHAB accreditation process.

The distribution of PHAB accreditation status by governance structure showed that less than a quarter (23.91%) of LHDs who were classified as state-governed were accredited or engaged, but 38.72% were planning or undecided, and 37.37% were not engaged in the PHAB accreditation process. LHDs who were classified as locally-governed showed 15.05% of LHDs were accredited or engaged, 57.69% were planning or undecided, and 27.26% were not engaged in the PHAB accreditation process. In the final governance structure, LHDs classified as shared governance showed that majority (55.15%) of them were accredited or engaged, but a little over a third (37.10%) were planning or undecided, and just under ten percent (7.76%) were not engaged in the PHAB accreditation process.

The 1930 LHDs in this study served populations ranging from 120 to 9,502,247. However, those "Accredited or engaged" in the accreditation process had a population ranging from 3,931 to 9,502,247. The LHDs with the "Planning or undecided" accreditation status ranged from 720 to 8,491,079. Those under the third (Not engaged) status ranged from minimum population size of 120 to 1,655,335. When population size was categorized into small (< 50,000), medium (50,000-499,999), and large (500,000 or greater) jurisdiction sizes, most LHDs who were serving small population size had an accreditation status of "Planning or undecided" (55.34%), this was followed by those "Not engaged" (33.87%), then by those "Accredited or engaged" (10.79%) in the accreditation process. LHDs serving medium size population had 31.22% "Accredited or engaged", 50.30% "Planning or undecided", and 18.47% "Not engaged" in the PHAB accreditation process. Finally, LHDs with large size population had 55.48%

"Accredited or engaged", 35.80%) "Planning or undecided", and 8.72% "Not engaged" in the PHAB accreditation process.

The total number of LHDs who had completed CHA within the last five years was 1425. Of this total 22.95% were accredited or engaged, 52.54% were planning or undecided, and 24.51% were not engaged in the accreditation process. Of the 373 LHDs reported "No, or not with five years", 10.05% were accredited or engaged, 52.71% were planning or undecided, and 37.24% were not engaged in the accreditation process. Participation in PHAB accreditation by LHD's CHIP status showed that a total of 67.99% of LHDs had completed CHIP within the last five years. However, only 24.79% was accredited or engaged in the PHAB accreditation, 51.16% reported being in the planning or undecided, and 24.05% were not engaged in the PHAB accreditation process. The distribution of remaining 32.01% for LHDs who did complete CHIP within the last five years showed that about a quarter (24.79%) was accredited or engaged in the PHAB accreditation, 51.16% were planning or undecided, and 24.05% were not engaged in the PHAB accreditation process. Of the 53.35% of LHDs who had completed SP in the last five years, 31.74% were accredited or engaged, 45.23% were planning or undecided, and 23.03% were not engaged in the PHAB accreditation processes. The distribution of the remaining 46.65% of LHDs who had not completed SP in the last five years showed that 7.08% were accredited or engaged, 60.95% were planning or undecided, and 31.97% were not engaged in the PHAB accreditation process.

Table 6: Relationship Between Likelihood of Completing PHAB Accreditation and Local Health Department Characteristics, 2016 NACCHO Profile Study

LHD Characteristics	Accredited or engaged, (%) or p	Planning or undecided, (%) or p	Not engaged, (%) or p
Governance structure	<.0001	<.0001	<.0001

State health department	23.91	38.72	37.37
Local health department	15.05	57.69	27.26
Shared health department	55.15	37.10	7.76
Population Size	<.0001	<.0001	<.0001
Small (<50,000)	10.79	55.34	33.87
Medium (49,999-499,999)	31.22	50.30	18.47
Large (500,000+)	55.48	35.80	8.72
Completed all three processes (CHA, CHIP, SP)	<.0001	<.0001	<.0001
Yes, within last five years	35.91	44.14	19.94
No, or not within five years	11.20	53.70	35.10
CHA completed	<.0001	<.0001	<.0001
Yes, within last five years	22.95	52.54	24.51
No, or not within five years	10.05	52.71	37.24
CHIP completed	<.0001	<.0001	<.0001
Yes, within last five years	24.79	51.16	24.05
No, or not within five years	10.56	55.14	34.3
SP completed	<.0001	<.0001	<.0001
Yes, within last five years	31.74	45.23	23.03
No, or not within five years	7.08	60.95	31.97

Abbreviations: PHAB, Public Health Accreditation Board; NACCHO, National Association of County and City Health Officials; LHD, Local health department; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning.

Inferential Statistics by LHD's Characteristics

Workforce Characteristics

Table 7 uses inferential statistics to compare completion of all three processes (CHA, CHIP, and SP) by LHDs' workforce characteristics. Values represent adjusted odds ratios along with 95% confident intervals and their corresponding p-values. Since completion of CHA, CHIP, and SP were initially compared with the workforce predictors using unadjusted odds ratios, this table included them and are enclosed in parentheses. Influence of workforce characteristics on

completion of all three processes (CHA, CHIP, and SP), or in individual process (CHA, CHIP, or SP) by an LHD was controlled for governance structure and population size.

Controlling for governance structure alone showed that LHDs locally governed had higher odds and were significantly more likely to complete all three processes (Odd ratio [OR] = 1.98; 95% confidence interval [CI] = 1.421, 2.747; p-value [p] <.0001) than state-governed LHDs. This was also true for those categorized as shared governance LHDs (OR = 5.33; CI = 2.681, 10.603; p <.0001) compared to state-governed LHDs. Adding population size as control variable produced similar outputs (Adjusted odds ratio [AOR] = 1.91; CI = 1.350, 2.704; p = 0.0003 for locally governed and AOR = 4.84; CI = 2.393, 9.786; p <.0001 for shared governance) with state-governed as reference.

Local health department characteristics of population size was statistically significance for completing all the three processes (CHA, CHIP, and SP). With no control variable in the model, LHDs with the medium population size had higher odds and more likely to complete all the three processes (OR = 3.10; CI = 2.238, 4.296; p<.0001) than were small size jurisdictions. Likewise, those with large size population had higher odds and more likely to complete all the three processes (OR = 8.73; CI = 3.480, 21.923; p<.0001) than were small size jurisdictions. When controlled for governance structure, LHDs had higher odds and more likely to complete all the three processes when they were medium (AOR = 3.09; CI = 2.227, 4.282; p<.0001) and large (AOR = 7.74; CI = 3.046, 19.656; p<.0001) population sizes than were small size population.

Logistics regression analysis was also conducted to assess the workforce characteristics associated with completion of these processes. In general, LHDs employing epidemiologists/statisticians were more likely to have completed all three processes (OR = 3.16;

CI= 2.193, 4.558; p<.0001). However, when controlled for governance structure and population size, employing an epidemiologist/statistician showed lower odds and less significance (AOR = 1.53; CI = 0.991, 2.362; p = 0.0551). When broken down by each process, LHDs who had employed epidemiologists/statisticians were more likely to report CHA completed (OR = 2.04; 95% CI = 1.542, 2.710; p <.0001), or CHIP completed (OR = 2.08; 95% CI = 1.643, 2.642; p <.0001), or SP completed (OR = 2.23; 95% CI = 1.801, 2.763; p <.0001) than were those who had not employed epidemiologists/statisticians. After controlling for governance structure and population size, LHDs who employed epidemiologists/statisticians were less likely to having CHA completed (AOR = 1.37; CI = 0.973, 1.928; p = 0.0717), but more likely to having CHIP completed (AOR = 1.42; CI = 0.1.075, 1.874; p = 0.0.0135) and SP completed (AOR = 1.48; CI = 1.152, 1.912; p = 0.0023) than had no epidemiologists/statisticians employed.

Local health departments who reported having employed health educators as part of their public health workforce were significantly more likely to indicate completed all three processes (CHA, CHIP, and SP) (OR = 6.33; 95% CI = 4.623, 8.665; p <.0001) than those who did not. Similar results were also seen with control variables (governance structure and population size) added to the model (AOR = 4.80; CI = 3.448, 6.690; p <.0001). With each process, they were also more likely to having CHA completed (OR = 2.70; 95% CI = 2.137, 3.406; p <.0001), or CHIP completed (OR = 3.01; 95% CI = 2.453, 3.693; p <.0001), or SP completed (OR = 3.30; 95% CI = 2.719, 4.013; p <.0001). Although there were slight decreased in likelihood after controlling for governance structure and population size, there were still statistically significant differences by LHD characteristics (AOR = 2.24; CI = 1.738, 2.880; p <.0001 for CHA, AOR = 2.57; CI = 2.065, 3.194; p <.0001 for CHIP, and AOR = 2.80; CI = 2.273, 3.444; p <.0001, for SP).

The final category of LHD workforce characteristics was LHD total FTEs employed. Size of workforce, measured by LHD total FTEs, was positively associated with LHDs' completion of all three processes (AOR = 1.00; CI = 0.995, 1.023; p = 0.1927), CHA (AOR = 1.00; CI = 1.000, 1.011; p = 0.0335,) or CHIP (AOR = 1.00; CI = 1.000, 1.006; p = 0.940), or SP (AOR = 1.00; CI = 0.1.001, 1.007; p = 0.0078) within the last five years. The association was also the same when control variables were not added to the model.

When categorized into quartiles, LHDs in the second quartile were more likely to having completed all three processes (OR = 3.05; 95% CI = 2.115, 4.391; p<.0001) than were LHDs in the lowest quartile. Controlling for governance structure and population size still showed an even higher odds (AOR = 3.54) for completing this process and higher statistical significance (CI = 2.378, 5.277; p <.0001). Similarly, LHDs in the third quartile (OR = 5.90; 95% CI = 3.755, 9.283; p<.0001) or the highest quartile (OR = 11.71; 95% CI = 6.491, 21.114; p<.0001) were more likely to having completed all three processes than were in the lowest quartile. This also holds true after controlling for governance structure and population size (AOR = 5.21; CI = 3.172, 8.572; p<.0001 for those in the third quartile and AOR = 8.25; CI = 3.878, 17.559; p<.0001 in the highest quartile). When broken down into each process, LHDs in the second quartile (OR = 1.76; 95% CI = 1.326, 2.332; p = 0.0002) or in the third quartile (OR = 2.22; 95% CI = 1.614, 3.058; p<.0001), or in the highest quartile (OR = 4.52; 95% CI = 2.913, 7.003; p<.0001) were more likely to having CHA completed than were in the lowest quartile. Similar outputs were seen after controlling for governance structure and population size (AOR = 1.98; CI = 1.470, 2.672; p<.0001 for those in the second quartile, AOR = 2.25; CI = 1.546, 3.227; p<.0001 in the third quartile, and AOR = 4.75; CI = 2.614, 8.625; p<.0001 in the highest quartile). LHDs were significantly more likely to having CHIP completed when they were in the

second quartile (OR = 2.12; 95% CI = 1.642, 2.731; p<.0001), or in the third quartile (OR = 2.71; 95% CI = 2.041, 3.603; p<.0001), or in the highest quartile (OR = 3.70; 95% CI = 2.644, 5.186; p<.0001) than were in the lowest quartile. This also holds true after controlling for governance structure and population size (AOR = 2.41; CI = 1.836, 3.154; p<.0001 for those in the second quartile, AOR = 2.71; CI = 1.918, 3.841; p<.0001 in the third quartile, and AOR = 3.07; CI = 1.930, 4.874; p<.0001 in the highest quartile). Similar likelihoods were seen with LHDs participating in developing strategic planning. They were significantly more likely to having SP completed when they were in the second quartile (OR = 2.06; 95% CI = 1.608, 2.629; p<.0001), or in the third quartile (OR = 2.92; 95% CI = 2.240, 3.812; p<.0001), or in the highest quartile (OR = 5.03; 95% CI = 3.674, 6.884; p<.0001) than were in the lowest quartile. After controlling for the governance structure and population size, LHDs were still more likely to having SP completed in all categories (AOR = 1.94; CI = 1.498, 3.154; p<.0001 for those in the second quartile, AOR = 2.58; CI = 1.877, 3.550; p<.0001 in the third quartile, and AOR = 3.85; CI = 2.501, 5.941; p<.0001 in the highest quartile).

Table 7: Logistic Regression for Completing CHA, CHIP, and SP, 2016 NACCHO Profile Study

	Completed all three processes (CHA, CHIP, SP		**CHA completed**		**CHIP completed**		**SP completed**	
Workforce Characteristics	AOR (OR)	p[a] (95% CI)	AOR (OR)	p[a] (95% CI)	AOR (OR)	p[a] (95% CI)	AOR (OR)	p[a] (95% CI)
Governance structure								
State health department	Ref		Ref		Ref		Ref	
Local health department	1.91 (1.98)	**0.0003** (1.350, 2.704)	2.30 (2.27)	**<.0001** (1.772, 2.983)	2.16 (2.14)	**<.0001** (1.697, 2.749)	0.79 (0.81)	0.0582 (0.617, 1.008)
Shared health department	4.84 (5.33)	**<.0001** (2.393, 9.786)	4.64 (4.84)	**<.0001** (2.636, 8.173)	4.30 (4.50)	**<.0001** (2.685, 6.871)	1.46 (1.60)	0.0663 (0.975, 2.194)

Population Size								
Small (<50,000)	Ref		Ref		Ref		Ref	
Medium (49,999-499,999)	3.09 (3.10)	**<.0001** (2.227, 4.282)	2.00 (1.98)	**<.0001** (1.548, 2.583)	1.83 (1.81)	**<.0001** (1.473, 2.271)	2.05 (2.06)	**<.0001** (1.683, 2.504)
Large (500,000+)	7.74 (8.73)	**<.0001** (3.046, 19.656)	2.23 (2.43)	**<.0001** (1.276, 3.880)	2.88 (3.10)	**<.0001** (1.752, 4.736)	4.50 (4.65)	**<.0001** (2.852, 7.092)
Epidemiologist/statistician employed								
No, or not within five years	Ref		Ref		Ref		Ref	
Yes, within last five years	1.53 (3.16)	0.0551 (0.991, 2.362)	1.37 (2.04)	0.0717 (0.973, 1.928)	1.42 (2.08)	**0.0135** (1.075, 1.874)	1.48 (2.23)	**0.0023** (1.152, 1.912)
Health Educator employed								
No, or not within five years	Ref		Ref		Ref		Ref	
Yes, within last five years	4.80 (6.33)	**<.0001** (3.448, 6.690)	2.24 (2.70)	**<.0001** (1.738, 2.880)	2.57 (3.01)	**<.0001** (2.065, 3.194)	2.80 (3.30)	**<.0001** (2.273, 3.444)
LHD total FTEs[b]	1.00 (1.02)	0.1927 (0.995, 1.023)	1.00 (1.01)	**0.0335** (1.000, 1.011)	1.00 (1.02)	0.0940 (1.000, 1.006)	1.00 (1.02)	**0.0078** (1.001, 1.007)
Lowest quartile (< 10.00)	Ref		Ref		Ref		Ref	
2nd quartile (10.00 - 24.99)	3.54 (3.05)	**<.0001** (2.378, 5.277)	1.98 (1.76)	**<.0001** (1.470, 2.672)	2.41 (2.12)	**<.0001** (1.836, 3.154)	1.94 (2.06)	**<.0001** (1.498, 2.500)
3rd quartile (25.00 - 74.99)	5.21 (5.90)	**<.0001** (3.172, 8.572)	2.25 (2.22)	**<.0001** (1.546, 3.277)	2.71 (2.71)	**<.0001** (1.918, 3.841)	2.58 (2.92)	**<.0001** (1.877, 3.550)
Highest quartile (> 74.99)	8.25 (11.71)	**<.0001** (3.878, 17.559)	4.75 (4.52)	**<.0001** (2.614, 8.625)	3.07 (3.70)	**<.0001** (1.930, 4.874)	3.85 (5.03)	**<.0001** (2.501, 5.941)

Abbreviations: CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning; LHD, Local health department; FTEs, Full-time equivalent; AOR, Adjusted odds ratio; OR, Odds ratio.

[a]Boldface indicates $p < .05$ for statistical significance when controlled for governance structure and population size.

[b]LHD total FTEs was computed as a continuous variable.

Leadership Characteristics

Mixed relationship between leadership characteristics and completion of CHA, CHIP, and SP are seen in Table 8. This table represents adjusted odds ratio along with correspondent

95% confident intervals and p-values. Control variables (governance structure and population size were added to the model to adjust for LHDs participation in these processes. The process and outputs for the effects of these control variables are similar to what had been described in the "Workforce Characteristics" section above. Logistic regression analysis indicated that tenure of top executive was only statistically significant when tenure was between six and ten years. After controlling for governance structure and population size, LHDs who had top executives serving for 6-10 years were more likely to complete all three processes (AOR = 2.08; CI = 1.259, 3.349; p = 0.0044), CHA, (AOR = 1.89; CI = 1.283, 2.775; p = 0.0013), CHIP (AOR = 1.65; CI = 1.189, 2.276; p = 0.0027), and SP (AOR = 1.35; CI = 1.005, 1.821; p = 0.0465) than with less than two years.

Overall, work status for the top executive was significantly related to either completion of all three processes or individual process. Specifically, LHDs were significantly more likely to have completed all the three processes when they had full-time status (OR = 6.15; CI = 3.556, 10.640; p<.0001) than had part-time status. When controlled for governance structure and population size, the results were similar (AOR = 5.55; CI = 3.125, 9.848; p<.0001). With each process, LHDs with top executive with full-time status (OR = 2.18; CI = 1.462, 3.252; p = 0.0001) were more likely to have CHA completed than those with part-time status. This level of significance (AOR = 2.24; CI = 1.476, 3.386; p = 0.0001) was shown when control variables (governance structure and population size) were added to the model. Similar results were reported with CHIP completed (OR = 2.49; CI = 1.701, 3.640; p<.0001) and SP completed (OR = 3.78; CI = 2.471, 5.774; p<.0001) when work status of top executive was full-time than part-time. The same results (AOR = 2.49; CI = 1.680, 3.702; p <.0001 for CHIP completed and AOR

= 2.97; CI = 1.939, 4.549; p <.0001 for SP completed) were seen when participation was controlled for governance structure and population size.

When relating the gender of the top executive, LHDs who had female top executives had higher odds and higher level of significance for completing all the three processes (CHA, CHIP, and SP) (OR = 1.83; CI = 1.374, 2.449; p<.0001) than had males. After controlling for governance structure and population size, the odds and level of significance were even higher (AOR =2.19; CI = 1.601, 2.990; p <.0001) for female than for male top executives. When related to each process, they were more likely to have CHA completed when there were female top executives (OR = 1.63; CI = 1.297, 2.050; p<.0001) than were males. This holds true (AOR =1.79; CI = 1.413, 2.279; p <.0001) after controlling for governance structure and population size. Likewise, gender of top executive was significantly related to CHIP completion when there were females (OR = 1.47; CI = 1.205, 1.804; p = 0.0002) than were males. It was slightly higher (AOR =1.62; CI = 1.313, 2.006; p <.0001) after controlling for governance structure and population size. Lastly LHDs with female top executives were more likely to have SP completed (AOR = 1.22; CI = 1.002, 1.486; p <.0001) than those with males.

Degree top executive holds showed mixed significant relationship when LHDs completed all the three processes (CHA, CHIP, and SP) or individual process (CHA, or CHIP, or SP). They were more likely to complete all the three processes when top executives hold bachelor's degrees (OR = 2.30; CI = 1.293, 4.075; p = 0.0046), or master's degrees (OR = 4.03; CI = 2.315, 7.014; p<.0001), or doctoral degrees (OR = 2.34; CI = 1.277, 4.301; p = 0.0060) than had associate degrees. When controlled for governance structure and population size, LHDs had higher odds and higher significance of completing all three processes when their top executives hold bachelor's degrees (AOR = 2.08; CI = 1.136, 3.793; p = 0.0177) or master's degrees (AOR =

2.68; CI = 1.487, 4.816; p = 0.0010), but not with doctoral degrees (AOR = 0.94; CI = 0.494, 1.880; p = 0.9124) than had associate degrees.

With each process, LHDs were more likely to have CHA completed when top executives had bachelor's degrees (OR = 1.60; CI = 1.039, 2.449; p = 0.0330), or master's degrees (OR = 2.00; CI = 1.324, 3.025; p = 0.0010), but not doctoral degrees (OR = 1.41; CI = 0.887, 2.241; p = 0.1461) compared to associate degrees. After controlling for governance structure and population size, this level of significance was lower and the degree attainments by the top executives showed no effect. Interestingly, completion of CHIP by LHDs was only significant when top executive hold master's degree (OR = 1.92; CI = 1.312, 2.809; p = 0.0008), but not with bachelor's degrees (OR = 1.29; CI = 0.871, 1.911; p = 0.2038), or doctoral degree (OR = 1.41; CI = 0.920. 2.152; p = 0.1150) compared to those with associate degree. Even interestingly, there were no association when control variables were added. Finally, LHDs had higher odds and higher level of significance to complete SP when degree top executive holds a master (OR = 2.43; CI = 1.670, 3.548; p<.0001), or a doctoral (OR = 1.97; CI = 1.298, 3.003; p = 0.0015), but not when it was a bachelor's degree (OR = 1.36; CI = 0.918, 2.008; p = 0.1252) with an associate degree as reference. However, this level of significance was only seen when LHDs complete SP with top executive holding master's degree (AOR = 1.83; CI = 0.846, 1.867; p = 0.0024) than those holding associate degrees after controlling for governance structure and population size.

Table 8: Logistic Regression of Completing CHA, CHIP, and SP, 2016 NACCHO Profile Study

Leadership Characteristics	**Completed all three processes (CHA, CHIP, SP**	**CHA completed**	**CHIP completed**	**SP completed**

	AOR (OR)	p[a] (95% CI)	AOR (OR)	p[a] (95% CI)	AOR (OR)	p[a] (95% CI)	AOR (OR)	p[a] (95% CI)
Governance structure								
State health department	Ref		Ref		Ref		Ref	
Local health department	1.91 (1.98)	**0.0003** (1.350, 2.704)	2.30 (2.27)	**<.0001** (1.772, 2.983)	2.16 (2.14)	**<.0001** (1.697, 2.749)	0.79 (0.81)	0.0582 (0.617, 1.008)
Shared health department	4.84 (5.33)	**<.0001** (2.393, 9.786)	4.64 (4.84)	**<.0001** (2.636, 8.173)	4.30 (4.50)	**<.0001** (2.685, 6.871)	1.46 (1.60)	0.0663 (0.975, 2.194)
Population Size								
Small (<50,000)	Ref		Ref		Ref		Ref	
Medium (49,999-499,999)	3.09 (3.10)	**<.0001** (2.227, 4.282)	2.00 (1.98)	**<.0001** (1.548, 2.583)	1.83 (1.81)	**<.0001** (1.473, 2.271)	2.05 (2.06)	**<.0001** (1.683, 2.504)
Large (500,000+)	7.74 (8.73)	**<.0001** (3.046, 19.656)	2.23 (2.43)	**<.0001** (1.276, 3.880)	2.88 (3.10)	**<.0001** (1.752, 4.736)	4.50 (4.65)	**<.0001** (2.852, 7.092)
Top executives tenure[b]	0.99 (0.99)	0.6442 (0.975, 1.016)	1.01 (1.01)	0.4341 (0.990, 1.024)	0.99 (0.99)	0.8797 (0.985, 1.013)	0.99 (0.99)	0.4684 (0.982, 1.008)
< 2 years	Ref		Ref		Ref		Ref	
2-5 years	1.33 (1.35)	0.1690 (0.885, 2.008)	1.19 (1.27)	0.2629 (0.876, 1.622)	1.28 (1.35)	0.0767 (0.974, 1.683)	1.22 (1.27)	0.1336 (0.941, 1.581)
6-10 years	2.08 (1.78)	**0.0044** (1.259, 3.449)	1.89 (1.82)	**0.0013** (1.283, 2.775)	1.65 (1.58)	**0.0027** (1.189, 2.276)	1.35 (1.31)	**0.0465** (1.005, 1.821)
11 or more years	0.97 (0.93)	0.9026 (0.635, 1.492)	1.24 (1.28)	0.2055 (0.890, 1.719)	1.08 (1.10)	0.6238 (0.805, 1.435)	0.94 (0.85)	0.6561 (0.715, 1.235)
Work status of the top executive								
Part-time	Ref		Ref		Ref		Ref	
Full-time	5.55 (6.15)	**<.0001** (3.125, 9.848)	2.24 (2.18)	**0.0001** (1.476, 3.386)	2.49 (2.49)	**<.0001** (1.680, 3.702)	2.97 (3.78)	**<.0001** (1.939, 4.549)
Gender of the top executive								
Male	Ref		Ref		Ref		Ref	
Female	2.19 (1.83)	**<.0001** (1.601, 2.990)	1.79 (1.63)	**<.0001** (1.413, 2.279)	1.62 (1.47)	**<.0001** (1.313, 2.006)	1.22 (1.08)	**0.0477** (1.002, 1.486)
Degree top executive holds								
Associates	1		1		1		1	

Bachelors	2.08 (2.30)	**0.0177** (1.136, 3.793)	1.42 (1.60)	0.1210 (0.912, 2.203)	1.15 (1.29)	0.5097 (0.765, 1.716)	1.26 (1.36)	0.2582 (0.846, 1.867)
Masters	2.68 (4.03)	**0.0010** (1.487, 4.816)	1.48 (2.00)	0.0775 (0.958, 2.283)	1.45 (1.92)	0.0678 (0.973, 2.159)	1.83 (2.43)	**0.0024** (1.237, 2.692)
Doctoral	0.96 (2.34)	0.9124 (0.494, 1.880)	0.83 (1.41)	0.4762 (0.501, 1.381)	0.84 (1.41)	0.4656 (0.532, 1.335)	1.17 (1.97)	0.5022 (0.746, 1.818)

Abbreviations: CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning; LHD, Local health department; AOR, Adjusted odds ratio; OR, Odds ratio.

[a]Boldface indicates $p < .05$ for statistical significance when controlled for governance structure and population size.

[b]Top executives' tenure was computed as a continuous variable.

LHD Characteristics and Level of Engagement in PHAB Accreditation

Multinomial analyses found statistical differences between different levels of LHD characteristics and engagement in the PHAB accreditation. First, research hypothesis that "Local health departments which have completed CHA, CHIP, and SP within the last five years are more likely to engage in PHAB accreditation" was tested and presented in Figure 7. LHDs who had completed all these three processes had higher odds of being "Accredited or engaged" (OR = 5.64; CI = 3.654, 9.361; p<.0001) or "Planning or undecided" (OR = 1.45; CI = 1.033, 2.026; p = 0.0316) than those who did not complete these processes. After controlling for governance structure and population size, LHDs who completed all three processes had higher odds and significance for being "Accredited or engaged" (AOR = 3.64; CI = 2.169, 6.094; p <.0001) than were those who did not complete these processes.

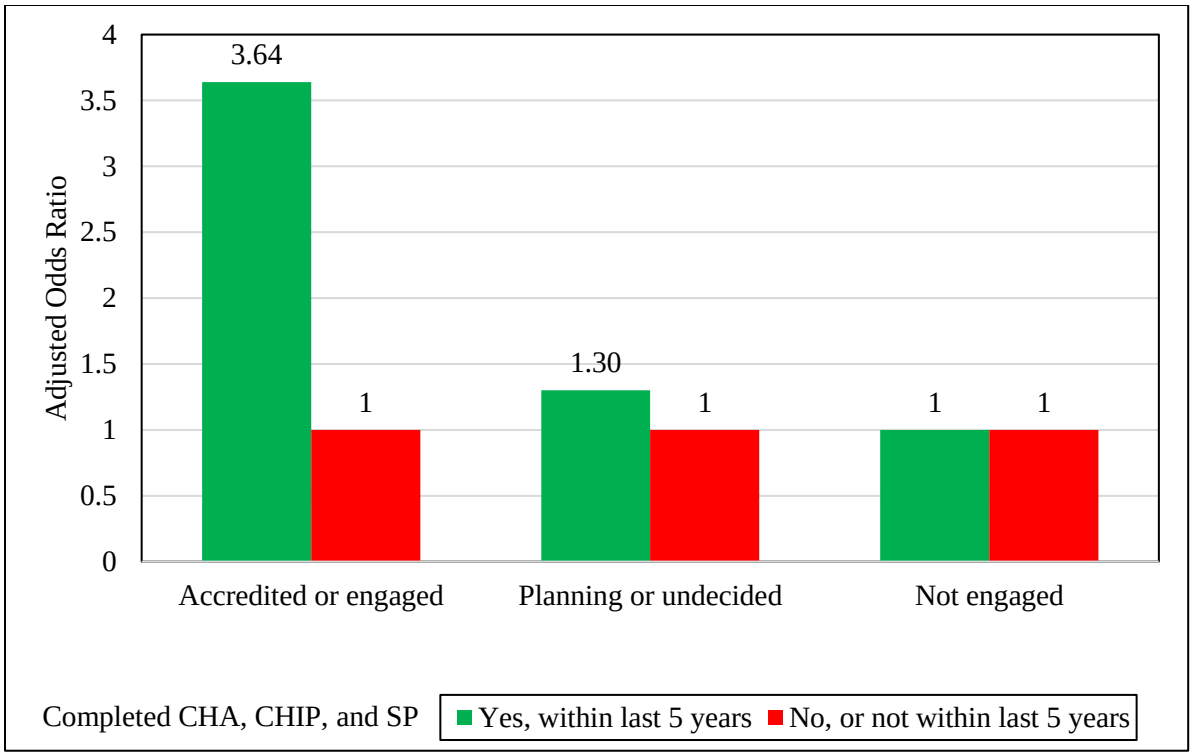

Figure 7: LHDs which have completed CHA, CHIP, and SP within the last five years are more likely to engage in PHAB accreditation
Number of LHDs = 1043
Note*:* Reference level used for PHAB accreditation was "Not engaged"
Abbreviations: LHD, Local health department; PHAB, Public Health Accreditation Board; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning.

Table 9 displays both unadjusted odds ratios and adjusted odds ratios. The displayed 95% confidence intervals and corresponding p-values were produced when engagement in the PHAB accreditation process was controlled for governance structure and population size. Governance structure showed that LHDs locally governed were more likely to being in the "Planning or undecided" (OR = 2.04; CI = 1.535, 2.717; p<.0001) compared to those not engaged in the PHAB accreditation than the state-governed LHDs. However, shared governance system showed that LHDs had higher odds and were more likely to either being "Accredited or engaged" (OR = 11.11; CI = 5.682, 21.735; p<.0001) or "Planning or undecided" (OR = 4.62; CI = 2.351, 9.060; p<.0001) than not engaged in the PHAB accreditation process compared to the state governance

system. After controlling for population size, LHDs who were locally governed were more likely to being in the planning or undecided than not engaged (AOR = 2.02; CI 1.513, 2.704; p <.0001) compared to the state-governed LHDs. LHDs classified as shared governance, had higher odds and higher level of significant for being accredited or engaged than not engaged (AOR = 11.74; CI = 4.145, 23.920; p <.0001) compared to state-governed. Similarly, LHDs with shared governance system were more than four times (AOR = 4.72; CI = 2.402, 9.277; p <.0001) more likely to being planning or undecided in the PHAB accreditation process than not engaged compare to state-governed LHDs.

Local health department characteristics of population size was statistically significance for PHAB accreditation. Specifically, LHDs with the medium population size had higher odds and were significantly more likely to being "Accredited or engaged" (OR = 5.31; CI = 3.890, 7.241; p<.0001) or "Planning or undecided" (OR = 1.67; CI = 1.299, 2.139; p<.0001) compared to being not engaged than were small population size. The same was true for LHDs with large population size (OR = 19.97; CI = 10.199, 39.091; p<.0001) for accredited or engaged; (OR = 2.51; CI = 1.280, 4.929; p = 0.0075) for planning or undecided compare to small population size. When controlled for governance structure, the results were similar: higher odds for being "Accredited or engaged" (AOR = 5.71; CI = 4.145, 7.865; p <.0001) or "Planning or undecided" (AOR = 1.68; CI = 1.310, 2.161; p <.0001) compared to being not engaged when medium size than small size jurisdiction. Large population size was also significance for being accredited or engaged (AOR = 20.29; CI = 10.013, 41.131; p<.0001) or "Planning or undecided" (AOR = 2.42; CI = 1.244, 4.720; p = 0.0093) compared to being not engaged in the accreditation process than being a small size jurisdiction after adding governance structure in the model.

When PHAB accreditation status was compared by each process, LHDs which reported to have completed CHA had higher odds of being "Accredited or engaged" (OR = 3.47; CI = 2.342, 5.136; p<.0001) or "Planning or undecided" (OR = 1.51; CI = 1.177, 1.954; p = 0.0013) than were those who did not complete CHA within the last five years. After controlling for governance structure and population size, LHDs who completed CHA within the last five years had higher odds and statistical significance for being "Accredited or engaged" (AOR = 2.76; CI = 1.797, 4.228; p<.0001) than were those who did not.

Local health departments which reported to have CHIP completed had higher odds of being "Accredited or engaged" (OR = 3.35; CI = 2.401, 4.669; p<.0001) or "Planning or undecided" (OR = 1.32; CI = 1.050, 1.667; p = 0.0174) than were those who had not completed CHIP within the last five years. After controlling for governance structure and population size, LHDs which reported to have CHIP completed had higher odds of being "Accredited or engaged" (AOR = 2.61; CI = 1.797, 3.725; p<.0001) than were those who had not completed CHIP within the last five years.

Completing SP in the last five years showed higher odds of being "Accredited or engaged" (OR = 6.22; CI = 4.472, 8.659; p<.0001) than not completing SP in the last five years. After controlling for governance structure and population size, LHDs reported having completed SP had higher odds and very high statistical significance for being "Accredited or engaged" (AOR = 4.99; CI = 3.464, 7.193; p<.0001) than were those who did not complete SP within the last five years.

Table 9: Multinomial Regression Analysis of Completing PHAB Accreditation, 2016 NACCHO Profile Study		
LHD Characteristics	Accredited or engaged[a]	Planning or undecided[a]

	AOR (OR)	p[b] (95% CI)	AOR (OR)	p[b] (95% CI)
Governance structure				
State health department	Ref		Ref	
Local health department	0.81 (0.86)	0.2757 (0.561, 1.180)	2.02 (2.04)	**<.0001** (1.513, 2.704)
Shared health department	11.74 (11.11)	**<.0001** (5.766, 23.920)	4.72 (4.62)	**<.0001** (2.402, 9.277)
Population Size				
Small (<50,000)	Ref		Ref	
Medium (49,999-499,999)	5.71 (5.31)	**<.0001** (4.145, 7.865)	1.68 (1.67)	**<.0001** (1.310, 2.161)
Large (500,000+)	20.29 (19.97)	**<.0001** (10.013, 41.131)	2.42 (2.51)	**0.0093** (1.244, 4.720)
Completed all three processes (CHA, CHIP, SP)				
No, or not within five years	Ref		Ref	
Yes, within last five years	3.64 (5.64)	**<.0001** (2.169, 6.094)	1.30 (1.45)	0.1435 (0.915, 1.848)
CHA completed				
No, or not within five years	Ref		Ref	
Yes, within last five years	2.76 (3.47)	**<.0001** (1.797, 4.228)	1.29 (1.51)	0.0584 (0.991, 1.689)
CHIP completed				
No, or not within five years	Ref		Ref	
Yes, within last five years	2.61 (3.35)	**<.0001** (1.832, 3.725)	1.14 (1.32)	0.2775 (0.898, 1.454)
SP completed				
No, or not within five years	Ref		Ref	
Yes, within last five years	4.99 (6.22)	**<.0001** (3.464, 7.193)	0.98 (1.03)	0.8700 (0.779, 1.235)

Abbreviations: PHAB, Public Health Accreditation Board; NACCHO, National Association of County and City Health Officials; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning; AOR, Adjusted odds ratio; OR, Odds ratio.
[a]Reference level used was "Not engaged"
[b]Boldface indicates $p < .05$ for statistical significance when controlled for governance structure and population size.

Overall, workforce, leadership, financial characteristics, completion of all three processes (CHA, CHIP, and SP) this study main predictors for LHDs' engagement in CHA, CHIP, SP, and

PHAB accreditation were examined and shown in this results section. After controlling for other independent variables, workforce characteristics most strongly associated with completion of all three processes (CHA, CHIP, and SP) or individual process (CHA, or CHIP, or SP) was health educator LHD employed. Strong association with completion of all three processes or individual process (CHA, or CHIP, or SP) was only seen when LHD total FTEs was categorized in quartiles.

Leadership characteristics strongly associated with completion of all three processes by LHDs were top executive full-time work status, female top executive, and top executive tenure of 6-10 years. This was also true when LHDs completed CHA, CHIP, or SP separately. The average tenure of top executives was 6.94 years with median experience at 3.61 years, and a range of zero to 48 years at the LHDs' top level.

Financially, LHDs spent more than five hundred dollars ($529,563) on average to cover public health activities in their local jurisdictions. Specifically, LHDs spent more on average for completing all three processes (CHA, CHIP, and SP) than on completing each of these processes separately per 10,000 populations.

Lastly, LHDs who completed all three processes were associated with higher odds of being accredited or engaged in the PHAB accreditation process than those who had not engaged. Similarly, LHDs reported CHA, CHIP, or SP completed individually within the last five years had higher odds of being accredited or engaged in the PHAB accreditation process compared to LHDs who had not engaged.

Table 10: Decision for the Hypotheses Testing		
Alternative hypothesis	**P-value***	**Decision**
Workforce Characteristics		
LHD Total FTEs		

Size of the workforce, indicated by FTEs, is positively associated with LHDs' completion of CHA.	**<.0001**	Reject null hypothesis
Size of the workforce, indicated by FTEs, is positively associated with LHDs' completion of CHIP.	**<.0001**	Reject null hypothesis
Size of the workforce, indicated by FTEs, is positively associated with LHDs' completion of SP.	**<.0001**	Reject null hypothesis
Health Educator		
Local health departments with health educators are more likely to complete CHA than LHDs without health educators.	**<.0001**	Reject null hypothesis
Local health departments with health educators are more likely to complete CHIP than LHDs without health educators.	**<.0001**	Reject null hypothesis
Local health departments with health educators are more likely to complete SP than LHDs without health educators.	**<.0001**	Reject null hypothesis
Epidemiologist/statistician.		
Local health departments with epidemiologist/statistician are more likely to complete CHA than LHDs without epidemiologist/statistician.	0.0717	Fail to reject null hypothesis
Local health departments with epidemiologist/statistician are more likely to complete CHIP than LHDs without epidemiologist/statistician.	**0.0135**	Reject null hypothesis
Local health departments with epidemiologist/statistician are more likely to complete SP than LHDs without epidemiologist/statistician.	**0.0023**	Reject null hypothesis
Leadership characteristics		
Tenure of the top executive		
Tenure of the top executive is positively associated with LHDs' completion of CHA	0.4341	Fail to reject null hypothesis
Tenure of the top executive is positively associated with LHDs' completion of CHIP	0.8797	Fail to reject null hypothesis
Tenure of the top executive is positively associated with LHDs' completion of SP	0.4684	Fail to reject null hypothesis
Work status of the top executive		
There is a statistically significant difference in completion of CHA by work status of the top executive.	**<.0001**	Reject null hypothesis
There is a statistically significant difference in completion of CHIP by work status of the top executive.	**<.0001**	Reject null hypothesis
There is a statistically significant difference in completion of SP by work status of the top executive.	**<.0001**	Reject null hypothesis
Gender of top executive		

There is a statistically significant difference in completion of CHA by gender of the top executive.	**<.0001**	Reject null hypothesis
There is a statistically significant difference in completion of CHIP by gender of the top executive.	**0.0001**	Reject null hypothesis
There is a statistically significant difference in completion of SP by gender of the top executive.	0.4365	Fail to reject null hypothesis
Educational attainment of the top executive		
There is a statistically significant difference in completion of CHA by educational attainment of the top executive.	**0.0033**	Reject null hypothesis
There is a statistically significant difference in completion of CHIP by educational attainment of the top executive.	**0.0003**	Reject null hypothesis
There is a statistically significant difference in completion of SP by educational attainment of the top executive.	**<.0001**	Reject null hypothesis
Financial characteristics		
Higher per capita expenditure per 10,000 population is positively associated with LHDs' completion of CHA.	**0.0009**	Reject null hypothesis
Higher per capita expenditure per 10,000 population is positively associated with LHDs' completion of CHIP.	**<.0001**	Reject null hypothesis
Higher per capita expenditure per 10,000 population is positively associated with LHDs' completion of SP.	**0.0287**	Reject null hypothesis
Completion of CHA, CHIP, and SP as independent variables		
Local health departments which have completed CHA, CHIP, and SP within the last five years are more likely to engage in PHAB accreditation.	**<.0001**	Reject null hypothesis

Abbreviations: FTEs, Full-time equivalents; LHDs, Local health departments; CHA, Community health assessment; CHIP, Community health improvement plan; SP, Strategic planning.
*Boldface indicates $p < .05$ for statistical significance.

CHAPTER 5

SUMMARY DISCUSSIONS AND CONCLUSIONS

Overview Discussions

The main purpose of this study was to assess and analyze characteristics of local health departments that are associated with completion of community health assessment, community health improvement plan, strategic planning, and PHAB accreditation processes. Analyses revealed that strong associations existed between workforce, leadership, and financial characteristics and completion of these processes. However, these associations showed varying significance levels when control variables (governance structure and population size) were added to the logistic regression model and analyzed by LHD characteristics.

General description of the data indicated that close to three-quarters (71.98%) of LHDs were classified as local or decentralized compared to state-governed (19.60%) and shared (8.42%) governance systems. Many of these LHDs (61.62%) served small size (<50,000) jurisdictions. Only a third (32.73%) served medium (49,999-499,999) size jurisdiction, leaving a very small fraction (5.65%) of LHDs in large (500,000+) or densely populated towns and cities across the country. These findings are consistent with other previous studies which indicated that most governance authorities are mostly governed locally with many serving smaller jurisdiction areas (Shah et al., 2018; Meit et al., 2012; Vest et al., 2012).

Although governance structure was strongly associated with completion of all three processes (CHA, CHIP, and SP), or CHA, or CHIP within the last five years, it was not associated with completion of SP across all categories. Very strong associations were seen with LHD jurisdiction sizes. The larger the population size, the higher the odds of completing all

these processes. These findings are mostly consistent with other previous studies that found that governance structure and jurisdiction population size are a crucial contributor to LHDs engagement in performance improvement assessments, (Shah et al., 2018; Erwin et al., 2014; Santerre, 2009).

In 2016, more than half (52.54%) of LHDs reported level of engagement in the PHAB accreditation process as planning or had not yet decided. Just a fifth (20.13%) of the study population was accredited or engaged and a little over a quarter (27.34%) reported not engaged at all in the accreditation process. Although the proportion of being accredited was smaller relative to those planning or undecided, more and more LHDs are being acquainted to the PHAB accreditation process and started to take a stance charge on this critical process, as chronicled by NACCHO profile studies (6% in 2013, 13% in 2014, and 21% in 2016). One possible reason for this increased in percentage could be that local board of health encouraged or supported LHDs to pursue accreditation from Public Health Accreditation Board, (Shah et al., 2018).

Generally, about three quarters (75.10%) of LHDs completed all three processes (CHA, CHIP, and SP) within the last five years compared to just one quarter (24.90%) of LHDs who did not. Completion rates (78.36% versus 21.64%) were even higher for those participating in CHA alone. However, the rates were a little lower (67.19% versus 32.81%) for those completing CHIP and even lower (53.45% versus 46.55%) for those completing SP within the last five years. Although LHD participation increased a bit in 2016, these numbers are in line with Beatty and colleagues (2018) findings from the 2013 NACCHO profile study.

Workforce characteristics were assessed using three variables. The first one was assessed with epidemiologist/statistician employed by an LHD. The results showed that just about a quarter (26.39%) of LHDs employed an epidemiologist/statistician and about three quarters

(73.61%) did not. This survey showed a slight decrease from the 2013 NACCHO survey by about ten percent. The second occupation employed by LHD and assessed in this study was having a health educator in LHD staff. Descriptive statistics showed that more than half (55.27%) of LHDs employed health educators and 44.73% did not. Interestingly, this occupation had also decreased by similar points (8% from previous survey conducted by NACCHO (2013). The third workforce characteristics assessed here was the total FTEs employed by LHD. The results showed that all LHDs employed 71,963.93 FTEs with a mean of 50.10 FTEs per LHD. When categorized in quartiles, more (38.55%) LHDs employed fewer than 10 FTEs with over a quarter (27.03%) employing between 10 and 25 FTEs, a fifth (20.27%) employed between 25 and 75 FTEs, and less than fifteen percent (14.15%) employing 75 or more FTEs. The median FTEs (14.85) had reduced by about 2% from the 2013 NACCHO survey. The trend was also similar for mean FTEs per LHD, as found by Scutchfield and colleagues in 2004 (55.31 FTEs) and in prior NACCHO surveys of 2010 and 2013. Yeager and colleagues (2015) found the mean to be even higher (110.10 FTEs) than in this 2016 NACCHO profile survey. The range in this study was lower (0 to 5512 total FTEs) than Yeager and colleagues' (2015) findings (0 to 6543 total FTEs). Similar to this study, workforce capacity across the country is consistently declining according to Robin and Leep (2017) analysis of LHDs.

This study found two workforce characteristics (LHD total FTEs and health educator employed) to be associated with the completion of all three processes (CHA, CHIP, and SP). In general, size of workforce, indicated by FTEs, was positively associated with completion of all three processes (CHA, CHIP, and SP). A positive association was also shown with the completion of each process (CHA, or CHIP, or SP). When total FTEs LHD employed was categorized in quartiles, the results showed that the higher the number of FTEs the higher the

odds of completing these processes. For example, LHDs who employed 75 or more FTEs were 8.25 times more likely to complete all three processes, compared to 5.21 times and 3.54 times in the 3rd and 2nd quartiles respectively. This order was also true with completion of each process (CHA, or CHIP, or SP) by an LHD. This finding alluded to the finding by Merrill and colleagues (2012) that LHDs with greater number of FTEs are more likely to be innovative.

Health educator employed by LHDs was one of the workforce characteristics with a stronger association for completing all three processes (CHA, CHIP, and SP) or individual process (CHA, or CHIP, or SP). Other similar studies showed that LHDs who employed health educators had a higher odd of participating in activities such as obesity prevention program than those who did not (Stamatakis et al., 2012; Zhang et al., 2010). Mixed associations were shown with an epidemiologist/statistician employed by LHD. Local health departments with epidemiologist/statistician employed were not likely to complete all three processes (CHA, CHIP, and SP). The same was true with completion of CHA within the last five years. However, they were more likely to complete CHIP or SP within the last five years than those without epidemiologist/statistician employed. Although this study is about LHDs' engagement in CHA, or CHIP, or SP, similar study on different LHDs' activity by Stamatakis and colleagues (2012) indicated that employing an epidemiologist by an LHD was associated with participating in obesity prevention program.

Characteristics of LHD leadership were assessed with four variables. The first one was top executives' tenure. The average time for serving at the top level was closed to seven years (6.94) with the median serving time at 3.61 years. Very few top executives served for nearly half a century (48 years), but many were serving for less than a year. Similar results were found by Jadhav and colleagues (2015) in their 2012-2013 cross-sectional study of LHD's top leaders in

Kentucky, that the average tenure was 6 years. When it comes to completion of all three processes (CHA, CHIP, and SP), a requirement for participating in PHAB accreditation, a mean time in position for the LHD top executives was a little lower (6.85 years) than the overall average time but was higher (7.48 years) for those who did not complete them in the last five years. With individual process, those completing CHA stayed in their positions a little longer (7.05 years) than those who did not complete CHA (6.67 years) within the last five years. However, average tenures were lower for those completing CHIP or SP than for those who did in the last five years. The findings also showed that categorizing top executives' tenure in four resulted in even distribution of LHDs. This finding was consistent with Handler and Turnock (1996) who twelve years ago, found that categorizing top executives' tenure showed about similar distribution by LHD from the 1992-1993 NACCHO profile survey. Between 2008 and 2013, the average top executives' tenure at LHD was two years more (Robin and Leep, 2017; Baum et al., 2011) and about a year more (Shah et al., 2014) compared to this 2016 NACCHO survey.

Local health departments with full-time top executives' work status were proportionally high as opposed to those with part-time work status. This was consistent with similar survey findings that many LHDs had top executives as full-times than part-times (Vest et al., 2017; Zhang et al., 2010; Handler & Turnock, 1996). In addition, Luo and colleagues (2013) indicated that over 90% of top executives had full-time status as they conducted many or all ten essentials public health services. This study also found that many LHDs employed more females than males as top executives. Other studies supported this finding that about two-thirds or more of the LHDs employed females at the top level as directors (Shah et al., 2015; Wetta et al., 2015; Luo et al., 2013; Handler & Turnock, 1996).

This study found that top executive full-time work status and hiring female at the top leadership position were statistically significant for LHD's engagement in CHA, CHIP, and SP. After controlling for other independent variables, LHDs who had top executives as full-time were more than five times more likely to complete all three processes (CHA, CHIP, and SP) than were those with part-time work status. Similarly, they odds of completing CHA, or CHIP, or SP separately when a top executive was a full-time, were more than two folds than had part-time. Finding also revealed that having a female top executive was associated with higher odds of completion of CHA, CHIP, and SP. Specifically, top executive's females had higher odds of completing all three processes (CHA, CHIP, and SP) or each process (CHA, or CHIP, or SP). Handler and Turnock (1996) indicated that there was a correlation between being a full-time or female top executive and performing core functions of public health. This higher odd of female top executives participating in these processes more than their male counterparts could be attributed to Jadhav and colleagues (2015) findings that females were more opened to change than males.

In general, tenure of top executive was negatively associated with either LHDs' completion of all three processes (CHA, CHIP, and SP) or with completion of each process (CHA, or CHIP, or SP). Interestingly, having a top executive with not more than ten years, but greater than five years (6-10 years) in position was strongly associated with completion of all three processes and with each process (CHA, or CHIP, or SP). Contrary to this findings, top executive tenure was found to be positively associated with other LHD's public health activities, e.g. implementation of health information exchange at the LHD (Shah et al., 2016).

Another leadership characteristic that was assessed in this study was degree top executive holds. Closed to half (46.18%) of LHDs had top executives with master's degrees and 29.89%

had bachelor's, 15.75% had doctoral, and 8.19% had associate degrees. Similar surveys produced similar findings as well (Beatty et al., 2017; Vest et al., 2012; Baum et al., 2011). In term of completion of CHA, CHIP, and SP, there were statistically significant differences by degree attainments. In particular, top executives who hold masters or bachelor's degrees were more likely to complete all three processes (CHA, CHIP, and SP), but not those holding doctoral degrees. With each process, none of the educational attainment level was associated with completion of CHA or CHIP. However, having a master's degree, but not bachelor's or doctoral, by top executive was associated with completion of SP in the last five years. This is similar to Scutchfield and colleagues (2004) who found that having a master's or bachelor's degree, but not doctoral degrees, were associated with higher performance by the top LHD executives. Since the finding of school of public health in 1916 in the United States, Master of Public Health (MPH) has been a core academic professional degree for public health workforce (Erwin and Brownson, 2017). This might have implicated this study finding that only a master's degree had a positive association with completion of CHA, CHIP, and SP.

Financial characteristics of LHDs assessed just the per capita expenditure per 10,000 populations, which was calculated as total LHD expenditure divided by the total population of an LHD. Results showed that over two thirds (67%) of LHDs reported most recently completed fiscal year total expenditure in the 2016 NACCHO survey. The distribution per capita expenditure was slightly right skewed with overall mean spending greater than median. It was over five hundred thousand dollars ($529,563) with overall median spending at $380,308 per 10,000 populations at each LHD. Overall, per capita spending has been on the decline as reported in the last three NACCHO surveys by about 25% (NACCHO, 2016). But public health

spending was significantly associated with performing many public health activities like recruiting workforce by the LHDs (Shah et al., 2018).

This study also examined the cross-tabulation by LDHs participation in performance improvement processes. As a result, higher average per capita expenditure was mainly seen with LHDs who had completed all three processes (CHA, CHIP, and SP). The distribution was wider as well compared to those reported no, or not within the last five years. Findings also showed that the second highest average spending was related to completion of CHIP, followed by SP, and then CHA within the last five years. The median spending per capita was also in that order. Other studies assessing similar public health outcomes found that average spending on per capita was higher when completing or participating in those outcome measures, such as partnerships, obesity prevention, etc. (Luo et al., 2016; Zhang et al., 2010). Mays and colleagues (2006) findings were also in line with this finding that per capita spending was positively associated with conducting assessments using ten essential public health services.

As hypothesized, LHDs who completed all three processes within the last five years were associated with higher odds of being accredited or engaged in the PHAB accreditation process. Although higher proportion of LHDs reported as being planning or undecided in the PHAB accreditation process than being accredited or engaged after completing all three processes, multinomial regression analysis did not show any statistical significance. This was even true after controlling for other variables. Similarly, LHDs reported CHA, CHIP, or SP completed individually within the last five years had higher odds of being accredited or engaged in the PHAB accreditation process. Similar survey authored by Shah and colleagues (2015) found that completion of CHIP and SP within the last five years were associated with LHD engagement in the accreditation process, but not with CHA completed. There was no statistical significance for

being in the planning or undecided either. Shared governance system had a very high odds of being accredited or engaged than state-governed. More significantly, the larger the jurisdiction sizes, the higher the odds of being accredited or engaged. This is also true according Yeager and colleagues (2018) findings that engagement in the accreditation process was strongly associated with governance system and population size.

Recommendations

Although stronger associations were identified between the workforce, leadership, and financial characteristics, varying significance levels were seen when completing CHA, CHIP, and Sp. It had become very true that completion of all these three processes (CHA, CHIP, and SP) by LHDs was a stronger predictor for being accredited by PHAB. More importantly, this study is cross-sectional, based on one point in time data to determine the extent of LHDs engagement in these crucial public health activities. Thus, these findings lack temporal sequence and should not be used by local health officials as proxies for resource allocations or to change agency settings. Instead, it is strongly recommended that these be viewed as educational by concerned public health agencies. Just as Aronson and colleagues (2014) suggested, LHDs should engage in this kind of evidence-based data to continue to make informed-decision making process. Essentially, LHDs should "engage in a planning process, use community health assessment in action planning, conduct health impact assessments, and evaluate their efforts" (Aronson et al., 2014) to keep current with emerging public health issues and population needs. Recommendation on how to approach each of these characteristics or predictors is detailed below.

First, LHDs need to invest in continuous education to keep occupation employed afloat with ever changing environment and population needs. With this finding, workforce characteristics indicated that employing health educator had a positive influence on LHD's engagement in these performance improvement processes (CHA, CHIP, and SP). Thus, LHDs should focus more on effective strategic thinking about conducting and engaging in these processes. To do this, they should continue to employ more health educators to design and implement community programs and other public health activities in the local jurisdictions. With no positive influence in employment of epidemiologist/statistician, monitoring and investigation of any disease outbreaks might be limited. Employment of epidemiologist/statistician is recommended as a proxy for conducting these assessments, but more to focus on data analysis, disease monitoring, and outbreak investigations.

Additionally, LHDs need to increase size of workforce to reduce work burden and job fatigues. As found by this study, positive association with larger LHD's workforce capacity should not be taken lightly. Local health officials need to find ways to increase and retain workforce in the departments to continue to conduct health assessments and planning. If an LHD doesn't have a bandwidth to retain larger workforce size, offering incentives and/or partnering with other agencies is recommended as other studies had found and suggested as effective and productive (Wahowiak, 2017; Wilson et al., 2014; Vest et al., 2012).

The second recommendation is related to leadership characteristics and LHDs' participation in CHA, CHIP, and SP process. Availability of most up to date CHA, CHIP, and SP data should be a must at LHD's databases for top leadership to make informed-decision should needs arise. Imperatively, they should continuously shoulder around or look internally on their existing top executive's work status and gender available. As found by this study that full-time work status

and being female at top leadership position had a positive influence in conducting CHA, CHIP, and SP. LHD should create a soothing work environment to retain these workforces. This doesn't mean that they would layoff male and part-time workers but should delve into strategic thinking to find out reasons male and part-time executives underperform than their counterparts.

More attention and support should be given to length of time in position and highest degree top executive holds. This study's findings showed that those top executives serving for more than six years, but less than eleven years outperformed other tenure positions even after controlling for other potential confounders. It is recommended that more research is needed to understand this performance. In the meantime, LHDs should give more time off and incentives to more experienced workforce and more training and certifications to less experienced workforce. Although degree top executive holds was less influential in conducting these community assessments and planning, investment in public health education need to be put into consideration. Future research should also be done to assess completion of these processes by academic discipline. Vest and colleagues (2012) found that having a doctoral degree was positively associated with usage of informatics system. This could be because a doctoral degree (DrPH, MD, DVD, etc.) is more specialized in a specific field and could only lead to outcomes related to that field of specialization.

Thirdly, this study found that LHDs spent more than half a million dollars on average to cover public health activities in their local jurisdictions. Specifically, spending on completing all three processes (CHA, CHIP, and SP) was higher than spending on completing each of these processes separately per 10,000 populations. If LHD has limited funds to spend on engaging in these processes, then this study recommends that engaging in collaboration and partnerships with academic institutions, community organizations, non-profit organizations, and other local

organizations with similar interests in public health should be sought. There is no doubt that higher per-capita spending produces positive results in performing activities related to population health (Mays et al., 2006). However, this could not lead to intended public health outcome if more funds are not reserved and allocated to cover these essential public health activities. Thus, LHDs need to identify and allocate additional funding as mandated by the Affordable Care Act (ACA) of 2010 (Erwin and Brownson, 2017).

With the finding that LHDs who completed all three processes (CHA, CHIP, and SP) had higher odds of being accredited, this last recommendation should be mandatory for LHDs. Although engagement in the PHAB accreditation is voluntary, keeping the accreditation status by LHDs is critical in improving performance and increasing transparency and accountability with their communities and stakeholders (Erwin and Brownson, 2017; PHAB, 2011). Local health departments should involve policy makers who would develop policy that impacts public health. These public health policies may include but not limited to increasing workforce size, train public health workers specifically to deal with the accreditation process, and increased engagement in CHA, CHIP, and SP. Finally, although this study did not examine the role of local board of health, it recommends that they should be hired and maintained to continuously encourage and support LHDs to seek accreditation. Shah and colleagues (2018) finding supported this recommendation as they indicated that local board of health officials with superior performance have a higher tendency to direct, encourage, or support LHD to seek PHAB accreditation activities.

Strengths and Limitations

This secondary data analysis applied to quantitative survey data previously collected by NACCHO in the 2016 profile study. It is based on the representative sample of LHDs across the country. Therefore, the data was very large enough to make some conclusions about the outcomes of interest. Adding other variables known to be confounders to the regression models was another strength this study employed. All variables were controlled for population size and governance structure. Adjusted odds ratios along with corresponding 95% confidence intervals and p-values were shown in each result table next to unadjusted odds ratios.

Just as in any other studies, the following limitations were expected and faced during the research study. The survey was a self-reported one to the NACCHO by LHDs and the 2016 NACCHO profile study indicated that they were not independently validated or verified. As such, LHDs may have interpreted or answered questions in a separate way for several reasons not intended by NACCHO. Since this 2016 profile study used some of the questions from the past profile studies for comparative analysis, which were not tested for significant differences, some information could be obsolete or would no longer applicable to study population and respondents.

Sample size may not be an exact representation of the reported LHDs due to missing data. There was possibility of some error to a limited extent of this study, which might not have been an issue on the original data collected by NACCHO. This study did not determine the magnitude of missing data or erroneous data entry as there was no alternative data source available for comparison. Some reports not included in the database may have significant different from those identified in the profile study.

Since this is a cross-sectional study, it had assessed the independent and dependent variables simultaneously. Additionally, it alluded to the fact that the lag time between them was

not accounted for in one study period. This made it difficult to draw predictive conclusions of independent variables on dependent variables. Finally, it could be possible that some control measures of association for key main variables that could be potential confounders were missed. To continuously engage LHDs in these processes (CHA, CHIP, SP, and PHAB accreditation), future studies may need to structure and examine leadership characteristics, specifically tenure and educational attainment, which showed positive association only with 6-10 years and a master's degree respectively. Also, analyses and comparisons of workforce occupation employed by LHDs need to be studied by specialty and experience relevant to that occupation.

Conclusions

Results reveal that LHDs are stanchly on track to be in full swing of getting engaged in CHA, CHIP, SP, and PHAB accreditation processes. All factors (workforce, leadership, and financial) examined in this study showed some associations, if not strong toward these processes. It is also found that structure of the LHDs governance and population size does matter as had been found by others to positively influence performance on key public health activities (Erwin et al., 2014; Santerre, 2009; Mays et al., 2006).

After controlling for other potential confounding variables, LHDs who employed health educators were highly inclined to complete all three processes (CHA, CHIP, and SP) or individual process (CHA, or CHIP, or SP). LHD workforce capacity was also a crucial factor in facilitating completion of these process. The odds were even higher with larger workforce capacity. In other word, LHDs were better off in participating in these essential public health activities when they had employed greater number of FTEs than had fewer FTEs.

In term of leadership, LHDs who employed full-time and female top executives had higher performance in participating in these processes (CHA, or CHIP, or SP, or all three). Tenure of a top executive was not a contributing factor to completing these processes. However, there was a connection between average time in office (6.94 years) and the stronger association shown with 6-10 years range when top executive's tenure was categorized. This view is also based on the previous studies that found average tenure of top executives to be between 6 and 9 years (Robin and Leep, 2017; Jadhav et al., 2015; Shah et al., 2014; Baum et al., 2011). This implied that top executives were less likely to be highly productive when their tenure peak at ten years but after they surpassed five years' time. More research to collect detailed data, preferably qualitative, is needed to determine this inconsistency in performance of LHD top leadership. Academic education in master's degree of public health indicated that an MPH remains to be a core public health specialty which trains public professionals to carry out essential public health activities (Erwin and Brownson, 2017).

Local health departments were shown to spend more on average in completing all three processes (CHA, CHIP, and SP) than on completing each of these processes separately per 10,000 populations. In general, this indicates that LHDs who increased public health investments can reap more measurable improvements in public health activities and would be more likely to have readily available data to make informed-decision. Specifically, LHDs were more likely to spend more on completing all three processes probably to pursue PHAB accreditation process.

Finally, LHDs which had completed all three processes (CHA, CHIP, and SP) within the last five years were more likely to be engaged in PHAB accreditation. The stronger association implies that getting accredited take more coordinated effort, which included larger workforce, committed leadership, and higher spending per capita. In addition, LHDs who had taken their

time, effort, and money to complete CHA, CHIP, and SP in the last five would want to set their bars high nationally to remain transparent, creditable, and accountable to their stakeholders and local population they serve.

Implications for Public Health

Findings about LHDs' engagement in CHA, CHIP, SP, and PHAB accreditation present the golden opportunity for public health officials and their stakeholders around the country. It rightfully allows them to accumulate evidence-based data to prepare for the policy, environmental, and systems changes. To adapt to these changes, this study encourages LHD officials to be more strategic thinkers in their planning processes and decision making.

Hiring and retaining more health educators who are well-trained in organizational activities such as design, development of educational programs and strategies for observing mandates is critically effective. Workforce capacity is crucial in performing any activity and LHDs should be mindful of keeping adequate workforce in their jurisdictions so that workers do not spread too thin to minimize job fatigues and stresses.

Top executives at the LHDs should be kept as full-time rather than part-time. This would enable them to focus on their job continuously without laps when planning for agency activities. Leadership development must be developed for young skilled workers and mentoring should be encouraged and mandated at the LHDs. This could be achieved by partnering with academic institutions and other agencies who would provide mentoring and networking. As the results indicated, female executives had higher odds of completing these processes. However, collection of qualitative data should be conducted and supported to find reasons they are more productive than their male counterparts.

Financially, higher per capita expenditure is needed by the LHDs to increase performance on essential public health activities. Investment in evidence-based data would prepare local health officials to response to ever changing environment and growing population. Increase in spending on public health activities would allow continuous data collection and evidence-based interventions, designed to be self-sustaining, to focus more on population health.

REFERENCES

Alachua County Health Department. (2012). Alachua County community health improvement plan November 2012. Retrieved from http://archived.naccho.org/topics/infrastructure/CHAIP/upload/Alachua-County-CHIP.pdf

Arizona Department of Health Services. (2012). Retrieved from http://pub.azdhs.gov/e-books/strategicplan/adhs-strategic-plan-2014-2018/index.html

Aronson, R. E., Lovelace, K., Smith, M., and Shah, G. H. (2014). Differences in definitions of EBPH and evidence: Implications for communication with practitioners. *Frontiers in Public Health Services and System Research, 3(*2). DOI: 10.13023/FPHSSR.0302.01

Association of State and Territorial Health Officials. (2011). ASTHO profile of state public health volume two. Retrieved from http://www.astho.org/uploadedFiles/Publications/Files/Survey_Research/ASTHO_StatProfilesSingle%5B1%5D%20lo%20res.pdf

Baum, N. M., DesRoches, C., Campbell, E. G., and Goold, S. D. (2011). Resource allocation in public health practice: A national survey of local public health officials. *Journal of Public Health Management and Practice, 17*(3), 265–274.

Beatty, K. E., Erwin, P. C., Brownson, R. C., Meit, M., Fey, J. (2018). Public Health Agency accreditation among rural local health departments: Influencers and barriers. *Journal of Public Health Management and Practice, 24*(1), 49-56. doi: 10.1097/PHH.0000000000000509

Bekemeier, B., Grembowski, D., Yang, Y., and Herting, J. R. (2012). Leadership matters: Local health department clinician leaders and their relationship to decreasing health disparities. *Journal of Public Health Management and Practice, 18*(2), E1–E10.

Besnard, M., Lastère, S., Teissier, A., Cao-Lormeau,V. M, and Musso, D. (2014). Evidence of perinatal transmission of Zika virus, French Polynesia, December 2013 and February 2014. *Euro Surveillance*, *19*(13), 20751.

Blavin, F., Blumberg, L.J., Waidmann, T., and Phadera, L. (2012). Trends in U.S. health care spending leading up to health reform. *The Urban Institute*. Retrieve from http://www.urban.org/research/publication/trends-us-health-care-spending-leading-health- reform/view/full_report

Brownson, R. C., Baker, E. A., Leet, T. L., Gillespie, K, N., and True, W. R. (2011). *Evidence based public health (2nd ed.).* New York, NY: Oxford University Press, Inc.

Bryson, M. J. (2011). *Strategic planning for public and nonprofit organizations: A guide to strengthening and sustaining organizational achievement* (4th ed.). San Francisco, CA: Jossey Bass.

Centers for Disease Control and Prevention. (2013). United States Public Health 101. Retrieved from https://www.cdc.gov/nphpsp/essentialservices.html

Centers for Disease Control and Prevention: (2017). Sexually transmitted disease surveillance 2016. Retrieved from https://www.cdc.gov/std/stats16/CDC2016STDSReport for508WebSep2120171644.pdf

Centers for Medicare and Medicaid Services. (2017). Projections of national health expenditures: Methodology and model specification. Retrieved from https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/ProjectionsMethodology.pdf

Centers for Medicare and Medicaid Services. (n.d). Winnable battles-related healthy people 2020 objective. Retrieved from https://www.cdc.gov/winnablebattles/targets/pdf/winnablebattles-related-healthypeople2020objectives.pdf

Chen, L. Nguyen, A. T., Jacobson, J., and Palm, D. (2012). Assessment of workforce capacity for local health departments in Nebraska: A perspective from public health programmatic areas. *Journal of Public Health Management and Practice, 18*(6), 595–601.

Commissioned Corps of the U.S. Public Health Service. (n.d). History. Retrieved from https://www.usphs.gov/aboutus/history.aspx

Cuckler, G. A, Sisko, A. M., Keehan, S. P., Smith, S. D., Madison, A. J., Poisal, J. A., …Stone, D. A. (2013). National health expenditure projections, 2012–22: Slow growth until coverage expands and economy improves. *Health Affairs*, *32*(10), 1820-1831.

Curtis, D. C. (2002). Evaluation of community health assessment in Kansas. *Journal of Public Health Management and Practice*, *8*(4), 20–25.

Department of Health and Human Services. (2010). Healthy People 2020 Framework. Retrieved from https://www.healthypeople.gov/sites/default/files/HP2020Framework.pdf

Emerson, H. and Luginbuhl, M. A. (1945). 1,200 Local Public Health Departments for the United States. *American Journal of Public Health, 35,* 898-904.

Erwin, P. C., Shah, G. H, and Mays, G. P. (2014). Local health departments and the 2008 recession characteristics of resiliency. *American Journal of Prevention Medicine, 46*(6), 559–568.

Erwin, P. and Brownson, R. (Eds.) (2017). *Scutchfield and Keck's Principles of Public Health Practice* (4th Ed). Boston, MA: Cengage Learning.

Farmer, C. M. (2017). Relationship of traffic fatality rates to maximum state speed limits. *Traffic Injury Prevention, 18*(4), 375-380. DOI: 10.1080/15389588.2016.1213821

Federal Register. (2014). Additional requirements for charitable hospitals; community health needs assessments for charitable hospitals; Requirement of a section 4959 excise tax return and time for filing the return; final rule. *Internal Revenue Service, 79*(250), 78953-79016.

Feldstein, P. J. (2015). *Health policy Issues: An economic perspective*. Chicago, IL: Health Administration Press.

Fineberg, H. V. (2011). Public health and medicine. *American Journal of Preventive Medicine, 41*(4), S149-S151.

Glascoff, M. A., Johnson, H. H., Glascoff, W. J., Lovelace, J. and Bibeau, D. L. (2005). A Profile of public health educators in North Carolina's Local Health Departments. *Journal of Public Health Management Practice, 11*(6), 528–536.

Godet, M. (1982). From forecasting to 'La Prospective': A new way to looking at futures. *Journal of forecasting, 1*(3), 293-301.

Gupta, A., Cavallerano, J., Sun, J. K., and Silva, P. S. (2017). Evidence for telemedicine for diabetic retinal disease. *Seminars in Ophthalmology, 32*(1), 22-28, doi:10.1080/08820538.2016.1228403

Gutilla, M. J., Hewitt, S. J., and Cooper, B. (2017). Making the most of our community health assessment by developing a framework for evaluation. *Journal of Public Health Management Practice, 23*(4), S34-S38. doi: 10.1097/PHH.0000000000000594

Hajat, A., Cilenti, D., Harrison, L. M., MacDonald, P. D., Pavletic, D., Mays, G. P., Baker, E.L. (2009). What predicts local public health agency performance improvement? A pilot study in North Carolina. *Journal of Public Health Management and Practice, 15*(2), E22-E33.

Handler, A. S and Turnock, B. J. (1996). Local health department effectiveness in addressing the core functions of public health: essential ingredients. *Journal of Public Health Policy, 17*(4), 460-483.

Henderson, J.M. (2015). *Health economics and policy (6th ed.).* Stamford, CT: Cengage Learning.

Holder, H. D. (2005). Community prevention of young adult drinking and associated problems. *Addiction, 92*(2), 155-171.

Honeycutt, A. A., Wile, K., Dove, C., Hawkins, J., Orenstein, D. (2015). Strategic planning for chronic disease prevention in rural America: Looking through a PRISM lens. *Journal of Public Health Management Practice, 21*(4), 392–399.

Horney, J. A., Carbone, E. G., Lynch, M., Wang, Z. J., Jones, T., & Rose, D. A. (2017). How health department contextual factors affect public health preparedness (php) and perceptions of the 15 PHP capabilities. *American Journal of Public Health*, *107*(2), S153–S160. http://doi.org/10.2105/AJPH.2017.303955

Institute of Medicine. (2012). Primary care and public health: exploring integration to improve population health. Washington, DC: The National Academies Press.

Institute of Medicine. (2003). *The Future of the Public's Health in the 21st Century*. Washington, DC: National Academies Press.

Institute of Medicine. (2002). *Committee on assuring the health of the public in the 21st Century. The Future of the Public's Health in the 21st Century*. Washington, DC: National Academies Press. Available from: https://www.ncbi.nlm.nih.gov/books/NBK221239

Institute of Medicine. (1988). Committee for the study of the future of public health. The future of public health. Washington, DC: National Academies Press. Available from: https://www.ncbi.nlm.nih.gov/books/NBK218227

Jadhav, E. D., Holsinger, J. W., and Fardo, D. W. (2015). Openness to change: experiential and demographic components of change in local health department leaders. *Frontiers in Public Health, (3*209). doi: 10.3389/fpubh.2015.00209

Johnson, N. B., Hayes, L. D., Brown, K., Hoo, E. C., and Ethier, K. A. (2014). CDC National health report: leading causes of morbidity and mortality and associated behavioral risk and protective factors--United States, 2005-2013. *Centers for Disease Control and Prevention, 63*(4), 3-27.

Johnston, B., Patterson, A., Bird, L., Wilson, E., Almack, K., Mathews, G., Seymour, J. (2018). Impact of the Macmillan specialist care at home service: a mixed methods evaluation across six sites. *BMC Palliative Care, 17*(1), 36. doi: 10.1186/s12904-018-0281-9

Keehan, S. P., Poisal, J. A., Cuckler, G. A., Sisko, A. M., Smith, S. D., Madison, A. J., …Lizonitz, J. M. (2016). National health expenditure projections, 2015-25: Economy, prices, and aging expected to shape spending and enrollment. *Health Affairs, 35*(8), 1522-1531.

Kronstadt, J., Meit, M., Siegfried, A., Nicolaus, T., Bender, K., and Corso, L. (2016). Evaluating the impact of national public health department accreditation — United States, 2016. *Morbidity and Mortality Weekly Report*, *65*(31), 803–806. DOI: http://dx.doi.org/10.15585/mmwr.mm6531a3

Madad, S. S., Masci, J., Cagliuso, N. V Sr., Allen, M. (2016). Preparedness for Zika virus disease — New York City, 2016. *Morbidity and Mortality Weekly Report, 65*(42), 1161-1165.

Mays, G. P., and Smith, S. A. (2011). Evidence links increases in public health spending to declines in preventable deaths. *Health Affairs (Project Hope), 30*(8), 1585–1593. http://doi.org/10.1377/hlthaff.2011.0196

Mays, G. P., McHugh, M. C., Shim, K., Perry, N., Lenaway, D., Halverson, P. K., and Moonesinghe, R. (2006). Institutional and economic determinants of public health system performance. *American Journal of Public Health, 96*(3), 523-531.

McLees, A. W., Thomas, C. W., Nawaz, S., Young, A. C., Rider, N., & Davis, M. (2014). Advances in public health accreditation readiness and quality improvement: Evaluation findings from the national public health improvement initiative. *Journal of Public Health Management and Practice*, 20(1), 29–35. http://doi.org/10.1097/PHH.0b013e31829ff726

Meit, M., Sellers, K., Kronstadt, J., Lawhorn, N., Brown, A., Liss-Levinson, R..,…Jarris, P. E. (2012). Governance typology: A consensus classification of state-local health department relationships. *Journal of Public Health Management and Practice, 18*(6), 520-528.

Merrill, J., Carley, K., Orr, M., Jeon, C., Storrick, J. (2012). Patterns of interaction among local public health officials and the adoption of recommended practices. *Frontiers for PHSSR, 1*(1), 1-5.

Morbidity and Mortality Weekly Report. (1997). Case definitions for infectious conditions under public health surveillance. *MMWR: Recommendation and Report, 46*(RR-10), 1-55.

National Association of County and City Health Officials. (2016). NACCHO 2016 national profile of local health departments. Washington, DC.

National Association of County and City Health Officials. (2016). Guide to data collected in national profile of local health departments and infrastructure studies 1990 –2016. Retrieved from http://nacchoprofilestudy.org/data-requests/

National Association of County & City Health Officials. (2016). Community health assessment & improvement processes. Retrieved from http://archived.naccho.org/topics/infrastructure/CHAIP/upload/CHA-and-CHIP-Processes-JJE.pdf

National Association of County and City Health Officials. (2014). NACCHO 2013 national profile of local health departments. Washington, DC. Retrieved on September 25, 2018 from http://nacchoprofilestudy.org/materials/2013-national-profile-of-local-health-departments/

Levin, B. W., and Fleischman, A. R. (2002). Public Health and Bioethics: The benefits of collaboration. *American Journal of Public Health, 92*(2), 165–167.

López-Torres, J., Rabanales, J., and Simarroc, M. J. (2015). Effectiveness of a telemedicine programme for patients with metabolic syndrome. *Technology and Health Care 23*, 161-169. DOI: 10.3233/THC-140888

Luo, H., Winterbauer, N. L., Shah, G., Tucker, A., and Xu, L. (2016). Factors driving local health departments' partnerships with other organizations in maternal and child health, communicable disease prevention, and chronic disease control. *Journal of Public Health Management and Practice*, *22*(4), E21-8.

Luo, H., Sotnikov, S., Shah, G., Galuska, D. A., and Zhang, X. (2013). Variation in delivery of the 10 essential public health services by local health departments for obesity control in 2005 and 2008. *Journal of Public Health Management Practice*, *19*(1), 53–61.

O'Keefe, K. A., Shafir, S. C., and Shoaf, K. I. (2013). Local health department epidemiologic capacity: a stratified cross-sectional assessment describing the quantity, education,

training, and perceived competencies of epidemiologic staff. *Frontiers in Public Health*, *1*, 64. http://doi.org/10.3389/fpubh.2013.00064

Public Health Accreditation Board. (2013). Standards and measures, version 1.5. Retrieved from http://www.phaboard.org/wp-content/uploads/SM-Version-1.5-Board-adopted-FINAL-01-24- 2014.docx.pdf

Public Health Accreditation Board. (2013). For immediate release: Monday, March 4, 2013 Retrieved from http://www.phaboard.org/wp-content/uploads/Eleven-Public-Health-Departments-First-to- Achieve-Accreditation-111.pdf

Public Health Accreditation Board. (2011). Guide to national public health department accreditation: Version 1.0 application period 2011-2012. Retrieved from http://www.phaboard.org/wpcontent/uploads/PHAB-Guide-to-National-Public-Health-Department-Accreditation-Version-1.0.pdf

Public Health Accreditation Board. (n.d.). Retrieved September 15, 2017, from PHAB website, http://www.phaboard.org/accreditation-overview/getting-started/

Public Health Accreditation Board. (n.d.). Accredited Health Departments. Retrieved March 22, 2018, from PHAB website, http://www.phaboard.org/news-room/accredited-health-departments/

Public Health Functions Steering Committee. (1994). Public Health Core Functions and 10 Essential Services. Retrieved from https://www.networkforphl.org/_asset/dd8lf6/Public-Health-Core-Functions-and-10-Essential-Services.pdf

Robin, N. and Leep, C. J. (2017). NACCHO's national profile of local health departments study: looking at trends in local public health departments. *Journal of Public Health Management and Practice, 23*(2), 198-201.

Ronzio, C. R., Pamuk, E., and Squires, G. D. (2004). The politics of preventable deaths: local spending, income inequality, and premature mortality in US cities. *Journal of Epidemiology and Community Health, 58,* 175–179. doi: 10.1136/jech.2003.008672

Roper, W. L., Baker, E. L., Dyal, W. W., and Nicola, R. M. (1992). Strengthening the public health system. *Public Health Reports, 107*(6), 609–615.

Rosenbaum, S. (2013). Principles to consider for the implementation of a community health needs assessment process. *The George Washington University School of Public Health and Health Services, Department of Health Policy.*

Russo, J. E., McCool, R. R., and Davies, L. (2016). VA Telemedicine: An Analysis of Cost and Time Savings. Telemedicine and e-Health, 22(3), 209-215. doi:10.1089/tmj.2015.0055

Santerre, R. E. (2009). Jurisdiction size and local public health spending. *Health Service Research, 44*(6), 2148–66.

Scutchfield, F. D., Knight, E. A., Kelly, A. V., Bhandari, M. W., and Vasilescu, I. P. (2004). Local public health agency capacity and its relationship to public health system performance. *Journal of Public Health Management and Practice, 10*(3), 204–215.

Shah, G. H., Mase, W. A, and Waterfield, K. C. (2018). Local health departments' engagement in addressing health disparities: the effect of health informatics. *Journal of Public Health Management and Practice*. doi: 10.1097/PHH.0000000000000842

Shah, G. H., Sotnikov, S., Leep, C. J., Ye, J, and Corso, L. (2018). Local boards of health characteristics influencing support for health department accreditation. *Journal of Public Health Management and Practice, 24*(3), 263-270.

Shah, G. H., Leider, J. P., Castrucci, B. C., Williams, K. S., and Luo, H. (2016). Characteristics of local health departments associated with implementation of electronic health records and other informatics systems. *Public Health Reports, 131*(2), 272–282.

Shah, G. H., Leep, C. J., Ye, J., Sellers, K., Liss-Levinson, R., and Williams, K. S. (2015). Public health agencies' level of engagement in and perceived barriers to PHAB national voluntary accreditation. *Journal of Public Health Management and Practice, 21*(2), 107-115.

Shah, G. H., Williams, K, Shah, B. G. (2015). Implementation of electronic disease reporting systems by local health departments. *Front Public Health Service System Research, 4*(4), 13–20.

Singh, S. R., Carlton, E, L. (2017). Exploring the link between completion of accreditation prerequisites and local health departments' decision to collaborate with tax-exempt hospitals around the community health assessment. *Journal of Public Health Management and Practice, 23*(2), 138-147.

Solet, D., Ciske, S., Gaonkar, R., Horsley, K., McNees, M., Nandi, P., and Krieger, J. W. (2009). Effective Community health assessments in King County, Washington. *Journal of Public Health Management Practice, 15*(1), 33–40.

Somerville, M. H., Mueller, C. H., Boddie-Willis, C. L., Folkemer, D. C., and Grossman, E. R. (2012). Hospital community benefits after the ACA: Partnerships for community health improvement. *The Hilltop Institute, Issue Brief.*

Stamatakis, K. A., Leatherdale, S. T., Marx, C. M, Yan, Y., Colditz, G. A., and Brownson, R. (2012). Where is obesity prevention on the map? distribution and predictors of local health department prevention activities in relation to county-level obesity prevalence in the United States. *Journal of Public Health Management and Practice, 18*(5), 402- 411.

Szklo, M & Nieto, F. J. (2014). *Epidemiology: Beyond the basics (3rd. ed.).* Burlington, MA: Jones and Bartlett Learning.

The National Association of County and City Health Officials. (2014). The 2013 national profile of local health departments. Retrieved from http://archived.naccho.org/topics/infrastructure/profile/upload/2013-National-Profile-ofLocal-Health-Departments-report.pdf

Thomas, D. L., Sharp, T. M., Torres, J., Armstrong, P. A., Munoz-Jordan, J., Ryff, K. R.…Rivera-Garcia, B. (2016). Local transmission of Zika virus — Puerto Rico, November 23, 2015–January 28, 2016. *Morbidity and Mortality Weekly Report, 65*(6), 154-158.

Tulchinsky, T. H and Varavikova, E. A. (2015). What is the "New Public Health"? *Public Health Reviews, 32*(1), 25-53.

United States National Library of Medicine. (1995). Images from the history of the public health service. Retrieved from https://www.nlm.nih.gov/exhibition/phs_history/intro.html

Varda, D., Shoup, J. A., and Miller, S. (2012). A systematic review of collaboration and network research in the public affairs literature: Implications for public health practice and research. *American Journal of Public Health, 102*(3), 564–571. http://doi.org/10.2105/AJPH.2011.300286

Venable, J. M., Li, Q., Ginter, P. M., and Duncan, W. J. (1993). Use of scenario analysis in local public health departments: Alternative futures for strategic planning. *Association of Schools of Public Health, 108*(6), 701-710.

Vest, J. R., Menachemi, N., and Ford, E. W. (2012). Governance's role in local health departments' information system and technology usage. *Journal of Public Health Management and Practice, 18*(2), 160-168.

Wahowiak, L. (2017). Community needs assessments leading to better outcomes. *American Journal of Public Health, 107*(8), 1195–1196.

Wetta, R. E., Dong, F., LaClair, B., Gianfranco, P., and Orr, S. A. (2015). Factors affecting the progress of community health assessment and improvement activities in Kansas. *Journal of Public Health Management and Practice*, 21(4), E1-E9.

Wetta, R. E., Gianfranco, P., LaClair, B., Orr, S. A., and Brown, M. B. (2014). Voices Across Kansas: Community health assessment and improvement efforts among local health departments. *Journal of Public Health Management and Practice, 20*(1), 39-42.

Wiley, L. F. and Matthews, G. (2017). Health care system transformation and integration: A call to action for public health. *Journal of Law, Medicine & Ethics, 45*(1), 94-97.

Wilson, K. D., Mohr, L. B., Beatty, K. E., and Ciecior, A. B. (2014). Describing the continuum of collaboration among local health departments with hospitals around the community health assessments. *Journal of Public Health Management and Practice, 20*(6), 617–625.

World Health Organization. (2003). WHO framework convention on tobacco control. Retrieved from http://www.who.int/tobacco/framework/WHO_FCTC_english.pdf

Yeager, V. A., Ye, J., Kronstadt, J., Robin, N., Leep, C. J., and Beitsch, L. M. (2018). National voluntary public health accreditation: are more local health departments intending to take part? *Journal of Public Health Management and Practice,* 22(2), 149-156.

Yeager, V. A., Ferdinand, A. O., Beitsch, L. M, Menachemi, N. (2015). Local public health department characteristics associated with likelihood to participate in national accreditation. *American Journal of Public Health, 105*(8), 1653-1659.

Yeung, L. F., Lurie, P., Dayan, G., Eduardo, E., Britz, P. H., Redd, S. B., and…Seward, J. F. (2005). A limited measles outbreak in a highly vaccinated US boarding school. *Pediatrics*, *116*(6), 1287-1291.

Zhang, B. (2016). The benefits and risks of telemedicine. *Risk Management, 63*(6), 14-16.

Zhang, X., Luo, H., Gregg, E. W., Mukhtar, Q., Rivera, M., Barker, L., and Albright, A. (2010). Obesity prevention and diabetes screening at local health departments. *American Journal of Public Health, 100*(8), 1434-1441.