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Exploring The Factors Associated With Social Media Use In Local Health Departments

Suzanne Lamarca Madden

EXPLORING THE FACTORS ASSOCIATED WITH SOCIAL MEDIA USE

IN LOCAL HEALTH DEPARTMENTS

by

SUZANNE LAMARCA MADDEN

(Under the Direction of Gulzar H. Shah)

ABSTRACT

Background: The health system in the United States is rapidly advancing, including newer technologies, newer ways of delivering essential public health services and population health. Approximately 70% of the public uses social media as a communication tool, which makes it an ideal platform for dissemination of information. Local health departments (LHDs) are accountable for assuring ten essential public health services, including informing, educating, and empowering people about health issues. Previous research showed less than 70% of LHDs are adequately performing this essential service. The purpose of this study was to examine what factors impact the use of social media by LHDs to communicate with the public. *Methods:* This study utilized a cross-sectional study design, using data from the 2016 NACCHO profile of local health departments. The data assessed for this study was derived from a set of questions in a module containing the questions of interest for this study related to social media utilization. *Results:* Results varied across platforms but showed significant associations between social media use and: youngest executives, larger populations, higher expenditures, locally governed LHDs, greater informatics use, greater communication channel use, LHDs employing Public Information Professionals, change in annual budget, PHAB accreditation status, top executive degree, top executive length of service, and top executive race. *Conclusion:* LHDs can utilize these results as a starting point for training and education for employees and leaders. As more people utilize social media platforms for communicating, understanding the LHD characteristics

that influence social media use can be vital for designing an effective system to reach audiences in the community for public health education. The strategic addition of new policies and procedures related to social media use at the executive level are needed in order to ensure public health essential service #3 is being sufficiently reached.

INDEX WORDS: Social media, Local health departments, Facebook, Twitter, Youtube, Essential public health service three, Health communication

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by

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CHAPTER I: BACKGROUND AND SIGNIFICANCE

Introduction

The health system in the United States is rapidly advancing, including newer

technologies, newer ways of delivering essential public health services and population health.

The increasing complexity and demands to address novel threats require newer ways of

communicating with the public. In today's digital and technological age, approximately 7 in 10

Americans, or 69% of the public, use social media platforms to connect with others, read news

content, share information, and for entertainment purposes. Despite this widespread use of social

media, local health departments (LHDs) are deficient in capitalizing on this inexpensive and

innovative method to communicate with constituents, with only 65% reporting Facebook use in

2016 (NACCHO, 2017). This study aims to examine what factors impact the use of social media

by LHDs.

Social media can be broadly defined as, "activities, practices, and behaviors among

communities of people who gather online to share information, knowledge, and opinions using

conversational media" (Thackeray, Neiger, Smith, & Van Wagenen, 2012). The purposes for

which these platforms are used in the public health discipline include informing the public of

educational events, emergency management, and disease outbreaks. An ever-increasing number

of people use social media platforms daily. Facebook is the most popular social media site, with

68% of Americans using this platform, and of those users, 76% visit the site daily. Twitter is

another popular social media platform, with 21% of Americans using this communication

channel, and of those users, 42% check in to the site daily (Pew Research Center, 2018).

Increasingly, photo and video sharing platforms (Instagram, Flickr and YouTube) are being used

for communicating with audiences. These social media platforms are progressively being

utilized more by health care providers and public health practitioners for distributing health information, conducting public health surveillance, and managing emergency events (Harris, Choucair, Maier, Jolani, & Bernhardt, 2014).

Increasingly, social media is being utilized by Local Health Departments as a communication channel with constituents. According to Thackeray et al (2012), "in public health, social media can be used to inform, educate and empower people about health issues, to enhance the speed at which communication is sent and received during public health emergencies or outbreaks, to mobilize community partnerships and action, to facilitate behavior change, to collect surveillance data, and to understand public perceptions of issues" (Thackeray, Neiger, Smith, & Van Wagenen, 2012). This importance is highlighted by the CDC's effort to assist public health practitioners in using social media by developing an online toolkit (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013).

Statement of the Problem

Local Health Departments (LHDs) have the ultimate responsibility of keeping the population healthy in the communities in which they serve. In particular, they are accountable for assuring ten essential public health services. The third essential service according to the Centers for Disease Control and Prevention (CDC) is: "inform, educate, and empower people about health issues" (Centers for Disease Control and Prevention, 2017). In a 2004 study by Mays and colleagues, only 61% of LHDs were sufficiently providing this third essential service (Mays, et al., 2004). In a follow-up study conducted in 2010, that percentage had only risen to 67 percent (Bhandari, Scutchfield, Charingo, Riddell, & Mays, 2010). This indicates a substantial gap between current performance and best practices.

The Public Health Accreditation Board (PHAB) requires as a measure for LHDs pursuing national accreditation to provide information on public health issues and functions to the public, as well as engage with the community (PHAB, 2013). In addition, Healthy People 2020 has 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" (Office of Disease Prevention and Health Promotion, 2017). These overarching directives contribute to the significance of social media use in LHDs.

To date, very little research has been completed related to social media use by LHDs. The studies that are currently available show variations among LHDs in the timing and extent of adoption of social media (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013). For instance, in 2013 Harris and colleagues found that region, as defined by the US Department of Health and Human Services, determines early adoption of social media by LHDs. For both Twitter and Facebook, the researchers found that LHDs in the Health Region 1, which includes northeastern states CT, ME, MA, NH, RI, and VT, were less likely to be innovators or early adopters of these social media platforms. In contrast, LHDs in Health Region 9, which includes AZ, CA, HI, and NV, were unexpectedly more likely to be innovators and early adopters. Harris and colleagues also found that overall "24% of LHDs had a Facebook page, 8% had Twitter accounts, and 7% had both." These variations may be driven by demographic and structural variables. For instance, LHDs located in jurisdictions with larger, urban populations were more likely to be innovators and early adopters for both Facebook and Twitter (Neiger, Thackeray, Burton, THackeray, & Reese, 2013). Higher population density was also significantly associated with higher use of social media by LHDs (Thackeray, Neiger, Smith, & Van Wagenen, 2012). The majority of innovator and early adopter LHDs were more

likely to be in a state where the State Health Department has both a Twitter and Facebook account (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013). Of note is the finding that state health departments also show variation in social media use. The majority (60% – 82%) are using at least one social media application (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013). However, very few used additional social media applications such as Flickr and YouTube (Thackeray, Neiger, Smith, & Van Wagenen, 2012).

Current research indicates that state health departments are using social media as a one-way communication channel indicating failure to capitalize on the interactive nature of this technology platform (Thackeray, Neiger, Smith, & Van Wagenen, 2012). Although there is no research showing similar use by LHDs, we can assume that they also are engaged in one-way communication through social media. The reason for this assumption is that the state health department is typically the practice model for LHDs. Additionally, the research findings related to photo-sharing platforms focused on Flickr (for instance, Thackeray et al, 2012), and not Instagram, which currently is very popular among young adults. Furthermore, it is not clear how individual and community socioeconomic status indicators are associated with LHD use of social media. However, research has alluded to the importance of larger constituency size and urban population as determinants of adoption and use of social media by LHDs. These are proxies of higher income levels.

Additionally, there is no research on the effect of ethnic and gender composition on social media use by LHDs. There is only one study on the impact of the educational profile of LHD top executives on social media use (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013). However, this study examined only the direct

effects of education on social media use, and did not examine the effects of interactions between education and gender, nor education and ethnic background on social media use. The same can be said about the effects of workforce composition (FTEs versus PTEs) and the composition of the revenue stream. Specifically, it is currently unknown how variations in Medicaid/Medicare contributions to LHD revenue streams affect overall social media use.

Purpose Statement

The aim of this research is to examine the patterns of social media use and determine the scope of use of social media by LHDs. In addition, this study will examine the impacts of gender, race and education of the top leadership at LHDs, expenditures, budget changes, and workforce composition on the likelihood of social media use by LHDs. The impact of these factors on social media use at LHDs has only been minimally studied in previous research, and not all factors were explored. Additionally, this research can serve as a guide for examining future approaches to improve communications and increase the use of social media by LHDs.

Research Questions

This research examines the following questions:

1. What are the patterns of social media use by LHDs in the United States?
2. What characteristics of LHD leadership are associated with social media use in LHDs?
   a. Do age, gender, ethnicity and race of LHD top executives have an effect on social media use?
   b. Does the educational profile of LHD top executives have an effect on social media use?
3. What characteristics of LHD infrastructure are associated with social media use?

a. Does population size have an effect on social media use?

b. Does LHD governance structure have an effect on social media use?

c. Does PHAB accreditation status have an effect on social media use?

d. Do staffing differences have an effect on social media use?

e. Does use of other communication channels have an effect on social media use?

Null Hypotheses

Ho1: There is not an association between LHD social media use and top executive age.

Ho2: There is not an association between LHD social media use and top executive gender.

Ho3: There is not an association between LHD social media use and top executive race.

Ho4: There is not an association between LHD social media use and top executive education.

Ho5: There is not an association between LHD social media use and population size.

Ho6: There is not an association between LHD social media use and having a PIP on staff.

Ho7: There is not an association between LHD social media use and executive length of service.

Ho8: There is not an association between LHD social media use and budget.

Ho9: There is not an association between LHD social media use and expenditures.

Ho10: There is not an association between LHD social media use and its governance structure.

Ho11: There is not an association between LHD social media use and informatics use.

Ho12: There is not an association between LHD social media use and LHD accreditation status.

Ho13: There is not an association between LHD social media use and other communication channel use.

Delimiters

The quantitative data used in this study were derived from the 2016 Profile of Local Health Departments conducted by the National Association of County and City Health Officials (NACCHO). The 2016 Profile was a survey that included a primary group of questions from a survey sent to all 2533 LHDs in the United States. A secondary set of additional questions were placed into two modules (Module 1 and Module 2), and then randomly administered to LHDs. The set of questions in Module 2 contained the questions of interest for this study related to social media utilization. Module 2 was sent to a representative stratified random sample of 625 LHDs. Sampling stratification was based on LHD population size. The response rate for Module 2 was 77%, with 480 LHDs completing the module.

Significance of Study

There is growing research evidence of the importance of social media platforms use in public health (e.g., Centers for Disease Control and Prevention, 2011; Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013; Thackeray, Neiger, Smith, & Van Wagenen, Adoption and use of social media among public health departments, 2012). However, there remains a number of knowledge gaps. This is more so in the areas of the impacts of leadership characteristics, and workforce effort and infrastructure on the likelihood of social media use by LHDs.

The impact of the LHD executive leader's gender on the performance of LHDs in general and in the use of social media by LHDs is completely unknown. Also, the effect of the

associations of executive leader's gender, age, race, and ethnicity on social media use is unknown. This study will quantitatively explore the direct effects of executive leader's age, gender, race, and ethnicity on social media use. The findings of this study will add to the literature related to these gaps, and will contribute new knowledge to the specific area of social media use by LHDs.

Local Health Departments (LHDs) now employ both full-time and part-time staff. Both groups perform vital public health functions. There are variations in the composition in terms of effort equivalent. According to the 2016 NACCHO Profile of Local Health Departments, 80 % of LHDs employ fewer than 50 FTEs, 37% employ fewer than 10 FTEs and 42% employ between 10 and 50 FTEs. A mere 10% of LHDs employ 100 or more FTEs (NACCHO, 2017). How these variations in effort composition impact social media use by LHDs is currently unknown. Also unknown is whether LHDs that have higher numbers of FTEs outperform those with smaller numbers of FTEs in social media platform use. This study aims to determine the effects of workforce composition on social media use by LHDs, and answer the basic question of whether or not a smaller number of FTEs is a barrier to social media use.

Definition of Terms

Facebook: A social media platform where individuals and organizations can create profiles in order to share information, photos, media, and exchange messages.

Follower. A follower is someone who subscribes to receive updates from a person or organization. In this study, a follower refers to social media users who choose to receive updates from LBH pages on Facebook, Twitter, Instagram, or Youtube.

Hashtag. A hashtag helps organize and share information on social media platforms. A key word or phrase (without spaces) is preceded by a hash symbol (#) (e.g., #socialmedia). Each hashtag is hyperlinked, so a user can click to see all content with the same hashtag or enter the hashtag in the search field of the social platform for similar results.

Like. A "like" is a way for social media users to show their approval for a message, post, picture, comment, or video on Facebook, Twitter, Instagram or Youtube.

Newsfeed. A feature that informs users on social media sites about their friends' recent activities on the platform. Also knows as a follower stream on Twitter.

Page. A page is similar to a user profile, but it displays information about organizations, agencies, and institutions.

Profile. The place on a social media site where an individual user displays their personal information such as name, pictures, links, and posts.

Social Media. Social media is indicated by, "activities, practices, and behaviors among communities of people who gather online to share information, knowledge, and opinions using conversational media" (Thackeray, Neiger, Smith, & Van Wagenen, 2012). In this study, social media definition is limited to the platforms Twitter, Facebook, Instagram, and YouTube.

Social network. The communities of users who can be found on social media sites. Often used as a synonym for social media.

Twitter: A social media platform that enables users to network and communicate by sending and receiving short messages and media of up to 140 characters, also known as "tweets".

Video Sharing: A type of social media platform where users share and receive video content. Users have ability to comment and share video content. Most popular site is Youtube.

Workforce Effort Composition. This is defined by the percentage of Full-Time Equivalent employees (FTEs) and Part-Time Equivalent employees (PTEs) at each LHD.

CHAPTER II: REVIEW OF THE LITERATURE

History of Health Communication

The field of communication is intricate and spans centuries. The National Communication Association (NCA), the leading professional organization for the field of communication, defines communication as a discipline that "focuses on how people use messages to generate meanings within and across various contexts, and is the discipline that studies all forms, modes, media, and consequences of communication through humanistic, social scientific, and aesthetic inquiry (The National Communication Association, 2018)." Researchers in the field of communication historically trace the foundation of the field back to Aristotle and Plato.

The field of health communication is comparatively newer, beginning only in the 1950's (Parvanta C. , Nelson, Parvanta, & Harner, 2011). The gradual development of the health communication discipline was heavily influenced by other social sciences such as sociology and psychology. The first peer reviewed scientific journal related to the discipline came in 1989, with the publishing of Health Communication. This was a milestone, giving credibility to the field for researchers around the world.

When specifying public health communication as a subset of health communication, there are numerous definitions to be found. In 1995, Maibach and Holtgrove gave their definition as "the use of communication techniques and technologies to influence individuals, populations, and organizations for the purpose of promoting conditions conducive to human and environmental health" (Maibach & Holtgrave, 1995). More recently, the CDC and the National Cancer Institute defined health communication as "the study and use of communication

strategies to inform and influence individual decisions that enhance health" (Centers for Disease Control and Prevention, 2011). Public health communication is a key tool for behavior change and advocacy.

When analyzing the field of health communication, the function of communication is considered to be the fundamental social process in the delivery of health services and public health promotion. This notion is based upon the important role communication plays in collecting and disseminating health information. Health information is essential in guiding health behavior, clinical outcomes, and decision making (Kreps, Bonaguro, & Query, 1998).

Research related to health communication is complex and wide-ranging, including numerous channels of communication and various levels of analysis. The principal stages for health communication analysis include intrapersonal, interpersonal, group, organizational, and societal communication. Social media use in public health can be found under the societal communication stage, which is defined as "the generation, dissemination, and utilization of relevant health information communicated via diverse media to a broad range of professional and lay audiences to promote health education, health promotion, and enlightened health care practice" (Kreps, Bonaguro, & Query, 1998).

The transmission or exchange of information to many people through electronic or print media is known as mass communication. Social media is an example of an electronic channel used for mass communication (Jones, 2016).

Internet and Social Media

The number of Americans who use the Internet in some form or fashion has grown exponentially in the past two decades. According to the Pew Research Center, currently nearly 90% of adults in the U.S. use the internet, up from 76% of adults in 2010, and nearly double the percentage of just 52% in the year 2000 (Pew Research Center, 2018). While the home or office desktop computer was the first way Americans connected virtually through the internet, many people now also connect via smartphones, tablets, and laptops. In fact, the smartphone is now growing in popularity as being the primary means of accessing information online. Statistics show that 95% of adults currently own a cellphone, with 77% of those being smartphones, which have the capability to connect online. Currently, one in five adults in the U.S. uses their smartphone as the sole technology to connect to the internet (Pew Research Center, 2018).

After the huge success of the Internet, there was an inevitable evolution to what is called Web 2.0. The term Web 2.0 can be defined as "the current iteration of the Internet that is shaped by interactive, user-generated and user-controlled content and applications," as opposed to the previously static Internet (Korda, 2013). With so many people now connected to the Internet and utilizing smartphones to connect with one another, it is no surprise that the use of social media platforms has also increased tremendously over the past decade, and continues to rise. A 2018 survey found that 69% of adults in the U.S. visit some type of social media platform. This is a tremendous increase from just 5% of social media users in 2005. Along with the increase in social media users, the diversity of the users has also grown. While young adults age 18 to 29 were initially the majority of early adopters of social media, utilization by adults aged 30 and over has rapidly risen over the past several years, as shown in Figure 2.1 (Pew Research Center, 2018).
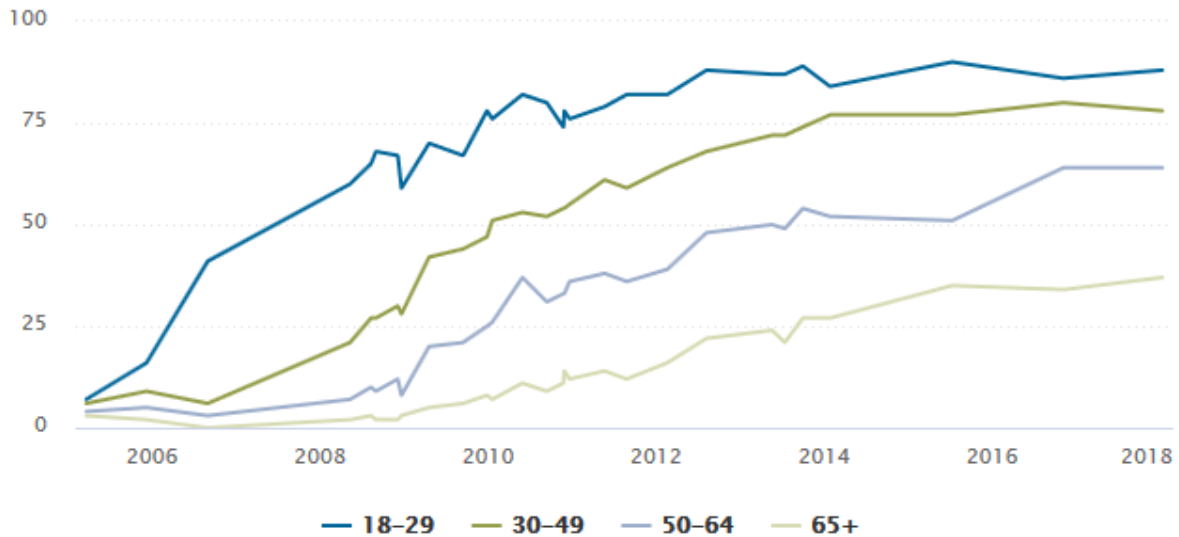
Figure 2.1: Percentage of U.S. Adults Who Use Social Media (Pew Research Center, 2018)

Defining Social Media

An ever-increasing number of people use social media platforms daily. There are several definitions in the literature for the term "social media." Merriam-Webster defines social media as "forms of electronic communication (such as websites for social networking and microblogging) through which users create online communities to share information, ideas, personal messages, and other content such as videos (Merriam-Webster, 2018)." Other definitions of social media describe it as web-based platforms, where users create profiles for multidirectional communication and collaboration, permitting users and communities to connect to one another within the platform, to share information, facts and opinions using informal media (Capurro, et al., 2014; Thackeray, Neiger, Smith, & Van Wagenen, 2012).

The term "social media" is sometimes used interchangeably with the term "social networks," but in fact, social media refers to the sites that allow users to share content and connect with other users, whereas social networks denotes communities of users on social media sites (Burns, 2017). Social media fosters and streamlines interactive participation and discussion, and provides a framework for influencing others (Barreto & Whitehair, 2017).

History of Social Media

Before the concepts of the internet and social media made their way to people everywhere, they began in the United States military. In 1983, a Department of Defense project called Advanced Research Projects Agency Network (ARPANET) created the communications model, Transmission Control Protocol and Internet Protocol, or TCP/IP, which established standards for how data could be transmitted between multiple networks. Once created, researchers then built the "network of networks" that became what we now refer to as the Internet. The online world became more familiar in 1990, when computer scientist Tim Berners-Lee developed the World Wide Web (Andrews, 2013).

The first social media site was the website Six Degrees, which began in 1997. This site allowed users to create a profile and then friend other users. Over the next few years, the internet evolved into the age of blogging and instant messaging. The term "blog" is a shortened version of the word "Weblog" which was coined by Jorn Barger, an early blogger who was the editor of the site "Robot Wisdom." Instant messaging services such as ICQ and AOL, and blogging sites LiveJournal and Xanga were especially prominent in this time period (Hale, 2015).

In the early 2000's social media platforms began to take shape as sites such as Friendster, MySpace, LinkedIn and Facebook were launched. Several of these sites, including MySpace and Friendster, lost their momentum within a few years, while others such as Facebook, Youtube, Twitter and LinkedIn increased in popularity over the past decade (Hale, 2015). As of 2018, the most popular social media platforms were Facebook, Youtube, Twitter, LinkedIn, Instagram, Pinterest and Snapchat.

Social Media Usage

In 2018, approximately 77% of the U.S. population was a user on some type of social media platform. The most popular social media platforms among U.S. adults are Facebook and Youtube. Seventy three percent of adults use Youtube, and 68% use Facebook. Youtube is a video-sharing site, and not a traditional social media platform, but contains some social elements. Facebook has been the most utilized social media platform for Americans since 2012, with 210 million users in the U.S. in 2018 and approximately 74% of those users accessing Facebook on a daily basis. Other social media platforms (Twitter, LinkedIn, Instagram, Pinterest and Snapchat) are used by 40% of Americans or less (Pew Research Center, 2018).

In 2018, 51% percent of Facebook users reported using the platform several times a day, and 23% use it once a day. Thirty-eight percent of adults reported using Instagram several times a day, with 22% using it once a day, and 39% less often. Twitter users responded using the platform 26% several times a day, 20% once a day, and 53% less often. Youtube users reported using the platform 29% several times a day, 17% once a day, and 55% less often (Pew Research Center, 2018).

As illustrated in the figure below, women are more likely than men to use social media, across all platforms, with the exception of Youtube. Black and Hispanic populations are more likely to use social media platforms than Whites. Higher social media usage percentages can also be found in younger populations, 18 – 29 years old, those with higher education, and those residing in urban areas (Pew Research Center, 2018).
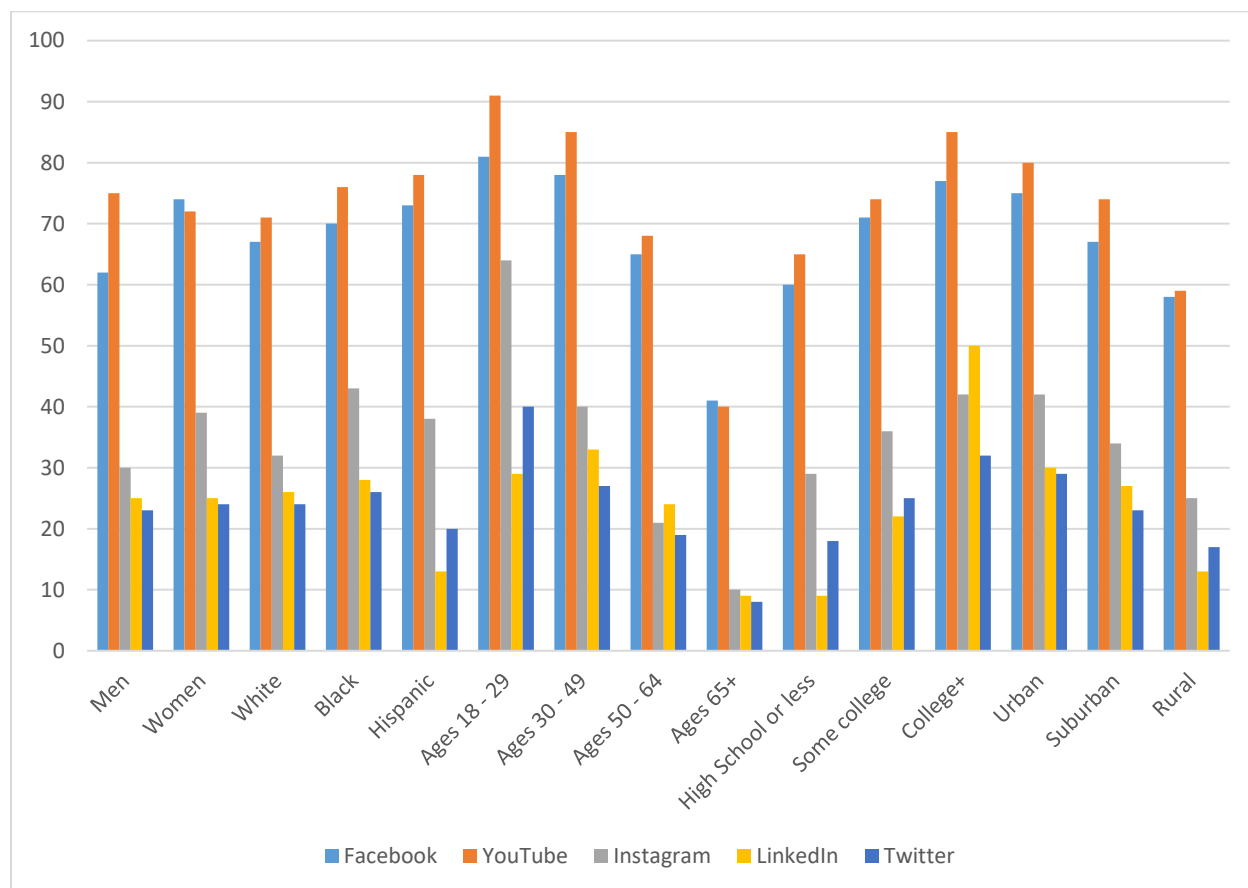
Figure 2.2: Percentage of U.S. Adult Social Media Use by Demographic Group and Platform

Note: Adapted from: Pew Research Center. (2018, March). *Social Media Use in 2018.* Retrieved from pewresearch.org: http://www.pewinternet.org/2018/03/01/social-media-use-in-2018/

Social media platforms can be accessed via smartphone, tablet or personal computer (PC). As shown in Figure 2.3, American adults by far access social media most frequently via smartphones, at 73%, then tablets at 30%, and just 29% by PC. This higher percentage of access

through smartphones is consistent across all ages and races. Because of the reach of social

media platforms, companies, brands and other organizations have a unique method to connect

with audiences across all spectrums (The Nielson Company, 2017).

Q3 2016

BY AGE DEMOGRAPHIC								
	ADULTS 18+	ADULTS 18+ REACH %	18-34 YEARS OLD	18-34 YEARS OLD REACH %	35-49 YEARS OLD	35-49 YEARS OLD REACH %	50+ YEARS OLD	50+ YEARS OLD REACH %
Smartphone	176.9 M	73%	59.6 M	82%	51.2 M	85%	65.5 M	60%
Tablet	74 M	30%	21.4 M	29%	27.5 M	45%	25. 1 M	23%
PC	70.2 M	29%	17 M	23%	20.1 M	33%	33.1 M	30%

Source: PC Social Networking Q3 2016 via Nielsen Netview; Smartphone (App/Web) and Tablet (iOS and Android)
Social Networking Q3 2016 via Nielsen Electronic Mobile Measurement.

BY RACE/ETHNIC COMPOSITION								
	African-American Adults (18+)	African-American Adults (18+) Reach %	Hispanic Adults (18+)	Hispanic Adults (18+) Reach %	Asian-American Adults (18+)	Asian-American Adults (18+) Reach %	White Adults (18+)	White Adults (18+) Reach %
Smartphone	21.9 M	72%	30 M	80%	9.7 M	65%	128.4 M	71%
Tablet	9.1 M	25%	5.9 M	20%	2.7 M	11%	57.5 M	19%
PC	8.4 M	27%	7 M	19%	2.4 M	16%	54.8 M	30%

Source: PC Social Networking Q3 2016 via Nielsen Netview; Smartphone (App/Web) and Tablet (iOS and Android)
Social Networking Q3 2016 via Nielsen Electronic Mobile Measurement.

Figure 2.3: Average Weekly Reach of Social Media Over Platforms (The Nielson Company, 2017)

Importance of Health Communication in Public Health

The CDC defines public health systems as "all public, private, and voluntary entities that

contribute to the delivery of essential public health services within a jurisdiction." Local health

departments are included within this system, along with other public health agencies, healthcare providers, public safety agencies, human service/charity organizations, education and youth development organizations, recreation and arts-related organizations, economic and philanthropic organizations, and environmental agencies/organizations (Centers for Disease Control and Prevention, 2017).

The field of public health is built on foundational principles. These include the three core functions (assessment, assurance, policy development), and the ten essential services of public health. These services are depicted in Figure 2.4.
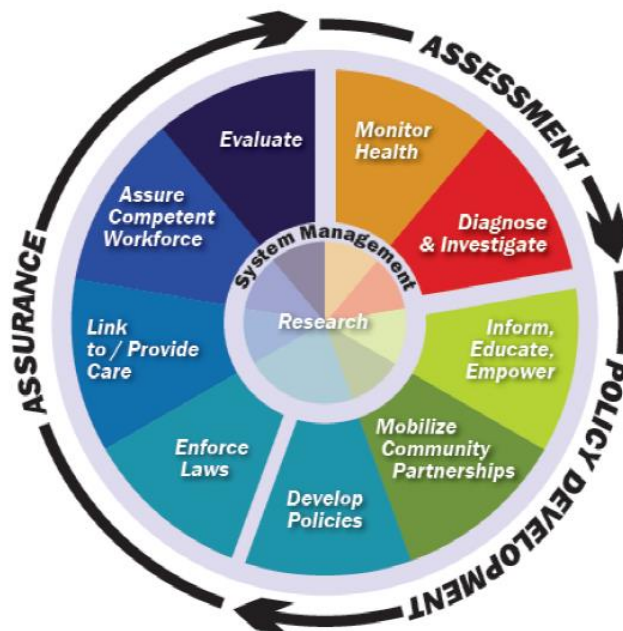
Figure 2.4: Ten Essential Public Health Services (Centers for Disease Control and Prevention, 2017)

Public health interventions and programs regularly refer to these ten essential services as benchmarks for driving services. The role of health communication in local health departments originated from these essential services. The function of health communication is incorporated in

nearly all of the essential services, but it is particularly important concerning the service to "inform, educate, and empower people about health issues" (Parvanta, Nelson, & Harner, Public Health Communication, 2018).

Vast improvements in information technology along with increasing expectations by the public for accurate, instantaneous information have prompted an evolution by many local health departments (LHDs) in order to continue being leaders in their field. Being strategic in collecting and using information effectively is crucial in keeping communities safe and healthy, and responding to their needs successfully (Gibson, Shah, Streichert, & Verchick, 2016; Drezner, McKeown, & Shah, 2016).

LHDs and Social Media

Local health departments (LHDs) have long been a part of the historical public health landscape in the United States. They serve to execute critical public health policies and provide needed health services for communities. The first LHD was implemented in 1911 in Yakima County, Washington, and was created in response to a successful county sanitation campaign that contained a dangerous typhoid epidemic at that time (Turnock, 2012). Local Health Departments continued to grow rapidly throughout the twentieth century, and in 2017 there were nearly 3,000 LHDs in the United States (NACCHO, 2017).

In 2003, a pivotal report was released by the Institute of Medicine (IOM) titled The Future of the Public's Health. This report encouraged the formation of a national steering committee to explore the advantages of having an accreditation body for LHDs. This led to the creation of the Public Health Accreditation Board, or PHAB, in 2007 (PHAB, 2013). This national accreditation body assesses LHD performance against a set of nationally recognized

standards (PHAB, 2013). Local health departments seeking national accreditation must use

PHAB standards as practice policy guidelines. There are several standards listed under twelve

domains. These domains include: 1) "Conduct and disseminate assessments focused on

population health status and public health issues facing the community," 2) "Investigate health

problems and environmental public health hazards to protect the community," 3) "Inform and

educate about public health issues and functions," 4) "Engage with the community to identify

and address health problems," 5) "Develop public health policies and plans," 6) "Enforce public

health laws," 7) "Promote strategies to improve access to health care," 8) "Maintain a competent

public health workforce," 9) "Evaluate and continuously improve health department processes,

programs and interventions," 10) "Contribute to and apply the evidence base of public health,"

11) "Maintain administrative and management capacity," and 12) "Maintain capacity to engage

the public health governing entity" (PHAB, 2013).

Increasingly, LHDs have adopted and utilized social media platforms for a variety of

population health purposes. The purposes for which these platforms are used include informing

the public of educational events, emergency management, and disease outbreaks. Of the PHAB

domains, 3 and 4 are the most relevant to social media use in LHDs. Domain 3 includes the

following standards: 1) "Provide health education and health promotion policies, programs,

processes, and interventions to support prevention and wellness" and 2) "Provide information on

public health issues and public health functions through multiple methods to a variety of

audiences" (PHAB, 2013). Domain 4 includes the following standards: 1) "Engage with the

public health system and the community in identifying and addressing health problems through

collaborative processes" and 2) "Promote the community's understanding of and support for

policies and strategies that will improve the public's health" (PHAB, 2013). The reason for

these domains and the standards within each is the growing interest within public health institutions to engage completely with the community they serve. Definitions of community engagement include "involving its residents, with service delivery and government institutions, in developing and implementing problem-solving activities" (Okubo & Weidman, 2000). The use of social media enhances this engagement between LHDs and their communities.

The social life of health information is constantly changing. According to a report from the Pew Research Center, there are two forces that drive online health conversations. They include: 1) "the availability of social media tools" and 2) "the increased desire and activity, especially among people living with chronic conditions, to connect with each other" (Fox, The Social Life of Health Information, 2011, 2011). The internet has changed the way people view and receive health information. Online sources are becoming a significant source of health information in the U.S., with 72% of adults having looked online for health information in the past year (Fox, The Social Life of Health Information, 2014).

The 2016 NACCHO Profile of Local Health Departments found that the three most used communication channels by LHDs are print media (91%), the LHD's website (78%), and broadcast media (69%). The most popular social media sites used by LHDs were Facebook (65%), followed by Twitter (28%), and Video sharing sites such as Youtube (10%). As shown in Figure 2.5, the 2016 Profile showed utilization of social media, across all platforms, increased as the size of population served increased. The 2016 Profile results also told that Local Health Departments are more likely to use social media platforms than those under state or shared governance, with the exception of video sharing platforms. These results are displayed in Figure 2.6 (NACCHO, 2017).
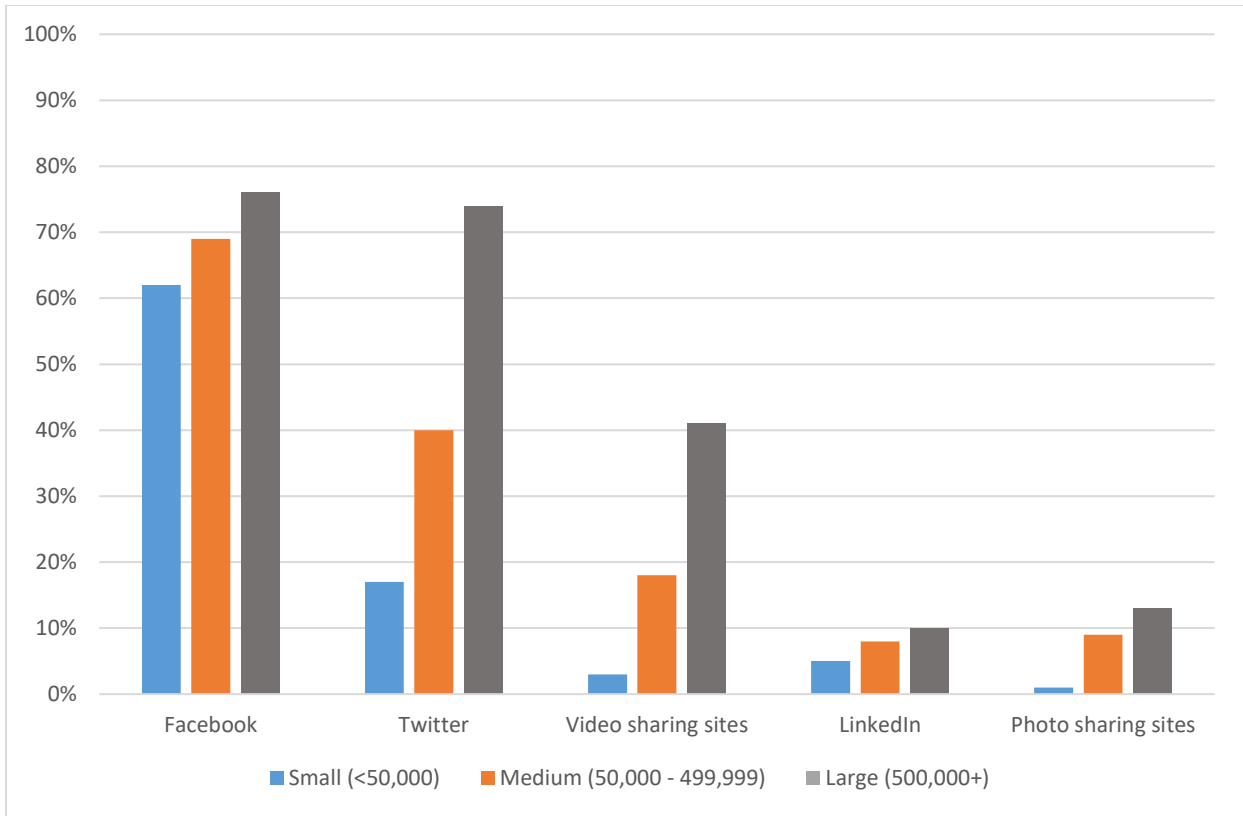
Figure 2.5: Social Media Channel Use by Size of Population Served (NACCHO, 2017)
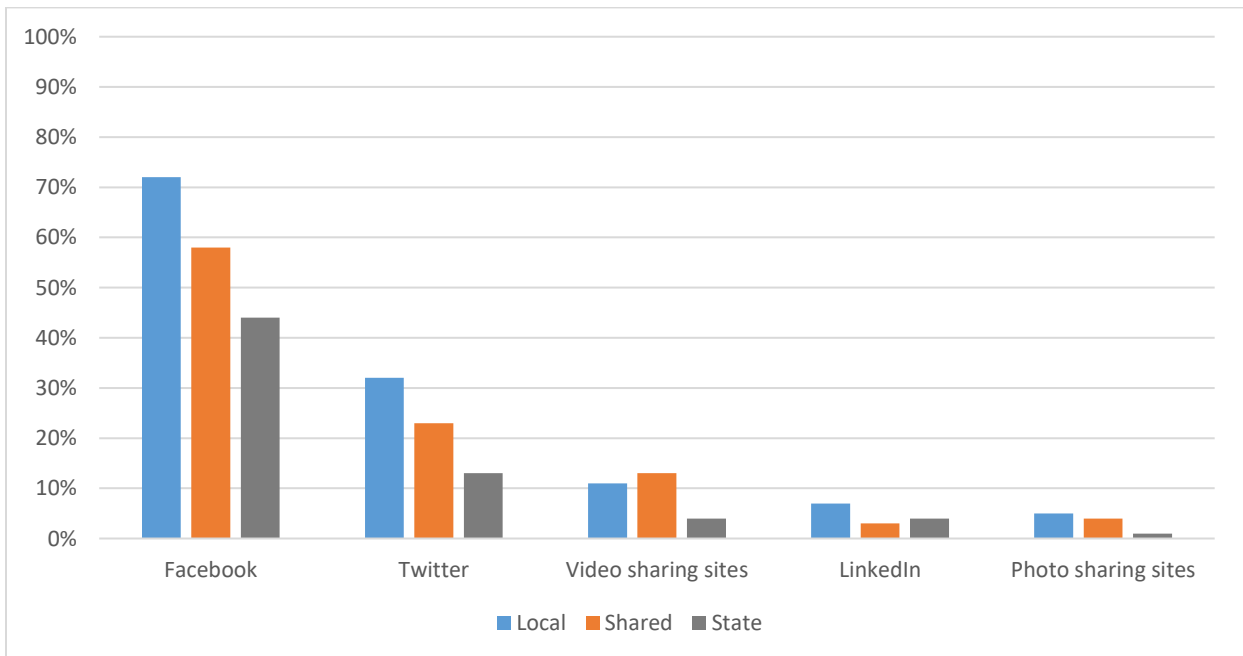
Figure 2.6: Social Media Channel Use by Type of Governance (NACCHO, 2017)

The past three NACCHO Profiles of Local Health Departments (2010, 2013, and 2016) show the use of social media platforms by LHDs over time. As shown in Figure 2.7, the use of Facebook and Twitter increased considerably over the past six years. Interestingly, the use of video sharing sites such as Youtube, which is currently the most popular social media platform, increased in 2013, but remained steady in 2016.
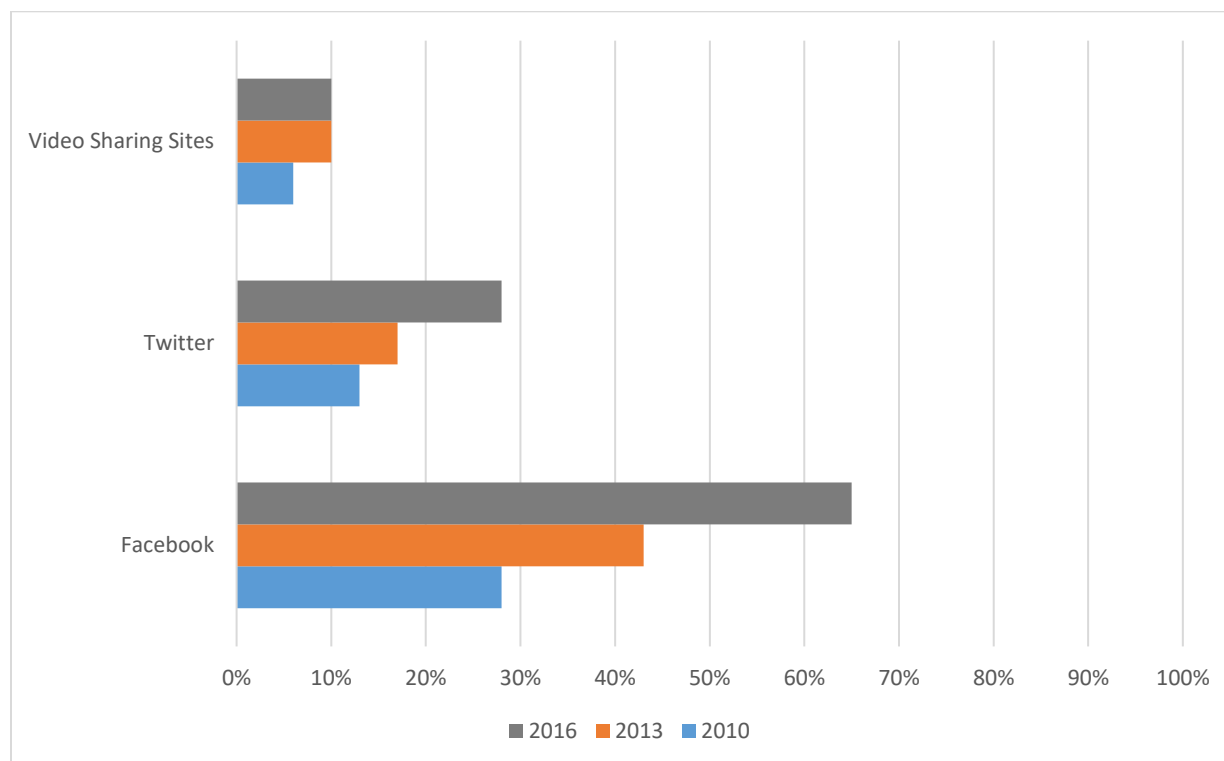
Figure 2.7: Social Media Channel Use Over Time (NACCHO, 2017)

Social Media Impact on Health Outcomes

Previous research has found that information-seeking behavior has a direct impact on knowledge and behaviors, which can ultimately impact health outcomes (Ramanadhan & Viswanath, 2006; Viswanath & Finnegan, 1996). The first types of Internet-based interventions

to identify positive health effects were related to weight loss, physical activity, and smoking cessation. Several studies have found that "using tailored messaging, repurposing and applying multiple complementary delivery modes to reinforce key themes, and encouraging users to engage with web-based applications as well as with other users are among the most promising" (Korda, 2013).

There is limited research on how social media can best be utilized to achieve successful public health outcomes. A systematic review and meta-analysis of such studies were conducted in 2014 by Laranjo et al, the first of its kind. The study showed a positive effect of social media interventions on health behavior outcomes. This study is promising, and reinforces the benefits of the cost-effective, far-reaching use of social media by LHDs (Laranjo, et al., 2015).

Recommendations/Best Practices

The Centers for Disease Control and Prevention (CDC) provides online tools for local health departments to guide the use of social media platforms to "extend community outreach, encourage engagement, and increase access to health messages." The CDC Social Media Toolkit states that social media can: (1) "Increase the timely dissemination and potential impact of health and safety information;" (2) "Leverage audience networks to facilitate information sharing;" (3) "Expand reach to include broader, more diverse audiences;" (4) "Personalize and reinforce health messages that can be more easily tailored or targeted to particular audiences;" (5) "Facilitate interactive communication, connection and public engagement;" and (6) "Empower people to make safer and healthier decisions" (Centers for Disease Control and Prevention, 2014).

The CDC recognizes three key attributes of social media platforms that designate them as exceedingly successful health communication tools. These attributes are personalization, presentation, and participation. Personalization refers to the ability to tailor content in health messages to meet the individual needs of your audience. Presentation refers to sharing timely and pertinent content available in multiple formats and contexts. Participation denotes the ability of constituents and partners to contribute content in meaningful ways. Other important aspects of social media use by LHDs include enabling social engagement and viral sharing of pertinent information, as well as building trust (Centers for Disease Control and Prevention, 2014).

NACCHO also recognizes the importance of social media use among local health departments. In their online health department communications tool, "Social Media Tips," they state "social media plays a vital role in public health. It can be a strong tool for communications, advocacy, public education, and community outreach. It has also proven to be an important resource for emergency preparedness and outbreak events (NACCHO, 2018)."

Many states have their own social media policies and guidelines for their respective agencies, including local health departments. For example, the state of Georgia, through their Digital Services division, encourages the use of social media among all its agencies, as mandated through their Social Media Guidelines ((Digital Services Georgia, 2015). They list several reasons within the guidelines as to why agencies should use social media. These reasons include:

- Puts a human face on government that allows you to provide real-time customer service.
- Helps build interactive communication & community.

- Allows you to listen to your audience - capture the pulse of public sentiment, get real-time feedback and "instant polling" from constituents - and thereby increase your effectiveness.

- Increases awareness of your agency, its programs, and its impact

- Allows you to monitor and influence messaging about your agency and programs

- Reaches your audience where they are - rather than expecting them to come to you.

- Expands your reach to new and diverse audiences that wouldn't typically visit your website.

- Provides opportunities for viral engagement - your audience can help share your message.

(Digital Services Georgia, 2015)

The Georgia guidelines also suggest strategies for using social media for the most effective and efficient reach to audiences. One strategy is to interact frequently by posting updates and communicating with the audience on a regular basis. The assignment of a point person or small group within the agency is suggested, to be the "Social Media Managers" that manage and update content on each social media platform the agency utilizes. Georgia encourages agencies to develop their own social media policies, such as developing a list of approved and prohibited topics for social media, remaining apolitical in postings, deciding what pages the agency will be allowed to "like" or "follow," and writing a clear and specific localized Terms of Use document for the social media platforms (Digital Services Georgia, 2015).

The state of New York also encourages its agencies to utilize social media sites for communicating with the public, but they also have more established requirements and

regulations on such usage. For instance, New York state government entities are required to create a monitored, regulated process for all user-generated content (such as comments) that must be pre-approved before posting to help ensure compliance with Federal and State laws, terms of use, and security risk mitigation. Such management is supervised by a Public Information Officer, or other designee (New York State Office of Information Technology Services, 2014).

The American Medical Association (AMA) also offers strategies for effective social media use. They suggest identifying the niche or target population first, and then researching the demographics of that population. This exercise will help focus the messaging for a specific demographic such as age group, gender, or educational status. The AMA also recommends monitoring other organizations that have a successful social media presence and examining their practices (Barreto & Whitehair, 2017).

Challenges/Barriers to Social Media Use

There are several barriers that can impede the adoption of social media in LHDs. The literature revealed barriers that included: a shortage of funding, the ability to interact on social media platforms in real time, the ever-changing/evolving nature of social media platforms, inadequate technology infrastructure or internet access, security measures such as network firewalls, and a lack of understanding of social media by staff. Most of these studies also showed that LHDs are not utilizing social media platforms to the greatest potential for the organization. Social media tools have primarily been used as a one-way communication channel, for dissemination of information only, and not capitalizing on the engagement and

interaction characteristics of these platforms (Schein, Wilson, & Keelan, 2010; Jha, Lin, & Savoia, 2016; Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013; Neiger, Thackeray, Burton, Thackeray, & Reese, 2013; Thackeray, Neiger, Smith, & Van Wagenen, 2012).

Local Health Department Organizational Factors and Social Media

There is very limited research related to the associations between organizational factors of LHDs and social media use. A small number of studies have investigated LHDs and their usage of Facebook and Twitter platforms. Only one of those studies conducted statistical analyses related to LHD organizational factors associated with Facebook and Twitter, and no previous studies were found that analyzed LHD organizational factors associated with other platforms Youtube, LinkedIn, or Instagram.

Two previous studies found LHDs that serve larger populations were more likely to utilize social media (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013; Thackeray, Neiger, Smith, & Van Wagenen, 2012). Harris et al conducted a study that grouped LHDs into categories of adoption based on the Diffusion of Innovations model. The first 2.5% of adopters were labeled as innovators, the next 47.5% were grouped as the early adopter/early majority, and then those who were non-adopters. A significant difference in social media adoption across geographic regions was found, with western states (Arizona, California, Hawaii, and Nevada) having first adopted social media before other states. Local health departments in the innovators' group for both Facebook and Twitter were also more likely to have the top executive hold a doctoral level degree. Likewise,

LHDs in the innovator and early adopter/early majority groups were more likely to have a Public

Information Specialist (PIS) employed within the department. Spending per capita was also

significant, with the highest spending in the innovator departments, and lowest spending in the

non-adoption departments, for both Facebook and Twitter (Harris, Mueller, & Snider, Social

Media Adoption in Local Health Departments Nationwide, 2013).

In a recent study in 2017 that analyzed the adoption of Facebook and Twitter in small

local government agencies in the state of Nebraska, population density was again found to be a

significant variable for the adoption of Facebook, but not for Twitter (Gao & Lee, 2017).

Theoretical Framework

The term "innovation" can be defined as the creation or adoption of a new idea, device,

product, policy, program or service (Zaltman, Duncan, & Holbek, 1973; Daft, 1978). As such,

the use of social media by an organization is considered an innovation to be adopted. The

Organizational Innovation Framework by Damanpour posits that innovation in organizations is

subject to influences in three categories: 1) individual, 2) organizational, and 3) environmental

(Damanpour F. , Organizational innovation: A meta-analysis of effects of determinants and

moderators, 1991).

Numerous previous research studies have examined what organizational characteristics

and processes facilitate the adoption of innovative tools and technologies (Damanpour &

Schneider, 2006; Drazin & Schoonhoven, 1996; Kimberly & Evanisko, 1981). As such, it is

important to assess what factors drive innovation in order to achieve it. The literature shows that

predictors of innovation that relate specifically to organizational factors include organization

size, financial resources, and external communication (Damanpour F., 1996; Subramanian & Nilakanta, 1996).

According to Damanpour and Schneider (2006), the person most influencing innovation in organizations is the top executive. Therefore, studying leadership characteristics of top executives is a novel way to gain insight into innovation adoption in organizations. Innovation adoption can be highly influenced by external, environmental factors such as cultural, political, or geographic conditions (Damanpour & Schneider, 2006; Wejnert, 2002; Pierce & Delbecq, 1977).

Incorporated into this study, for the individual level category, organizational leadership characteristics of top executive age, gender, race, employment tenure, and education level are included. It has been shown that managers and leaders have a great deal of influence on employee motivation and satisfaction in the workplace. Good leaders are able to empower employees to build capacity for innovation (Ahmed, 1998; Jung, Chow, & Wu, 2003; DiLiello & Houghton, 2006).

The organizational level category includes the following factors: number of FTEs, whether or not a public information professional is on staff, level of activity for informatics tools, whether or not the LHD is PHAB accredited, expenditures per 100,000 population, and use of other communication tools in the organization. Environmental factors include LHD governance classification, size of population served by the LHD, and annual budget change.

CHAPTER III: METHODOLOGY

Study Design

A quantitative approach using secondary data was utilized for this study to determine what factors are associated with social media use by local health departments. For this cross-sectional study, data were representative of LHDs nationally.

Data Source and Design

Data were obtained from the National Association of County and City Health Officials (NACCHO). The NACCHO National Profile of Local Health Departments survey was conducted in the year 2016, to yield a comprehensive description of local health department (LHD) infrastructure and practice in the United States. Longitudinal data were not feasible for use in this study because a potentially different set of LHDs may receive the questions administered to the sample.

The 2016 Profile was a survey that included a primary group of questions from a survey sent to all 2533 LHDs in the United States. A secondary set of additional questions were placed into two modules (Module 1 and Module 2), and then randomly administered to LHDs. The set of questions in Module 2 contained the questions of interest for this study related to social media utilization. Module 2 was sent to a representative stratified random sample of 625 LHDs. Sampling stratification was based on LHD population size. The response rate for Module 2 was 77%, with 480 LHDs completing the module.

A statistical weight given by NACCHO was used for Module 2 data, as just a sample of all LHDs were included in this module. The weight was developed in consideration of the following factors: "(a) disproportionate response rate by population size (7 population strata,

typically used in NACCHO surveys), (b) oversampling of LHDs with larger population sizes, and (c) sampling rather than the census approach (Williams & Shah, 2016)."

Dependent Variables

The dependent variables for this study were derived from a question in the 2016 NACCHO Profile survey, which indicated LHD's level of social media usage in the Module 2. The question stated "Indicate whether LHD used any of the following communication channels to communicate with the public. Then, for each communication channel your LHD uses, indicate how your LHD uses the channel." The question included five communication channels related to social media: Facebook, Twitter, LinkedIn, Instagram, and Youtube. There were two sub-questions for each communication channel: 1) Has your LHD used this communication channel? The response categories for this question were a) Yes or b) No. The second sub-question was: 2) Indicate how your LHD uses the communications channel. The response categories for this question were to select all that apply from the following: a) Communicate for routine activities, and b) Communicate to the public for an emergency response (NACCHO, 2017). A final variable list and respective codes are displayed in Table 3.1.

Independent Variables

The independent variables utilized for the multivariate analyses included LHD leadership and infrastructure characteristics, as well as capacity and financial characteristics of LHDs. The Profile responses did not provide a specific annual budget amount, therefore, the expenditures data were used, as this is a proxy for budget.

More specifically, these variables included: 1) population served, 2) LHD governance classification, 3) expenditures per 100K, 4) budget change from previous year, 5) top executive

race, 6) top executive gender, 7) top executive age, 8) top executive degree, 9) top executive length of service 10) number of FTEs, 11) public information professional on staff, 12) is LHD accredited by PHAB, 13) Level of activity for informatics tools (EHRs, HIE, Immunization registry, EDRM, electronic lab reporting, 14) Use of other communication channels (broadcast media, print media, text messaging, email, blogs, website).

Table 3.1. Study Variables, Definitions, and Variable Type

Study Variable	Definition	Variable Type
Facebook Use	Does LHD use Facebook: (1) Yes, (0) No	Dependent, *Dichotomous*
Twitter Use	Does LHD use Twitter: (1) Yes, (0) No	Dependent, *Dichotomous*
Video Sharing Use	Does LHD use Video Sharing Sites: (1) Yes, (0) No	Dependent, *Dichotomous*
Facebook Use Routine Activities	Does LHD use Facebook for routine activities: (1)Yes, (0) No	Dependent, *Dichotomous*
Facebook Use Emergency Response	Does LHD use Facebook for emergency response: (1)Yes, (0) No	Dependent *Dichotomous*
Twitter Use Routine Activities	Does LHD use Twitter for routine activities: (1)Yes, (0) No	Dependent *Dichotomous*
Twitter Use Emergency Response	Does LHD use Twitter for emergency response: (1)Yes, (0) No	Dependent *Dichotomous*
Video Sharing Use Routine Activities	Does LHD use Video sharing sites for routine activities: (1)Yes, (0) No	Dependent *Dichotomous*
Video Sharing Use Emergency Response	Does LHD use Video sharing sites for emergency response: (1)Yes, (0) No	Dependent, *Dichotomous*
Social Media Use Score	LHD Social Media Use: 1 point for each social media platform (Facebook, Twitter, LinkedIn, Photo sharing sites, Video sharing sites) used (range of 0 to 4).	Dependent, *Count variable*
Population Size	LHD Size of population served in quartiles	Independent

LHD Governance	LHD Governance classification: (1) unit of state government, (2) unit of local government, (3) unit governed by both state and local	Independent
Expenditures per 100K	LHD Last FY expenditures per 100,000 population (Quartiles)	Independent
Budget Change	LHD Current fiscal year budget is: (1) Less than previous year (2) Approx. the same, (3) More than previous year	Independent
Top Exec Age	LHD Top Executive age in quartiles	Independent
Top Exec Gender	LHD Top Executive gender: (1) Male, (2) Female	Independent
Top Exec Race	Dummy variables for LHD Top Executive race: Black, Asian, American Indian or Alaska Native, and Other.	Independent
Top Exec Ethnicity	LHD Top Executive ethnicity: (1) Hispanic, (0) Not Hispanic	Independent
Top Exec Education Level	LHD Top Executive highest degree: (1) Bachelors degree or less, (2) Masters degree (3) Doctoral degree.	Independent
Top Exec LOS	LHD Top Executive length of service in quartiles	Independent
LHD FTEs	Number of full-time equivalents (FTEs) workforce at LHD per 100,000 population (Quartiles)	Independent
LHD Employs PIP	Does LHD have a Public Information Professional (PIP) on staff? (1)Yes, (0) No	Independent
LHD Accredited	Is LHD accredited by PHAB: (1) Accredited, Submitted application, or In ePHAB, (2) Plans to apply, (3) Has not decided, Not applying, or Do not know	Independent
Informatics Use Score	LHD Informatics Use: 1 point for each informatics technology (HER, HIE, IR, EDRS, ELR) used (range of 0 to 5).	Independent
Other Communication Channel Use Score	LHD Use of Other Communication Channels: 1 point for each other channel used (Automated phone calling, Hotline, Fax, Broadcast media, Print media, Text messaging, Email, Blogs, Website) used (range of 0 to 5).	Independent

Statistical Analyses

Analyses conducted for this study were executed using IBM SPSS Statistics version 23.

Descriptive analyses were performed, including a percentage table for categorical variables. It is

important to recognize that all LHDs are not created equally. Each can differ in governance

structure, composition, and population size. Ten separate regression models were computed.

Nine models were binary logistic regressions, using each of the top 3 social media platforms as a

dependent variable. Binary logistic regression was the statistical method selected because the

dependent variables were dichotomous (yes/no), and we examined which independent predictor

variables showed stronger associations with the dependent variables. The last model was a

Poisson regression, because the dependent variable, Social Media Use Score, was a count

variable. This variable was calculated by giving one point for each social media channel used by

the LHD. Final sample size after cleaning the data for analyses was 448 (93%) for all logistic

regression models, and 399 (83%) for the linear regression model.

CHAPTER IV: RESULTS

The response rate for the 2016 NACCHO Profile Module 2 survey was 77%, with 480 out of 625 LHDs completing the module. Frequencies were completed to analyze social media use by LHDs, using the Profile survey question asking whether or not the LHD uses the channel to communicate with the public. Results from this question are shown in Figure 4.1. The most utilized social media platform was Facebook, with 64.7% of LHDs reporting use. The second and third most utilized platforms were Twitter at 33%, and Video sharing sites such as Youtube at 13.7%. The least utilized platforms were LinkedIn at 6.7% and Photo sharing sites such as Instagram at 5.6%.

Once the top three platforms were revealed, these three (Facebook, Twitter, Video Sharing Sites) were chosen as the dependent variables of interest for the analyses. Another dependent variable was created as well, using a count method to create a social media utilization score, where LHDs were given 1 point for each social media platform used, with a range between 0 and 5 as possible values. This count variable was used in the final Poisson regression model as the dependent variable. Data for regression analyses was weighted, using a weight variable given by NACCHO in order to yield accurate population estimates from the sample. Descriptive statistics were not weighted.

Descriptive Statistics

Once variable selection was finalized, descriptive analyses were performed on the data, including frequency tables for the categorical variables, as shown in Table 4.1. The nine dependent variables for our binary logistic regression models are shown first, followed by the independent variables used in the analyses.

The top three social media platforms mentioned previously comprise the first nine variables. In looking at how LHDs use the top three platforms, 62.2% use Facebook for routine activities, and 38.6% use Facebook for emergency response purposes. For the platform Twitter, 62.2% use it for routine activities, and 19.9% use it for emergency response purposes. For Video Sharing platforms such as Youtube, 12.4% of LHDs use them for routine activities, and only 2.1% use video sharing for emergency response purposes.

The number of social media channels used by the LHD ranged from 0 to 4, with the final category of 4 being those that used 4 or 5 channels. This final category was combined because of the small number of LHDs in the 4 and 5 categories. The results are shown in Figure 4.2. Sixty-six percent of LHDs used at least one social media platform.

The majority of LHDs who use social media channels use only one platform, at 31.3%. Approximately 19% use two social media channels, 11.6% use 3 channels, and only 4.6% use 4 or more social media platforms.
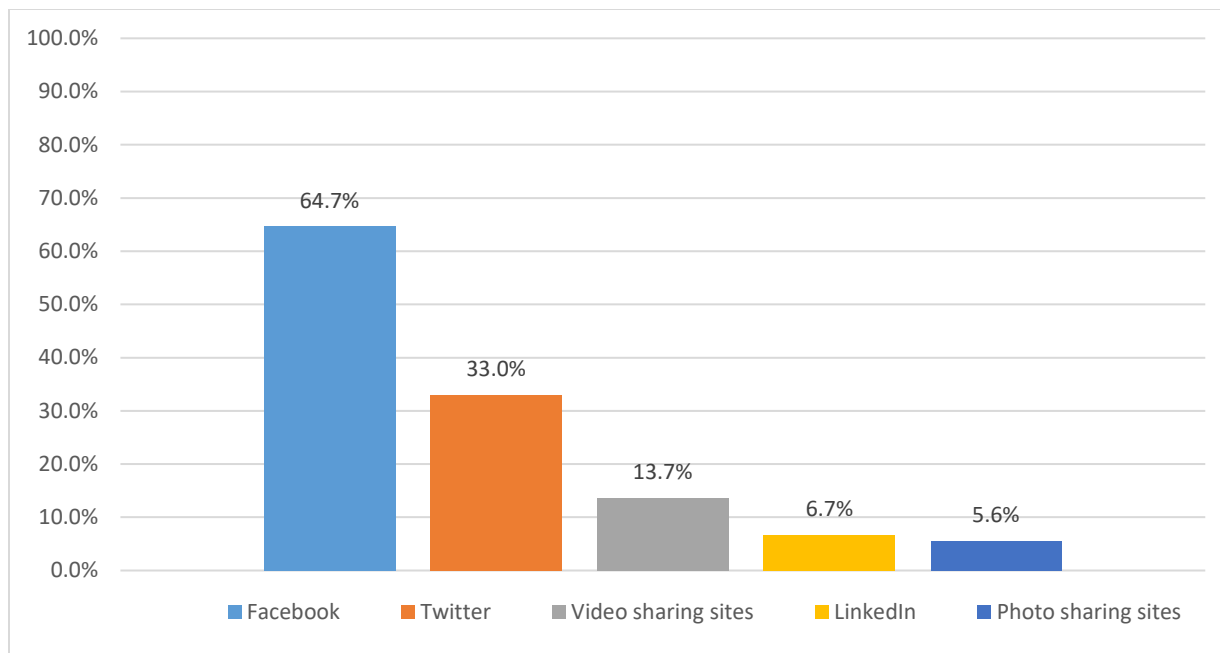
Figure 4.1 Percent of Local Health Departments Using Social Media to Communicate with the Public, by Social Media Platform
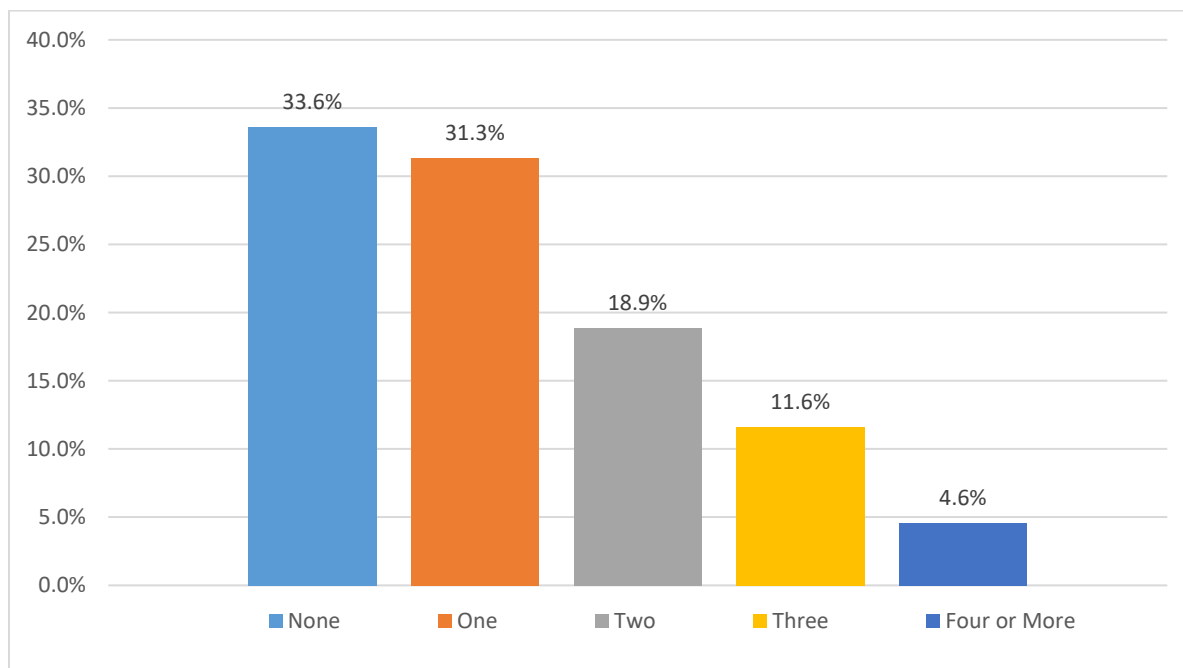
Figure 4.2 Percent of Local Health Departments Using Social Media to Communicate with the Public, by Number of Platforms Used

Other variables included leadership, organizational, and population characteristics of

LHDs. The two variables Population size of the LHD and the LHD annual Expenditures per

100,000 Population were categorized by quartiles, with an approximately equal number of LHDs

represented in each quartile. Population sizes ranged from 860 to 9.5 million people. Annual

expenditures per 100,000 population ranged from $127,632 to $40.3 Million. The variable

Decentralized Governance categorized LHDs into two categories, shared and/or state governed at

29%, or locally governed with the majority reporting at 71%.

The second financial organizational variable was Budget Change, which described

whether the LHD budget had changed from the previous fiscal year. The majority of the LHDs

reported their budget to be approximately the same as the previous year's, at 40.7%.

Approximately 20% reported having a current budget that is less than the previous year, but 25%

reported having an increased budget over the previous year.

Participation in the PHAB accreditation process was captured in the variable PHAB

Accredited. The majority of LHDs (55.6%) responded that they either were not applying for

accreditation, have not yet decided if they are applying, do not know, or did not respond.

Approximately 24% of LHDs have either already been PHAB accredited, have submitted an

application, or are in ePHAB in preparation for accreditation. Another 20.7% of LHDs plan to

apply for accreditation.

Several leadership characteristic variables were used for analysis in this study.

Demographics characteristics such as age, gender, race, education level, and length of service

were used. The majority of respondents were female, at 58.3%, and males at 41.7%. Eighty-

eight percent of leaders were White, 6.6% were Black, 1.2% Asian, 2.1% Other race, and only

0.6% Native American. In addition, only 1.9% of respondents reported as Hispanic. The

majority of executives responded their highest degree earned was a Master's or equivalent degree at 45.6%. Approximately 29% hold a Bachelor's degree or less, and 18.3% hold a Doctoral degree.

The range of the age for top executive spans from 26 to 80 years old, with a mean age of 52, and the majority of leaders falling in the 50 to 60 year decade. The top executive's length of service in the leadership position ranges from .16 to 35.83 years, and the distribution shows the mean to be 7.3 years in the leadership position.

Other organizational variables included in this study are: whether the LHD employs a Public Information Professional (PIP), LHD informatics use, and LHD communication channel use. The majority of LHDs do not employ a PIP, with only 25.9% saying they have a PIP on staff, and 74.1% responding no. The variables for LHD informatics use and LHD communication channel use are count variables. LHDs were given a point for each informatics technology used, ranging between 0 and 5 for the LHD Informatics variable. The LHD Communication Channel variable gave one point for each communication channel used, other than social media, by the LHD, ranging from 0 to 5.

Table 4.1 Descriptive Statistics for Categorical Variables Included in Analysis

	n	%
Facebook Use	312	64.7%
Twitter Use	159	33.0%
Video Sharing Use	66	13.7%
Use Facebook for Routine Activities	300	62.2%
Use Facebook for Emergency Response	186	38.6%

Use Twitter for Routine Activities	155	32.2%
Use Twitter for Emergency Response	96	19.9%
Use Video Sharing for Routine Activities	60	12.4%
Use Video Sharing for Emergency Response	10	2.1%
Social Media Score		
No social media channels used	162	33.6%
1 social media channel used	151	31.3%
2 social media channels used	91	18.9%
3 social media channels used	56	11.6%
4 or more social media channels used	22	4.6%
Informatics Use Score		
No informatics use	49	10.2%
1 informatics technology used	56	11.6%
2 informatics technologies used	107	22.2%
3 informatics technologies used	126	26.1%
4 informatics technologies used	101	21.0%
5 informatics technologies used	43	8.9%
Other Channel Use Score	24	5.0%
No other communication channel use		
1 other communication channel used	18	3.7%
2 other communication channels used	45	9.3%
3 other communication channels used	54	11.2%
4 other communication channels used	83	17.2%
5 or more other communication channels used	258	53.5%
Population		
1st quartile (860 - 21,028)	120	24.9%
2nd (21,029 - 50,994)	121	25.1%
3rd (50,995 - 193,444)	121	25.1%
4th quartile (193,445 - 9,502,247)	120	24.9%
Decentralized governance		

Shared/State	140	29.0%
Local	342	71.0%
Expenditures per 100K		
Not Reported	150	31.1%
1st quartile (127,632 - 2,143,351)	83	17.2%
2nd quartile (2,143,352 - 3,653,935)	83	17.2%
3rd quartile (3,653,936 - 6,133,804)	83	17.2%
4th quartile (6,133,805 - 40,256,302)	83	17.2%
Budget Change	71	14.7%
Not Reported		
Less than previous year's budget	94	19.5%
Approximately the same	196	40.7%
Greater than previous year's budget	121	25.1%
PHAB Accredited		
Accredited, Submitted Application or in ePHAB	114	23.7%
Plans to apply	100	20.7%
Has not decided, Not applying, Does not know, Not reported	268	55.6%
Top Executive Gender		
Male	191	41.7%
Female	267	58.3%
Top Executive Hispanic	9	1.9%
Top Executive Black	32	6.6%
Top Executive Native American	3	0.6%
Top Executive Asian	6	1.2%
Top Executive Other Race	10	2.1%
Top Executive Degree		
Not Reported	34	7.1%
BA or less	140	29.0%
Masters or equivalent	220	45.6%
Doctorate	88	18.3%

Top Executive Age		
Not Reported	53	11.0%
1st quartile (26 - 45 years)	113	23.4%
2nd (46 - 53 years)	106	22.0%
3rd (54 - 60 years)	127	26.3%
4th quartile (61 - 80 years)	83	17.2%
Top Executive Length of Service		
Not Reported	53	11.0%
1st quartile (0.16 - 1.80 years)	107	22.2%
2nd quartile (1.81 - 4.53 years)	107	22.2%
3rd quartile (4.54 - 10.90 years)	110	22.8%
4th quartile (10.91 - 35.83 years)	105	21.8%

Abbreviations: PHAB, Public Health Accreditation Board; n, number of observations

Logistic Regression Models

Nine binary logistic regression models were run, each using one of the nine dependent variables discussed previously, and all included 17 independent variables. Multicollinearity tests were run initially on 18 independent variables, and two variables, FTE's per 100K and Expenditures per 100K, were found to be highly correlated at just under 0.8. Because of this, only one of these variables, Expenditures per 100K, was used in all analyses. Forward stepwise logistic regression was the type of model used for each analysis. Final sample size after cleaning the data for analyses was 448 (93%) for all logistic regression models

Model 1: Facebook Use

Results of the binary logistic regression model with Facebook Use as the dependent variable showed several independent variables with significant associations, and are shown in

Table 4.2. A significant association was found between LHDs employing Public Information Professionals (PIPs) and Facebook use. Not employing PIPs significantly decreased the odds of using Facebook (AOR = .649; CI = .468, .898; p = .009), compared to LHDs employing PIPs.

One category of the variable Informatics Use was significantly associated with Facebook use. LHDs using 4 informatics technologies significantly decreased the odds of using Facebook (AOR = .532; CI = .340, .831; p = .006), compared to LHDs that used the most (five) informatics technologies. Other categories of this variable were not significant.

Two categories of the variable Communication Channel Use were significantly associated with Facebook use. Compared to LHDs that use the most communication channels other than social media, using only 1 other communication channel significantly decreased the odds of using Facebook (AOR = .298; CI = .175, .510; p = .000). LHDs using two other communication channels also significantly decreased the odds of using Facebook than those that use the most communication channels (AOR = .170; CI = .118, .244; p = .000). Other categories of this variable were not significant.

All quartiles of the variable Population were significantly associated with Facebook use. Population size was positively associated with Facebook use. As the population size increased, the likelihood of Facebook use also increased. Having the smallest population size significantly decreased the odds of using Facebook than those in the highest quartile (AOR = .255; CI = .161, .405; p = .000). LHDs having the second population size quartile also significantly decreased the odds of using Facebook than those in the highest quartile (AOR = .330; CI = .215, .507; p = .000). Accordingly, LHDs having the third population size quartile also significantly decreased the odds of using Facebook than those in the highest quartile (AOR = .421; CI = .279, .637; p = .000).

The variable Decentralized Governance was significantly associated with Facebook use. Compared to Health Departments that had shared or state governance, locally governed Health Departments were 2.73 times more likely to use Facebook (AOR = 2.73; CI = 2.115, 3.518; p = .000). Therefore, Health Departments that were locally governed were positively associated with using Facebook.

All quartiles of the variable Expenditures per 100K were significantly associated with Facebook use. LHDs in the lowest expenditures quartile had significantly decreased odds of using Facebook than those in the highest quartile (AOR = .192; CI = .130, .284; p = .000). LHDs in the second expenditures quartile had significantly decreased odds of using Facebook than those in the highest quartile (AOR = .379; CI = .255, .564; p = .000). LHDs in the third expenditures quartile had significantly decreased odds of using Facebook than those in the highest quartile (AOR = .296; CI = .200, .438; p = .000). Therefore, LHDs with the highest expenditures per 100,000 population were more likely to use Facebook than LHDs with lower expenditures.

One category of the variable PHAB Accredited was significantly associated with Facebook use. Compared to LHDs that are already PHAB accredited, submitted an application, or are in the ePHAB system, LHDs that were planning to apply for accreditation were 4.42 times more likely to use Facebook (AOR = 4.421; CI = 2.951, 6.622; p = .000). Other categories of this variable were not significant.

The variable Top Executive Hispanic was significantly associated with Facebook use. Compared to LHDs that had top executives who were non-Hispanic, LHDs with top executives that were Hispanic had significantly decreased odds of using Facebook (AOR = .143; CI = .054,

.379; p = .000). Therefore, LHDs with top executives that were non-Hispanic were more likely to use Facebook than those with Hispanic top executives.

One category of the variable Budget Change was significantly associated with Facebook use. Compared to LHDs that had an increased budget than the previous year, LHDs that had a decrease in the previous year's budget were 1.54 times more likely to use Facebook (AOR = 1.535; CI = 1.102, 2.137; p = .011). Other categories of this variable were not significant.

The variable Top Executive Black was significantly associated with Facebook use. Compared to LHDs that had top executives who identified as a race other than Black, LHDs with top executives that were Black had significantly decreased odds of using Facebook (AOR = .444; CI = .281, .700; p = .000). Therefore, LHDs with top executives that identified as non-Black were more likely to use Facebook than those with Black top executives.

The variable Top Executive Asian was significantly associated with Facebook use. Compared to LHDs that had top executives who identified as a race other than Asian, LHDs with top executives that were Asian had significantly decreased odds of using Facebook (AOR = .055; CI = .017, .180; p = .000). Therefore, LHDs with top executives that identified as non-Asian were more likely to use Facebook than those with Asian top executives.

The variable Top Executive Other Race was significantly associated with Facebook use. Compared to LHDs that had top executives who did not identify as Other Race, LHDs with top executives that were classified as Other Race were 2.87 times more likely to use Facebook (AOR = 2.868; CI = 1.068, 7.703; p = .037).

One category of the variable Top Executive Degree was significantly associated with Facebook use. Compared to LHDs whose top executive had a doctoral degree, LHDs whose top

executive held a Bachelor's degree or less were 1.72 times more likely to use Facebook (AOR = 1.72; CI = 1.185, 2.498; p = .004). Other categories of this variable were not significant.

The variable Top Executive Age was shown to be significant in all quartiles. The analysis showed that as the age of the top executive increases, the likelihood of the LHD using Facebook decreases. When compared to LHDs with top executives in the oldest quartile, LHDs with top executives in the youngest quartile were 2.81 times more likely to use Facebook (AOR = 2.814; CI = 2.001, 3.957; p = .000). LHDs with top executives in the second age quartile were 1.63 times more likely to use Facebook than the oldest quartile (AOR = 1.626; CI = 1.164, 2.273; p .004). LHDs with top executives in the third age quartile were 1.61 times more likely to use Facebook than the oldest quartile (AOR = 1.617; CI = 1.174, 2.225; p = .003).

Model 2: Twitter Use

The second model looked at associations related to LHD use of Twitter. Results are shown in Table 4.3. LHD population size was found to be significant in all quartiles, indicating that as population increases, use of Twitter increases as well. LHDs in the smallest population quartile had significantly decreased odds of using Twitter than those in the largest population quartile (AOR = .080; CI = .050, .129; p = .000). LHDs in the second population quartile had significantly decreased odds of using Twitter than those in the largest population quartile (AOR = .119; CI = .079, .180; p = .000). LHDs in the third population quartile had significantly decreased odds of using Twitter than those in the largest population quartile (AOR = .196; CI = .131, .293; p = .000).

LHDs that used four informatics technologies had significantly decreased odds of using Twitter than those that used 5 informatics technologies (AOR = .303; CI = .185, .498; p = .000).

LHDs that used only one other communication channel had significantly decreased odds of using Twitter than those that used 5 or more communication channels (AOR = .213; CI = .088, .515; p = .001). LHDs that used three other communication channels had significantly decreased odds of using Twitter than those that used 5 or more communication channels (AOR = .290; CI = .187, .450; p = .000). LHDs that used four other communication channels had significantly decreased odds of using Twitter than those that used 5 or more communication channels (AOR = .243; CI = .173, .341; p = .000).

The variable Decentralized Governance was significantly associated with Twitter use. Compared to Health Departments that had shared or state governance, locally governed Health Departments were 3.62 times more likely to use Twitter (AOR = 3.62; CI = 2.573, 5.087; p = .000). Therefore, Health Departments that were locally governed were positively associated with using Twitter.

All quartiles of the variable Expenditures per 100K were significantly associated with Twitter use. LHDs in the lowest expenditures quartile had significantly decreased odds of using Twitter than those in the highest quartile (AOR = .443; CI = .297, .661; p = .000). LHDs in the second expenditures quartile had significantly decreased odds of using Twitter than those in the highest quartile (AOR = .464; CI = .308, .699; p = .000). LHDs in the third expenditures quartile had significantly decreased odds of using Twitter than those in the highest quartile (AOR = .400; CI = .269, .596; p = .000). LHDs with the highest expenditures per 100,000 population were more likely to use Twitter than LHDs with lower expenditures.

One category of the variable PHAB Accredited was significantly associated with Twitter use. Compared to LHDs that are already PHAB accredited, submitted an application, or are in the ePHAB system, LHDs that were either not applying for accreditation, undecided, did not

know or did not report had significantly decreased odds of using Twitter (AOR = .333; CI = .239, .464; p = .000).

The variable Top Executive Other Race was significantly associated with Twitter use. Compared to LHDs that had top executives who did not identify as Other Race, LHDs with top executives that were classified as Other Race were 4.61 times more likely to use Twitter (AOR = 4.61; CI = 1.338, 15.887; p = .015).

One category of the variable Top Executive Degree was significantly associated with Twitter use. Compared to LHDs whose top executive had a doctoral degree, LHDs whose top executive held a Bachelor's degree or less had significantly decreased odds of using Twitter (AOR = .564; CI = .375, .850; p = .006).

The variable Top Executive Age was shown to be significant in two quartiles. The analysis showed that as the age of the top executive increases, the likelihood of the LHD using Twitter decreases. When compared to LHDs with top executives in the oldest quartile, LHDs with top executives in the youngest quartile were 2.54 times more likely to use Twitter (AOR = 2.54; CI = 1.688, 3.822; p = .000). LHDs with top executives in the second age quartile were 1.8 times more likely to use Twitter than the oldest quartile (AOR = 1.766; CI = 1.189, 2.621; p = .005).

Compared to LHDs with top executives that had the longest tenure, LHDs with top executives that had the shortest tenure had significantly decreased odds of using Twitter (AOR = .575; CI = .394, .841; p = .004). LHDs with top executives in the second quartile of tenure had significantly decreased odds of using Twitter (AOR = .550; CI = .372, .813; p = .003).

Model 3: Video Sharing Use

The third model examined associations related to LHD use of Video Sharing platforms. Results are shown in Table 4.4. A significant association was found between LHDs employing Public Information Professionals (PIPs) and Video Sharing use. Compared to LHDs that employ PIPs, those that do not employ PIPs are 1.94 times more likely to use Video Sharing (AOR = 1.94; CI = 1.271, 2.97; p = .002).

LHD population size was found to be significant in all quartiles, indicating that as population increases, use of Video Sharing increases as well. LHDs in the smallest population quartile had significantly decreased odds of using Video Sharing than those in the largest population quartile (AOR = .043; CI = .020, .095; p = .000). LHDs in the second population quartile had significantly decreased odds of using Video Sharing than those in the largest population quartile (AOR = .060; CI = .033, .109; p = .000). LHDs in the third population quartile had significantly decreased odds of using Video Sharing than those in the largest population quartile (AOR = .249; CI = .160, .387; p = .000).

The variable Decentralized Governance was significantly associated with Video Sharing use. Compared to Health Departments that had shared or state governance, locally governed Health Departments were 2.5 times more likely to use Video Sharing (AOR = 2.503; CI = 1.535, 4.083; p = .000). Therefore, Health Departments that were locally governed were positively associated with using Video Sharing.

Two quartiles of the variable Expenditures per 100K were significantly associated with Video Sharing use. LHDs in the lowest expenditures quartile had significantly decreased odds of using Video Sharing than those in the highest quartile (AOR = .411; CI = .232, .728; p = .002). LHDs in the third expenditures quartile had significantly decreased odds of using Video Sharing than those in the highest quartile (AOR = .358; CI = .201, .636; p = .000). LHDs with the

highest expenditures per 100,000 population were more likely to use Video Sharing than LHDs with lower expenditures.

The variable Budget Change was significantly associated with Video Sharing use. Compared to LHDs that had an increased budget than the previous year, LHDs that had a decrease in the previous year's budget had significantly decreased odds of using Video Sharing (AOR = .456; CI = .286, .727; p = .001). LHDs that had no change in the previous year's budget had significantly decreased odds of using Video Sharing (AOR = .394; CI = .253, .615; p = .000).

One category of the variable PHAB Accredited was significantly associated with Video Sharing use. Compared to LHDs that are already PHAB accredited, submitted an application, or are in the ePHAB system, LHDs that were either not applying for accreditation, undecided, did not know or did not report had significantly decreased odds of using Video Sharing (AOR = .477; CI = .301, .755; p = .002).

The variable Top Executive Black was significantly associated with Video Sharing use. Compared to LHDs that had top executives who identified as non-Black, LHDs with top executives that were classified as Black were 2.5 times more likely to use Video Sharing (AOR = 2.504; CI = 1.344, 4.664; p = .004).

Two categories of the variable Top Executive Degree were significantly associated with Video Sharing use. Compared to LHDs whose top executive had a doctoral degree, LHDs whose top executive held a Bachelor's degree or less had significantly decreased odds of using Video Sharing (AOR = .200; CI = .106, .376; p = .000). LHDs whose top executive held a

Master's degree had significantly decreased odds of using Video Sharing (AOR = .344; CI = .224, .528; p = .000).

The variable Top Executive Age was shown to be significant in one quartile. When compared to LHDs with top executives in the oldest quartile, LHDs with top executives in the third quartile had significantly decreased odds of using Video Sharing (AOR = .559; CI = .334, .936; p = .027).

Compared to LHDs with top executives that had the longest tenure, LHDs with top executives that had the shortest tenure were 2.97 times more likely to use Video Sharing (AOR = 2.97; CI = 1.768, 4.987; p = .000). LHDs with top executives in the second quartile of tenure had significantly decreased odds of using Video Sharing (AOR = .439; CI = .245, .788; p = .006).

Models 4 through 9

Models 4 through 6 compared the same 17 independent variables to LHDs use of social media for routine activities. The three dependent variables for these models were whether or not the LHD used the top three social media channels, Facebook, Twitter, and Video Sharing, for routine activities. Results from these models are shown in Table 4.5.

Models 7 through 9 compared the same 17 independent variables to LHDs use of social media for emergency response. The three dependent variables for these models were whether or not the LHD used the top three social media channels, Facebook, and Twitter, for emergency response. There were not a large enough sample size of LHDs that responded yes to using Video Sharing for emergency response (2.1%), so it was excluded. Results from these models are shown in Table 4.6.

Linear Regression Model

Model 10

The final model was a Poisson regression model, using the Social Media Use Score variable as the dependent variable, looking at predictors of multiple social media channel use. Results from the model are found in Table 4.7.

All quartiles of the variable Population were significantly associated with multiple social media channel use. Population size was positively associated with multiple social media channel use. As the population size increased, the likelihood of using multiple social media channels also increased. LHDs in the smallest population quartile had significantly decreased odds of using multiple social media channels than those in the highest quartile (AOR = .400; CI = .340, .471; p = .000). LHDs in the second population quartile had significantly decreased odds of using multiple social media channels than those in the highest quartile (AOR = .545; CI = .475, .626; p = .000). LHDs in the third population quartile had significantly decreased odds of using multiple social media channels than those in the highest quartile (AOR = .674; CI = .594, .765; p = .000).

The variable Decentralized Governance was significantly associated with multiple social media channel use. Compared to Health Departments that were locally governed, Health Departments with shared or state governance had significantly decreased odds of using multiple social media channels (AOR = .534; CI = .473, .604; p = .000). Therefore, Health Departments that were locally governed were positively associated with using multiple social media channels.

All quartiles of the variable Expenditures per 100K were significantly associated with multiple social media channel use. LHDs in the lowest expenditures quartile had significantly

decreased odds of using multiple social media channels than those in the highest quartile (AOR = .723; CI = .628, .831; p = .000). LHDs in the second expenditures quartile had significantly decreased odds of using multiple social media channels than those in the highest quartile (AOR = .812; CI = .712, .925; p = .002). LHDs in the third expenditures quartile had significantly decreased odds of using multiple social media channels than those in the highest quartile (AOR = .789; CI = .694, .899; p = .000). Therefore, LHDs with the highest expenditures per 100,000 population were more likely to use multiple social media channels than LHDs with lower expenditures.

The variable PHAB Accredited was significantly associated with multiple social media channel use. Compared to LHDs that had not decided, were not applying, did not know or did not report, LHDs that are already PHAB accredited, submitted an application, or are in the ePHAB system, were 1.4 times more likely to use multiple social media channels (AOR = 1.388; CI = 1.236, 1.559; p = .000). LHDs that were planning to apply for accreditation were 1.3 times more likely to use multiple social media channels (AOR = 1.329; CI = 1.192, 1.482; p = .000).

The variable Top Executive Asian was significantly associated with multiple social media channel use. Compared to LHDs that had top executives who were Asian, LHDs with top executives that were non-Asian were 2.2 times more likely to use multiple social media channels (AOR = 2.202; CI = 1.331, 3.643; p = .002). Therefore, LHDs with top executives that were non-Asian were more likely to use multiple social media channels than those with Asian top executives.

The variable Top Executive Degree was significantly associated with multiple social media channel use. Compared to LHDs whose top executive had a doctoral degree, LHDs whose top executive held a Bachelor's degree or less had significantly decreased odds of using

multiple social media channels (AOR = .855; CI = .745, .982; p = .026). LHDs whose top executive held a Master's degree had significantly decreased odds of using multiple social media channels (AOR = .815; CI = .725, .916; p = .001).

The variable Top Executive Age was shown to be significant in one quartile. When compared to LHDs with top executives in the oldest quartile, LHDs with top executives in the youngest quartile were 1.2 times more likely to use multiple social media channels (AOR = 1.155; CI = 1.012, 1.318; p = .033).

Two categories of the variable Informatics Use were significantly associated with multiple social media channel use. Compared to those LHDs that use the most (five) informatics technologies, those that reported using no informatics technologies or did not report had significantly decreased odds of using multiple social media channels (AOR = .600; CI = .484, .744; p = .000). Compared to those LHDs that use the most (five) informatics technologies, those that used 4 informatics technologies had significantly decreased odds of using multiple social media channels (AOR = .801; CI = .682, .940; p = .006). Other categories of this variable were not significant.

One category of the variable Budget Change was significantly associated with multiple social media channel use. Compared to LHDs that had an increased budget than the previous year, LHDs that had a decrease in the previous year's budget were 1.14 times more likely to use multiple social media channels (AOR = 1.14; CI = 1.017, 1.277; p = .024).

Table 4.2 Model 1: Binary Logistic Regression of Local Health Department's Use of Facebook as a Communication Channel with the Public, Using NACCHO Profile 2016 Data

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
LHD Employs PIP				
No	0.649	0.468	0.898	**0.009***
Yes	Ref.			
Informatics Use Score				
Use 0 informatics technologies	0.762	0.452	1.286	0.309
Use 1 informatics technology	0.739	0.460	1.185	0.209
Use 2 informatics technologies	0.926	0.597	1.438	0.733
Use 3 informatics technologies	1.017	0.651	1.590	0.940
Use 4 informatics technologies	0.532	0.340	0.831	**0.006***
Use 5 informatics technologies	Ref.			
Other Channel Use Score				
Use 0 other communication channels	0.000	0.000	.	0.996
Use 1 other communication channel	0.298	0.175	0.510	**0.000***
Use 2 other communication channels	0.170	0.118	0.244	**0.000***
Use 3 other communication channels	0.774	0.556	1.078	0.129
Use 4 other communication channels	1.097	0.814	1.479	0.541
Use 5+ other communication channels	Ref.			
Population				
1st quartile (860 - 21,028)	0.255	0.161	0.405	**0.000***
2nd quartile (21,029 - 50,994)	0.330	0.215	0.507	**0.000***
3rd quartile (50,995 - 193,444)	0.421	0.279	0.637	**0.000***
4th quartile (193,445 - 9,502,247)	Ref.			
Decentralized governance				
Shared/State	Ref.			
Local	2.728	2.115	3.518	**0.000***
Expenditures per 100K				

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
Not reported	0.590	0.401	0.867	**0.007***
1st quartile (127,632 - 2,143,351)	0.192	0.130	0.284	**0.000***
2nd quartile (2,143,352 - 3,653,935)	0.379	0.255	0.564	**0.000***
3rd quartile (3,653,936 - 6,133,804)	0.296	0.200	0.438	**0.000***
4th quartile (6,133,805 - 40,256,302)	Ref.			
Budget Change				
Not reported	0.787	0.510	1.214	0.278
Less than previous year	1.535	1.102	2.137	**0.011***
No change	1.151	0.872	1.519	0.322
Greater than previous year	Ref.			
PHAB Accredited				
Accredited, Submitted Application or in ePHAB	Ref.			
Plans to apply	4.421	2.951	6.622	**0.000***
Undecided, Not applying, Does not know, Not reported	0.996	0.727	1.364	0.979
Top Executive Hispanic				
Yes	0.143	0.054	0.379	**0.000***
No	Ref.			
Top Executive Black				
Yes	0.444	0.281	0.700	**0.000***
No	Ref.			
Top Executive Asian				
Yes	0.055	0.017	0.180	**0.000***
No	Ref.			
Top Executive Other Race				
Yes	2.868	1.068	7.703	**0.037***
No	Ref.			
Top Executive Degree				
Not reported	0.813	0.464	1.426	0.470

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
Bachelors or less	1.720	1.185	2.498	**0.004***
Masters degree	1.003	0.708	1.420	0.986
Doctoral degree	Ref.			
Top Executive Age				
Not reported	1.127	0.707	1.797	0.616
1st quartile (26 - 45 years)	2.814	2.001	3.957	**0.000***
2nd (46 - 53 years)	1.626	1.164	2.273	**0.004***
3rd (54 - 60 years)	1.617	1.174	2.225	**0.003***
4th quartile (61 - 80 years)	Ref.			

*Significant at p<.05

Abbreviations: PHAB, Public Health Accreditation Board; LHD, local health department; PIP, Public Information Professional; AOR, adjusted odds ratio; CI, confidence interval; Ref., reference category

Table 4.3 Model 2: Binary Logistic Regression of Local Health Department's Use of Twitter as a Communication Channel with the Public, Using NACCHO Profile 2016 Data

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
Informatics Use Score				
Use 0 informatics technologies	0.902	0.494	1.649	0.737
Use 1 informatics technology	0.698	0.410	1.187	0.185
Use 2 informatics technologies	0.703	0.438	1.128	0.144
Use 3 informatics technologies	0.991	0.626	1.568	0.968
Use 4 informatics technologies	0.303	0.185	0.498	**0.000***
Use 5 informatics technologies	Ref.			
Other Channel Use Score				
Use 0 other communication channels	0.000	0.000	.	0.996
Use 1 other communication channel	0.213	0.088	0.515	**0.001***
Use 2 other communication channels	0.000	0.000	.	0.993
Use 3 other communication channels	0.290	0.187	0.450	**0.000***
Use 4 other communication channels	0.243	0.173	0.341	**0.000***
Use 5+ other communication channels	Ref.			
Population				
1st quartile (860 - 21,028)	0.080	0.050	0.129	**0.000***
2nd quartile (21,029 - 50,994)	0.119	0.079	0.180	**0.000***
3rd quartile (50,995 - 193,444)	0.196	0.131	0.293	**0.000***
4th quartile (193,445 - 9,502,247)	Ref.			
Decentralized governance				
Shared/State	Ref.			
Local	3.618	2.573	5.087	**0.000***
Expenditures per 100K				
Not reported	0.439	0.298	0.646	**0.000***
1st quartile (127,632 - 2,143,351)	0.443	0.297	0.661	**0.000***
2nd quartile (2,143,352 - 3,653,935)	0.464	0.308	0.699	**0.000***
3rd quartile (3,653,936 - 6,133,804)	0.400	0.269	0.596	**0.000***

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
4th quartile (6,133,805 - 40,256,302)	Ref.			
PHAB Accredited				
Accredited, Submitted Application or in ePHAB	Ref.			
Plans to apply	1.086	0.761	1.551	0.650
Undecided, Not applying, Does not know, Not	0.333	0.239	0.464	**0.000***
Top Executive Other Race				
Yes	4.611	1.338	15.887	0.015*
No	Ref.			**0.000***
Top Executive Degree				
Not reported	0.258	0.106	0.629	**0.003***
Bachelors or less	0.564	0.375	0.850	**0.006***
Masters degree	1.033	0.731	1.459	0.855
Doctoral degree	Ref.			
Top Executive Age				
Not reported	1.288	0.703	2.362	0.413
1st quartile (26 - 45 years)	2.540	1.688	3.822	**0.000***
2nd (46 - 53 years)	1.766	1.189	2.621	**0.005***
3rd (54 - 60 years)	0.865	0.596	1.255	0.444
4th quartile (61 - 80 years)	Ref.			
Top Executive Length of Service				
Not reported	1.830	1.045	3.206	**0.035***
1st quartile (0.16 - 1.80 years)	0.575	0.394	0.841	**0.004***
2nd quartile (1.81 - 4.53 years)	0.550	0.372	0.813	**0.003***
3rd quartile (4.54 - 10.90 years)	0.753	0.530	1.070	0.113
4th quartile (10.91 - 35.83 years)	Ref.			

*Significant at p<.05
Abbreviations: PHAB, Public Health Accreditation Board; LHD, local health department; AOR, adjusted odds ratio; CI, confidence interval; Ref., reference category

Table 4.4 Model 3: Binary Logistic Regression of Local Health Department's Use of Video Sharing as a Communication Channel with the Public, Using NACCHO Profile 2016 Data

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
LHD Employs PIP				
No	1.944	1.271	2.973	**0.002***
Yes	Ref.			
Other Channel Use Score				
Use 0 other communication channels	0.000	0.000	.	0.997
Use 1 other communication channel	0.000	0.000	.	0.995
Use 2 other communication channels	0.000	0.000	.	0.993
Use 3 other communication channels	0.717	0.351	1.467	0.363
Use 4 other communication channels	0.918	0.571	1.476	0.725
Use 5+ other communication channels	Ref.			
Population				
1st quartile (860 - 21,028)	0.043	0.020	0.095	**0.000***
2nd quartile (21,029 - 50,994)	0.060	0.033	0.109	**0.000***
3rd quartile (50,995 - 193,444)	0.249	0.160	0.387	**0.000***
4th quartile (193,445 - 9,502,247)	Ref.			
Decentralized governance				
Shared/State	Ref.			
Local	2.503	1.535	4.083	**0.000***
Expenditures per 100K				
Not reported	0.492	0.259	0.932	**0.030***
1st quartile (127,632 - 2,143,351)	0.411	0.232	0.728	**0.002***
2nd quartile (2,143,352 - 3,653,935)	0.723	0.430	1.214	0.220
3rd quartile (3,653,936 - 6,133,804)	0.358	0.201	0.636	0.000*

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
4th quartile (6,133,805 - 40,256,302)	Ref.			
Budget Change				
Not reported	0.185	0.080	0.428	0.000*
Less than previous year	0.456	0.286	0.727	0.001*
No change	0.394	0.253	0.615	0.000*
Greater than previous year	Ref.			
PHAB Accredited				
Accredited, Submitted Application or in ePHAB	Ref.			
Plans to apply	0.702	0.442	1.114	0.133
Undecided, Not applying, Does not know, Not reported	0.477	0.301	0.755	0.002*
Top Executive Black				
Yes	2.504	1.344	4.664	0.004*
No	Ref.			
Top Executive Degree				
Not reported	0.519	0.192	1.400	0.195
Bachelors or less	0.200	0.106	0.376	0.000*
Masters degree	0.344	0.224	0.528	0.000*
Doctoral degree	Ref.			
Top Executive Age				
Not reported	0.296	0.114	0.768	**0.012***
1st quartile (26 - 45 years)	0.680	0.374	1.240	0.208
2nd (46 - 53 years)	1.415	0.848	2.361	0.184
3rd (54 - 60 years)	0.559	0.334	0.936	**0.027***
4th quartile (61 - 80 years)	Ref.			
Top Executive Length of Service				

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
Not reported	1.663	0.719	3.846	0.234
1st quartile (0.16 - 1.80 years)	2.970	1.768	4.987	**0.000***
2nd quartile (1.81 - 4.53 years)	0.439	0.245	0.788	**0.006***
3rd quartile (4.54 - 10.90 years)	1.221	0.737	2.023	0.438
4th quartile (10.91 - 35.83 years)	Ref.			

*Significant at p<.05
Abbreviations: PHAB, Public Health Accreditation Board; LHD, local health department; AOR, adjusted odds ratio; CI, confidence interval; Ref., reference category

Table 4.5 Models 4 – 6: Binary Logistic Regression of Local Health Department's Use of Specific Social Media Platforms as a Communication Channel with the Public for Routine Activities, Using NACCHO Profile 2016 Data

LHD Characteristic	P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)	
	Facebook Use for Routine Activities				Twitter Use for Routine Activities				Video Sharing for Routine Activities			
Informatics Use Score												
Use 0 informatics technologies	0.056	0.615	0.373	1.012	0.492	0.804	0.432	1.497	**0.005***	3.351	1.433	7.836
Use 1 informatics technology	**0.039***	0.624	0.399	0.977	0.516	0.838	0.492	1.429	0.985	1.008	0.454	2.237
Use 2 informatics technologies	0.491	0.864	0.570	1.309	0.297	0.775	0.481	1.251	0.776	0.900	0.436	1.859
Use 3 informatics technologies	0.973	0.993	0.652	1.512	0.531	1.160	0.730	1.844	0.253	1.434	0.773	2.662
Use 4 informatics technologies	**0.017***	0.594	0.388	0.910	**0.000***	0.372	0.226	0.612	0.482	1.262	0.660	2.415
Use 5 informatics technologies		Ref.				Ref.				Ref.		
Other Channel Use Score												
Use 0 other communication channels	0.996	0.000	0.000	.	0.996	0.000	0.000	.	0.997	0.000	0.000	.
Use 1 other communication channel	**0.000***	0.378	0.223	0.640	**0.002***	0.247	0.102	0.595	0.996	0.000	0.000	.
Use 2 other communication channels	**0.000***	0.189	0.133	0.268	0.993	0.000	0.000	.	0.993	0.000	0.000	.
Use 3 other communication channels	0.428	0.877	0.635	1.212	**0.000***	0.341	0.221	0.527	0.474	0.763	0.364	1.600
Use 4 other communication channels	0.575	0.923	0.696	1.223	**0.000***	0.241	0.171	0.340	0.382	0.793	0.472	1.334
Use 5+ other communication channels		Ref.				Ref.				Ref.		
Population												

LHD Characteristic	P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)	
1st quartile	**0.000***	0.239	0.156	0.368	**0.000***	0.077	0.048	0.124	**0.000***	0.026	0.010	0.067
2nd quartile	**0.000***	0.324	0.217	0.485	**0.000***	0.108	0.071	0.163	**0.000***	0.074	0.041	0.137
3rd quartile	**0.000***	0.410	0.278	0.607	**0.000***	0.182	0.122	0.271	**0.000***	0.360	0.233	0.557
4th quartile		Ref.				Ref.				Ref.		
Decentralized governance												
Shared/State		Ref.				Ref.				Ref.		
Local	**0.000***	2.492	1.943	3.196	**0.000***	3.728	2.644	5.256	**0.000***	3.387	1.959	5.858
Expenditures per 100K												
Not reported	**0.003***	0.574	0.400	0.824	**0.004***	0.571	0.388	0.840	0.881	1.051	0.549	2.012
1st quartile	**0.000***	0.195	0.135	0.283	**0.000***	0.485	0.324	0.726	0.291	0.722	0.394	1.321
2nd quartile	**0.000***	0.468	0.320	0.686	**0.008***	0.576	0.384	0.866	0.985	1.005	0.580	1.742
3rd quartile	**0.000***	0.341	0.235	0.495	**0.001***	0.501	0.338	0.745	**0.007***	0.423	0.226	0.793
4th quartile		Ref.				Ref.				Ref.		
Budget Change												
Not reported	0.152	0.736	0.485	1.119					**0.000***	0.178	0.079	0.403
Less than previous year	0.056	1.361	0.992	1.866					**0.000***	0.294	0.174	0.497
No change	0.653	1.064	0.812	1.395					**0.000***	0.287	0.179	0.460
Greater than previous year		Ref.				Ref.				Ref.		
PHAB Accredited												
Accredited, Submitted Application or in ePHAB		Ref.				Ref.				Ref.		
Plans to apply	**0.000***	4.238	2.867	6.264	0.578	1.106	0.775	1.579	**0.043***	0.618	0.388	0.985
Undecided, Not applying, Does not know, Not reported	0.262	0.843	0.625	1.136	**0.000***	0.326	0.234	0.455	**0.031***	0.594	0.370	0.953
Top Executive Hispanic												
Yes	**0.000***	0.109	0.042	0.284								
No		Ref.										
Top Executive Black												

LHD Characteristic	P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)	
Yes	**0.002***	0.485	0.310	0.761					**0.001***	2.778	1.517	5.084
No		Ref.								Ref.		
Top Executive Asian												
Yes	**0.000***	0.064	0.020	0.205								
No		Ref.										
Top Executive Other Race												
Yes	**0.022***	3.198	1.180	8.668	**0.008***	4.681	1.496	14.649				
No		Ref.				Ref.						
Top Executive Degree												
Not reported	0.916	1.030	0.596	1.781	**0.041***	0.395	0.162	0.961	0.352	1.629	0.583	4.552
Bachelors or less	**0.001***	1.827	1.274	2.621	0.182	0.754	0.497	1.142	**0.004***	0.386	0.204	0.733
Masters degree	0.806	0.959	0.687	1.339	0.138	1.304	0.919	1.852	**0.002***	0.491	0.316	0.765
Doctoral degree		Ref.				Ref.				Ref.		
Top Executive Age												
Not reported	0.177	0.732	0.466	1.151	0.890	0.957	0.509	1.798				
1st quartile (26 - 45 years)	**0.000***	2.197	1.581	3.053	**0.000***	2.186	1.457	3.280				
2nd (46 - 53 years)	0.067	1.357	0.979	1.881	**0.013***	1.652	1.113	2.451				
3rd (54 - 60 years)	0.114	1.285	0.941	1.754	0.401	0.853	0.589	1.236				
4th quartile (61 - 80 years)		Ref.				Ref.						
Top Executive Length of Service												
Not reported					0.144	1.528	0.866	2.697	0.242	0.565	0.218	1.469
1st quartile (0.16 - 1.80 years)					**0.001***	0.515	0.351	0.754	**0.000***	2.591	1.568	4.282
2nd quartile (1.81 - 4.53 years)					**0.001***	0.510	0.345	0.754	**0.000***	0.336	0.185	0.609
3rd quartile (4.54 - 10.90 years)					0.131	0.765	0.540	1.083	0.840	1.053	0.638	1.738
4th quartile (10.91 - 35.83 years)						Ref.				Ref.		

*Significant at p<.05

Abbreviations: PHAB, Public Health Accreditation Board; LHD, local health department; AOR, adjusted odds ratio; CI, confidence interval; Ref., reference category

Table 4.6 Models 7 – 9: Binary Logistic Regression of Local Health Department's Use of Specific Social Media Platforms as a Communication Channel with the Public for Emergency Response, Using NACCHO Profile 2016 Data

LHD Characteristic	P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)	
		Facebook Use for Emergency Response				Twitter Use for Emergency Response		
LHD employs PIP								
No	**0.002***	0.662	0.509	0.862	**0.004***	0.614	0.440	0.856
Yes		Ref.				Ref.		
Informatics Use Score								
Use 0 informatics technologies					0.631	0.857	0.456	1.610
Use 1 informatics technology					**0.000***	0.257	0.138	0.479
Use 2 informatics technologies					**0.005***	0.489	0.297	0.805
Use 3 informatics technologies					**0.039***	0.608	0.379	0.976
Use 4 informatics technologies					**0.000***	0.360	0.216	0.599
Use 5 informatics technologies						Ref.		
Other Channel Use Score								
Use 0 other communication channels	0.997	0.000	0.000	.	0.996	0.000	0.000	.
Use 1 other communication channel	**0.000***	0.062	0.025	0.155	0.996	0.000	0.000	.
Use 2 other communication channels	**0.000***	0.187	0.122	0.287	0.993	0.000	0.000	.
Use 3 other communication channels	0.543	0.911	0.676	1.229	**0.005***	0.494	0.301	0.812
Use 4 other communication channels	0.825	1.028	0.803	1.317	**0.000***	0.363	0.245	0.538
Use 5+ other communication channels		Ref.				Ref.		
Population								
1st quartile	**0.043***	0.684	0.474	0.987	**0.000***	0.102	0.058	0.180
2nd quartile	**0.018***	0.657	0.464	0.931	**0.000***	0.352	0.229	0.542
3rd quartile	**0.000***	0.522	0.374	0.728	**0.000***	0.457	0.310	0.676
4th quartile		Ref.				Ref.		

LHD Characteristic	P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)	
Governance								
Local	**0.000***	1.807	1.416	2.306	**0.000***	5.485	3.498	8.602
Shared		Ref.				Ref.		
Expenditures per 100K								
Not reported	0.359	0.863	0.630	1.182				
1st quartile	**0.001***	0.574	0.414	0.795				
2nd quartile	0.211	1.223	0.892	1.676				
3rd quartile	0.687	1.066	0.781	1.456				
4th quartile		Ref.						
Budget Change								
Not reported	0.123	1.375	0.917	2.060	0.448	1.235	0.717	2.127
Less than previous year	**0.000***	1.752	1.325	2.316	**0.013***	1.627	1.106	2.391
No change	**0.025***	1.332	1.037	1.712	0.859	1.032	0.729	1.462
More than previous year		Ref.				Ref.		
PHAB Accredited								
Accredited, Submitted Application or in ePHAB		Ref.				Ref.		
Plan to apply	**0.000***	1.974	1.449	2.688	0.867	1.032	0.714	1.492
Undecided, Not applying, Do not know, Not reported	0.919	1.015	0.768	1.340	**0.000***	0.332	0.229	0.483
Top Executive Gender								
Male	**0.021***	0.784	0.638	0.963	**0.006***	0.655	0.485	0.884
Female		Ref.				Ref.		
Top Executive Hispanic								
Yes	**0.043***	0.389	0.156	0.970				
No		Ref.						
Top Executive Black								
Yes	**0.000***	0.387	0.231	0.648				
No		Ref.						
Top Executive Asian								

LHD Characteristic	P Value	AOR	CI (Lower, Upper)		P Value	AOR	CI (Lower, Upper)	
Yes	**0.022***	0.257	0.080	0.821				
No		Ref.						
Top Executive Other Race								
Yes					**0.020***	3.446	1.220	9.734
No						Ref.		
Top Executive Age								
Not reported	0.127	1.423	0.904	2.238	0.767	1.116	0.542	2.297
1st quartile	**0.000***	2.995	2.161	4.150	**0.000***	3.601	2.243	5.780
2nd quartile	**0.000***	1.826	1.331	2.505	0.077	1.522	0.955	2.427
3rd quartile	**0.014***	1.444	1.076	1.937	0.476	1.174	0.755	1.824
4th quartile		Ref.				Ref.		
Top Executive Length of Service								
Not reported	**0.019***	1.706	1.091	2.667	**0.000***	4.972	2.720	9.086
1st quartile	**0.006***	0.661	0.493	0.887	0.114	0.699	0.449	1.090
2nd quartile	0.229	0.836	0.624	1.120	0.536	0.871	0.562	1.350
3rd quartile	0.362	1.135	0.864	1.490	0.284	1.243	0.835	1.852
4th quartile		Ref.				Ref.		

*Significant at p<.05

Abbreviations: PHAB, Public Health Accreditation Board; LHD, local health department; PIP, public information professional; AOR, adjusted odds ratio; CI, confidence interval; Ref., reference category

Table 4.7 Model 10: Poisson Linear Regression of Local Health Departments' Level of Utilization of Social Media

Channels to Communicate with the Public, Using NACCHO Profile 2016 Data

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
Population				
1st quartile (860 - 21,028)	0.400	0.340	0.471	**0.000***
2nd quartile (21,029 - 50,994)	0.545	0.475	0.626	**0.000***
3rd quartile (50,995 - 193,444)	0.674	0.594	0.765	**0.000***
4th quartile (193,445 - 9,502,247)	Ref.			
Governance				
Shared/State	0.534	0.473	0.604	**0.000***
Local	Ref.			
Expenditures per 100,000 population				
Not Reported	0.723	0.628	0.831	**0.000***
1st quartile ($127,632 - $2,143,351)	0.710	0.619	0.814	**0.000***
2nd quartile ($2,143,352 - $3,653,935)	0.812	0.712	0.925	**0.002***
3rd quartile ($3,653,936 - $6,133,804)	0.789	0.694	0.899	**0.000***
4th quartile (6,133,805 - 40,256,302)	Ref.			
PHAB Accredited				
Accredited, Submitted Application or in ePHAB	1.388	1.236	1.559	**0.000***
Plans to apply	1.329	1.192	1.482	**0.000***
Undecided, Not applying, Does not know, Not reported	Ref.			
Top Executive Gender				
Male	1.027	0.935	1.128	0.583
Female	Ref.			
Top Executive Hispanic				
Yes	Ref.			
No	1.375	0.891	2.124	0.151
Top Executive Black				
Yes	Ref.			

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
No	1.122	0.939	1.342	0.206
Top Executive Asian				
Yes	Ref.			
No	2.202	1.331	3.643	**0.002***
Top Executive Other Race				
Yes	Ref.			
No	1.233	0.883	1.720	0.219
Top Executive Degree				
Not Reported	0.714	0.537	0.950	**0.021***
Bachelors or less	0.855	0.745	0.982	**0.026***
Masters degree	0.815	0.725	0.916	**0.001***
Doctoral degree	Ref.			
Top Executive Age				
Not Reported	0.870	0.692	1.093	0.231
1st quartile (26 - 45 years)	1.155	1.012	1.318	**0.033***
2nd quartile (46 - 53 years)	1.057	0.924	1.209	0.421
3rd quartile (54 - 60 years)	0.937	0.824	1.066	0.323
4th quartile (61 - 80 years)	Ref.			
Informatics Use				
Use 0 informatics technologies	0.600	0.484	0.744	**0.000***
Use 1 informatics technology	0.883	0.739	1.056	0.174
Use 2 informatics technologies	0.918	0.783	1.077	0.296
Use 3 informatics technologies	1.076	0.928	1.248	0.331
Use 4 informatics technologies	0.801	0.682	0.940	**0.006***
Use 5 informatics technologies	Ref.			
Budget Change				
Less than previous year	1.140	1.017	1.277	**0.024***
No change	1.080	0.975	1.196	0.140
Greater than previous year	Ref.			
LHD Employs PIP				

LHD Characteristics	AOR	CI Lower	CI Upper	P-Value
No	0.899	0.806	1.002	0.055
Yes	Ref.			

*Significant at p<.05

Abbreviations: PHAB, Public Health Accreditation Board; LHD, local health department; PIP, public information professional; AOR, adjusted odds ratio; CI, confidence interval; Ref., reference category

Table 4.8 Summary of Regression Models for Local Health Department Use of the Top Three Social Media Channels to Communicate with the Public

	Facebook Use	Twitter Use	Video Sharing Use
LHD Employs PIP	Compared to LHDs that employ PIPs, LHDs that do not employ PIPs had significantly decreased odds of using Facebook.	Not Significant	Compared to LHDs that employ PIPs, LHDs that do not employ PIPs are 1.94 times more likely to use Video Sharing.
Informatics Use Score	Compared to those LHDs that use the most (five) informatics technologies, those that used 4 informatics technologies had significantly decreased odds of using Facebook.	Compared to LHDs that used 5 informatics technologies, LHDs that used four informatics technologies had significantly decreased odds of using Twitter.	Not Significant
Other Channel Use Score	Compared to LHDs that used 5 communication channels other than social media, those that used only 1 other communication channel had significantly decreased odds of using Facebook. LHDs that used two other communication channels had significantly decreased odds of using Facebook.	Compared to LHDs that used 5 communication channels other than social media, those that used 1, 3 or 4 other communication channels had significantly decreased odds of using Twitter.	Not Significant

	Facebook Use	**Twitter Use**	**Video Sharing Use**
Population	Compared to the largest population quartile, LHDs in all other population quartiles had significantly decreased odds of using Facebook.	Compared to the largest population quartile, LHDs in all other population quartiles had significantly decreased odds of using Twitter.	Compared to the largest population quartile, LHDs in all other population quartiles had significantly decreased odds of using Video Sharing.
Decentralized Governance	Compared to Health Departments that had shared or state governance, locally governed Health Departments were 2.73 times more likely to use Facebook.	Compared to Health Departments that had shared or state governance, locally governed Health Departments were 3.62 times more likely to use Twitter.	Compared to Health Departments that had shared or state governance, locally governed Health Departments were 2.5 times more likely to use Video Sharing
Expenditures per 100K	Compared to the highest spending quartile, LHDs in all other spending quartiles had significantly decreased odds of using Facebook.	Compared to the highest spending quartile, LHDs in all other expenditures quartiles had significantly decreased odds of using Twitter.	Compared to the highest spending quartile, LHDs in the lowest expenditures quartile had significantly decreased odds of using Video Sharing. LHDs in the third expenditures quartile also had significantly decreased odds of using Video Sharing.
Budget Change	Compared to LHDs that had an increased budget than the previous year, LHDs that had a decrease in the previous year's budget were 1.54 times more likely to use Facebook.	Not Significant	Compared to LHDs that had an increased budget than the previous year, LHDs that had a decrease in the previous year's budget had significantly decreased odds of using Video Sharing. LHDs that had no change in the previous year's budget also had significantly decreased odds of using Video Sharing.

	Facebook Use	Twitter Use	Video Sharing Use
PHAB Accredited	Compared to LHDs that are already PHAB accredited, submitted an application, or are in the ePHAB system, LHDs that were planning to apply for accreditation were 4.42 times more likely to use Facebook.	Compared to LHDs that are already PHAB accredited, submitted an application, or are in the ePHAB system, LHDs that were either not applying for accreditation, undecided, did not know or did not report had significantly decreased odds of using Twitter.	Compared to LHDs that are already PHAB accredited, submitted an application, or are in the ePHAB system, LHDs that were either not applying for accreditation, undecided, did not know or did not report had significantly decreased odds of using Video Sharing.
Top Executive Hispanic	Compared to LHDs that had top executives who were non-Hispanic, LHDs with top executives that were Hispanic had significantly decreased odds of using Facebook.	Not Significant	Not Significant
Top Executive Black	Compared to LHDs that had top executives who identified as a race other than Black, LHDs with top executives that were Black had significantly decreased odds of using Facebook.	Not Significant	Compared to LHDs that had top executives who identified as non-Black, LHDs with top executives that were classified as Black were 2.5 times more likely to use Video Sharing.
Top Executive Asian	Compared to LHDs that had top executives who identified as a race other than Asian, LHDs with top executives that were Asian had significantly decreased odds of using Facebook.	Not Significant	Not Significant
Top Executive Other Race	Compared to LHDs that had top executives who did not identify as Other Race, LHDs with top executives that were classified as Other Race were 2.87 times more likely to use Facebook.	Compared to LHDs that had top executives who did not identify as Other Race, LHDs with top executives that were classified as Other Race were 4.61 times more likely to use Twitter.	Not Significant

	Facebook Use	Twitter Use	Video Sharing Use
Top Executive Degree	Compared to LHDs whose top executive had a doctoral degree, LHDs whose top executive held a Bachelor's degree or less were 1.72 times more likely to use Facebook.	Compared to LHDs whose top executive had a doctoral degree, LHDs whose top executive held a Bachelor's degree or less had significantly decreased odds of using Twitter.	Compared to LHDs whose top executive had a doctoral degree, LHDs whose top executive held a Bachelor's degree or less had significantly decreased odds of using Video Sharing. LHDs whose top executive held a Master's degree also had significantly decreased odds of using Video Sharing.
Top Executive Age	When compared to LHDs with top executives in the oldest quartile, LHDs with top executives in the youngest quartile were 2.81 times more likely to use Facebook. LHDs with top executives in the second age quartile were 1.63 times more likely to use Facebook. LHDs with top executives in the third age quartile were 1.61 times more likely to use Facebook.	When compared to LHDs with top executives in the oldest quartile, LHDs with top executives in the youngest quartile were 2.54 times more likely to use Twitter. LHDs with top executives in the second age quartile were 1.8 times more likely to use Twitter than the oldest quartile.	When compared to LHDs with top executives in the oldest quartile, LHDs with top executives in the third quartile had significantly decreased odds of using Video Sharing.
Top Executive Length of Service	Not Significant	Compared to LHDs with top executives that had the longest tenure, LHDs with top executives that had the shortest tenure had significantly decreased odds of using Twitter. LHDs with top executives in the second quartile of tenure also had significantly decreased odds of using Twitter.	Compared to LHDs with top executives that had the longest tenure, LHDs with top executives that had the shortest tenure were 2.97 times more likely to use Video Sharing. LHDs with top executives in the second quartile of tenure had significantly decreased odds of using Video Sharing.

Abbreviations: PHAB, Public Health Accreditation Board; LHD, local health department; PIP, public information professional

Chapter V: Discussion and Conclusions

Discussion

The goal of this study was to use the NACCHO 2016 Profile data to examine the organizational, individual (leadership), and environmental characteristics of local health departments that are associated with the use of social media channels as a communication tool. Descriptive statistics were conducted initially on the data, including frequencies and chi-square crosstab analyses. Further analyses were conducted including 9 binary logistic regression models and 1 Poisson regression model. As indicated in the literature, only 67% of LHDs are sufficiently addressing the third essential public health service, "to inform educate, and empower people about health issues" (Bhandari, Scutchfield, Charingo, Riddell, & Mays, 2010). This study aimed to address this gap.

Frequency and descriptive analyses of the data showed that 66.4% of LHDs use at least one social media channel. This leaves a gap of 33.6% LHDs that do not utilize this popular and inexpensive communication tool. The most utilized social media platform was Facebook, with 64.7% of LHDs reporting use. The second and third most utilized platforms were Twitter at 33%, and Video sharing sites such as Youtube at 13.7%. Regression models used these top three platforms as dependent variables. Binary logistic regression models showed several significant variables associated with social media use. Variables that were significant across at least 2 of the 3 social media platforms analyzed (Facebook, Twitter, Video Sharing) are discussed here.

Organizational Characteristics

Whether or not LHDs employ Public Information Specialists was significant for Facebook and Video Sharing, but the two results differed. Health departments that employed

PIPs were more likely to use Facebook, but less likely to use Video Sharing. This finding related to Facebook is consistent with the literature, which found that LHDs who were early adopters of Facebook were more likely to have a PIP on staff (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013). However, LHDs that employed a PIP were less likely to use Facebook or Twitter for emergency response purposes.

Spending per 100,000 population was significant across all three social media platforms. Though percentages differed slightly, all three lower quartiles of expenditures were less likely to use social media platforms than those in the highest quartile of spending. LHDs that spent the most money per 100,000 population were more likely to use social media for communication. This is also consistent with previous studies that presented spending per capita as significant, with highest spending LHDs in the innovator departments, and lowest spending LHDs in the non-adoption departments, for both Facebook and Twitter (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013). LHDs in the lowest spending quartile were less likely to use social media for emergency purposes than those in the highest quartile.

PHAB accreditation was significant across all three social media variables, but the odds ratios were different. LHDs that were already accredited, had submitted an application, or were in the ePHAB system were less likely to use Facebook, but more likely to use Twitter and Video Sharing. The results of the social media score Poisson regression also showed a positive relationship between accreditation and use of multiple social media channels. This could be a result of LHDs trying harder to achieve success in executing the essential public health services because of the accreditation process. However, LHDs just planning to apply were twice as likely

to use Facebook for emergency purposes compared to those already accredited, submitted the application, or in the ePHAB system.

Informatics use was significant for both Facebook and Twitter use. LHDs that use the most (5) informatics technologies were shown to be more likely to use Facebook and Twitter than those that used 4 informatics technologies. This is further reinforced by the Poisson regression results looking at LHD social media score and informatics use, which were also significant. When looking at LHDs use of communication channels other than social media, LHDs that used the most communication channels (5 or more) were more likely to use Facebook and Twitter than LHDs using less channels. Health departments that used the most informatics technologies were also more likely to use Twitter for emergency response purposes.

Individual (Leadership) Characteristics

The race of the LHD top executive was significant across more than one platform in the Black and Other Race categories. Top executives that identified as other race were more likely to use Facebook and Twitter. Top executives that identified as black race were less likely to use Facebook, but more likely to use Video Sharing. This is somewhat consistent with recent data from the Pew Research Center on race and social media use, where blacks were more likely to use Youtube than whites, but it also shows that blacks are more likely to use Facebook than whites as well, but by a smaller margin. Those that identified as Other Race were also more likely to use Twitter for emergency response purposes; however, executives that identified as non-Black, non-Asian, or non-Hispanic were all less likely to use social media for emergency purposes.

Other leadership characteristics that were significant across multiple platforms included top executive age, education degree, and length of service. Top executives that were younger were more likely to use Facebook and Twitter, but less likely to use Video Sharing. Also, younger executives were more likely to use multiple social media channels than older executives. Age was also significant in looking at how LHDs use social media. LHDs with top executives that were younger were more likely to use social media for emergency purposes than older executives. These results are consistent with the literature on age and social media, with younger populations using social media more frequently and on more platforms than older populations.

Executives with a Bachelor's degree or less were more likely to use Facebook and Video Sharing, but executives with Doctoral degrees were more likely to use Twitter. Also, executives with doctoral degrees were more likely to use multiple social media channels. This result is consistent with recent data showing that higher education positively correlates with social media use. However, the Pew Research data did not assess education level beyond Bachelor's degree, so it is impossible to compare accurately.

In looking at gender of top executives, only two of the models showed a significant association. Female executives were more likely to use both Facebook and Twitter for emergency purposes than male executives. Regarding length of service, top executives that held the longest tenure in their position were more likely to use Twitter, but less likely to use Video Sharing than those with the shortest tenure. Executives with the longest tenure were also more likely to use Facebook for emergency response purposes than those with the shortest tenure.

Environmental Characteristics

The size of the population served by LHD was significant across all platforms. As population increased, the likelihood of social media use increased as well. This is further bolstered by the Poisson regression looking at LHD social media score and population. This finding is consistent with the literature that showed LHDs serving larger populations were more likely to use social media (Harris, Mueller, & Snider, Social Media Adoption in Local Health Departments Nationwide, 2013; Thackeray, Neiger, Smith, & Van Wagenen, 2012).

. In looking at budget change of the LHD, results differed between Facebook and Video Sharing Use. Health departments that had a decrease in the annual budget were more likely to use Facebook and less likely to use Video Sharing, when compared to LHDs that had an increase in the budget. However, the Poisson analysis results showed that LHDs that had a decrease in the annual budget were more likely to use multiple social media channels.

Health departments that were locally governed, versus those that had shared or state governance were more likely to use all three social media channels. Locally governed health departments were between 2.5 and 3.6 times more likely to use the top three social media channels. This was also the outcome for the Poisson regression.

Table 5.1 Null Hypotheses Results and Decision

Null Hypotheses	Result	Decision
Ho1: There is not an association between LHD social media use and top executive age.	Youngest executives = More likely to use social media	Reject Null Hypothesis
Ho2: There is not an association between LHD social media use and top executive gender.	Results not significant	Fail to Reject Null Hypothesis
Ho3: There is not an association between LHD social media use and top executive race.	Less likely for Facebook, More likely for Video Sharing	Fail to Reject for Facebook; Reject Null Hypothesis for Video Sharing
Ho4: There is not an association between LHD social media use and top executive education level	Less likely for Facebook, More likely for Twitter and Video Sharing	Fail to Reject for Facebook; Reject Null Hypothesis for Twitter and Video Sharing
Ho5: There is not an association between LHD social media use and LHD population size	Larger population = More likely to use social media	Reject Null Hypothesis
Ho6: There is not an association between LHD social media use and having a PIP on staff.	More likely for Facebook, less likely for Video Sharing	Reject Null Hypothesis for Facebook; Fail to Reject for Video Sharing
Ho7: There is not an association between LHD social media use and top executive length of service.	Significant but conflicting results	Reject Null Hypothesis
Ho8: There is not an association between LHD social media use and budget.	Significant but conflicting results	Reject Null Hypothesis
Ho9: There is not an association between LHD social media use and expenditures.	Higher expenditures = More likely to use social media	Reject Null Hypothesis
Ho10: There is not an association between LHD social media use and its governance structure.	Locally governed = More likely to use social media	Reject Null Hypothesis
Ho11: There is not an association between LHD social media use and informatics use.	Most informatics use = More likely to use social media	Reject Null Hypothesis

Null Hypotheses	Result	Decision
Ho12: There is not an association between LHD social media use and LHD accreditation status.	Significant but conflicting results	Reject Null Hypothesis
Ho13: There is not an association between LHD social media use and other communication channel use.	More channel use = More likely to use social media	Reject Null Hypothesis

Abbreviations: PHAB, Public Health Accreditation Board; LHD, local health department; PIP, public information professional

Strengths and Limitations

The key strength of this research was using secondary data from a distinguished and reliable source (NACCHO) and was a representative stratified random sample of local health departments throughout the United States. The survey questions were comprehensive and included many characteristics of LHDs in relation to social media use from leadership, organizational, and environmental viewpoints. There is limited evidence in the literature on these variables related to social media use specifically by LHDs. This study addresses that gap in knowledge.

A limitation of the study was that the survey responses were self-reported, and not independently verified or validated, according to NACCHO. This means LHDs may have provided incomplete or inaccurate information. Also, some LHDs may have purposely skipped questions because of time constraints. Another limitation is that longitudinal data were not feasible for use in this study because a potentially different set of LHDs may receive the questions administered to the sample on different years. Some questions in the Profile related to social media are outdated in comparison to the current popular social media platforms, which is

also a limitation. Another possible limitation is not having a rural vs urban population comparison. Rural and urban comparisons were not analyzed because of the complicated definitions of rural designations; therefore, population size was utilized as an alternative.

Public Health Implications and Recommendations

As the health system in the United States is rapidly advancing with including newer technologies, and newer ways of delivering essential public health services, the increasing complexity and demands to address novel threats require newer ways of communicating with the public. With 69% of the public using social media platforms to connect with others, read news content, share information, and for entertainment purposes, LHDs should be capitalizing on this inexpensive and innovative method to communicate with constituents. However, LHDs are deficient, with only 66% reporting social media use in the 2016 Profile.

When used effectively, social media utilization has the capability to advance the way public health organizations connect and communicate with each other and their constituents. Not only does social media offer LHDs a unique opportunity to reach constituents to educate and disseminate information, but the use of social media provides an avenue for sharing best practices and knowledge with other public health organizations. Local health departments can take advantage of the results from this study by using results as a starting point for training and education for employees and leaders. As more and more people utilize social media platforms for communicating, understanding the LHD characteristics that influence social media use can be vital for designing an effective system to reach audiences in the community for public health education.

The strategic addition of new policies and procedures related to social media use at the executive level are needed in order to ensure public health essential service #3 is being sufficiently reached. Leadership development should be implemented with training on technology and the newest social media platforms, in particular for the older leaders. Training should take into consideration the diversity of populations that use social media platforms, and how to best reach each audience.

Health departments that are underfunded or that do not employ Public Information Professionals may want to consider partnering with academic institutions for assistance. Younger populations are proficient in social media, and more tech-savvy than older populations. Hiring interns or utilizing an academic partnership where college students can manage social media platforms for the LHDs in exchange for academic credit or service experience should be explored.

Conclusion

Further research investigating the reasons why certain leadership characteristics are more indicative for social media use should be explored, including collecting qualitative data from top executives. Additional evidence is needed in order to develop concrete best practices related to social media use in local health departments.

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