CORE FUNCTIONS AND EFFECTIVENESS OF THE LOCAL PUBLIC HEALTH SYSTEM IN THE UNITED STATES

by

AMBER HUGHES SINCLAIR

(Under the Direction of Andrew Whitford)

ABSTRACT

The history of the United States public health system includes a number of great successes that have improved the health status and increased the life expectancy of Americans. The history also tells of the complex, contentious, and oft-changing roles played by local public health departments (LHDs). In recent years, public health agencies at all levels have been asked to acknowledge a common set of roles and assess the efficacy of associated program efforts. The primary aims of the dissertation are to: 1) describe the history of the local public health system in the U.S. with emphasis on how essential roles (core functions) have changed over time, 2) describe the field of public health systems and services research with a review of core function effectiveness studies, and 3) examine the effects of three system characteristics on the perceived effectiveness of community delivery of assessment, policy development and assurance core public health functions. These three characteristics are a) the health department's contribution to effort, b) the participation of other types of agencies/organizations, and c) the percentage of other agencies/organization types that participate.

Results indicate that local health department contribution to effort and the participation of other types of agencies/organizations are significantly associated with health department

directors' perceived effectiveness of public health core functions. As these factors increase, perceived effectiveness increases. The significance of participation of individual types of agencies/organizations varies by core functions area, with the exception of local government agencies and hospitals being significant for all three core function areas. More participation of these types of agencies/organizations is associated with greater perceived effectiveness.

This is the first study to look at how local public health department contributions to core functions and the participation of other community agencies/organizations impact the perceived effectiveness of community delivery of core functions. The research adds to the understanding of effectiveness of core functions in the nascent field of public health systems and services research.

INDEX WORDS: Public administration, Public health administration, Participation theory, Collaboration theory, Network Theory

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B.A., Berea College, 1994

M.S., Emory University, 1999

A Dissertation Submitted to the Graduate Faculty of the University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2012

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IN THE UNITED STATES

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August 2012

DEDICATION

I dedicate this dissertation to my mom, Angela Hughes, who has provided endless support throughout the entire process, and who set an example in a commitment to her own educational pursuits over the years. Many times, the thought, “If mom could raise three kids and work full time while pursing her nursing degrees, then I can do this,” kept me going when I wanted to quit.

ACKNOWLEDGEMENTS

I gratefully and sincerely acknowledge the faculty, friends and family who supported me and made this dissertation possible. First, I thank my advisor, Dr. Andrew Whitford, for his guidance, encouragement and patience over the years it took for me to complete the dissertation. He never gave up on seeing me finish this process, and for that, I am most appreciative. I also thank my committee members, Dr. Hal Rainey, Dr. Robert Christensen, and Dr. Brian Williams, for their time and helpful comments and suggestions.

I thank my friends and family who have encouraged me to finish this degree and who supported me throughout the process. In particular, I thank my parents, Ricky and Angela Hughes; my sisters, Sheilah Hughes Giles and Christina Hughes Branch; and my grandparents, Bobbie and Leroy Hughes. Thank you to Doug Sinclair who supported me in this dissertation through thick and thin, and to Adam Hagues who always provided a listening ear and a glass of wine when I needed it. I also owe a big thank you to my classmates, Ellen Rubin, Dan Smith, Ben Clark, and Christine Ledvinka, who helped me get through the course work and comprehensive exams.

I am lucky to have two mentors in my life who encouraged me in my pursuit of the doctoral degree: Terry Richardson of the U.S. Government Accountability Office and George Washington University; and Dennis Tolsma of Kaiser Permanente. I feel very fortunate to have the guidance and support of these two exceptional mentors and friends.

Lastly, I want to thank the University of Kentucky and the Robert Wood Johnson Foundation for grant-funding that supported my dissertation work for several semesters. I am also indebted to Dr. Glen Mays at the University of Kentucky who shared the study data.

TABLE OF CONTENTS

Page

ACKNOWLEDGEMENTS v

LIST OF TABLES x

LIST OF FIGURES xii

CHAPTER

1. INTRODUCTION 1

Core functions 2

Measuring core function effectiveness 4

Study Aims 7

Chapter Layout 7

2. HISTORY OF CORE FUNCTIONS OF THE LOCAL PUBLIC HEALTH SYSTEM IN THE UNITED STATES 9

Definitions 9

Early Influences and Development of the Local Public Health System 11

Expanding Roles of Public Health 13

Modern Day 15

The Field of Public Health Systems and Services Research 18

3. THEORY AND PRACTICE OF PARTICIPATION AND COLLABORATION IN THE SYSTEM AND SYSTEM EFFECTIVENESS 20

A Participation Theory Perspective 22

A Collaboration Theory Perspective 26

A Network Theory Perspective 32

The Empiric Literature of Public Health Systems 54

Moving Forward 58

4. RESEARCH QUESTIONS AND HYPOTHESES 60

Public Health Assessment Core Functions 62

Public Health Policy Development Core Functions 62

Public Health Assurance Core Functions 63

5. DATA AND ANALYSIS METHODS 64

Three Dependent Variables 65

Three Main Independent Variables 68

Control Variables 69

Analysis Methods 74

Limitations 77

6. RESULTS: EFFECTIVENESS OF PUBLIC HEALTH ASSESSMENT CORE FUNCTIONS 79

Descriptive Statistics 79

Bivariate Analysis 82

Multivariate Models 86

7. RESULTS: EFFECTIVENESS OF PUBLIC HEALTH POLICY DEVELOPMENT CORE FUNCTIONS 92

Descriptive Statistics 92

Bivariate Analysis 95

Multivariate Models 99

8. RESULTS: EFFECTIVENESS OF PUBLIC HEALTH ASSURANCE CORE FUNCTIONS 105

Descriptive Statistics 105

Bivariate Analysis 108

Multivariate Models 110

9. SUMMARY AND CONCLUSIONS 117

Summary of Findings 117

Implications 119

Directions for Further Study 125

REFERENCES 127

APPENDIX A: SURVEY INSTRUMENT 134

APPENDIX B: ACRONYMS 137

LIST OF TABLES

Page

Table 1.1: Ten essential public health services. 3

Table 3.1: A typology of interorganizational network research. 40

Table 5.1: Survey response. 65

Table 5.2: Illustration of dependent variables in the subjective/objective category.....67

Table 5.3: Survey item for health department contribution main independent variable. 68

Table 5.4: Survey item for participation of other agencies/organizations main independent set of variables. 68

Table 5.5: Independent variables and sources. 70

Table 5.6: Statistical model specifications.....76

Table 6.1: Variable descriptive statistics. 80

Table 6.2: SAS variable names and labels.....84

Table 6.3: Correlation analysis for assessment dependent variable and continuous covariates. ...85

Table 6.4: Effectiveness of assessment functions multivariate model results. 88

Table 6.5: Effectiveness of assessment functions multivariate model results. 91

Table 7.1: Variable descriptive statistics. 93

Table 7.2: SAS variable names and labels. 97

Table 7.3: Correlation analysis for policy development dependent variable and continuous covariates. 98

Table 7.4: Effectiveness of policy development functions multivariate model results. 101

Table 7.5: Effectiveness of policy development functions multivariate model results. 104

Table 8.1: Variable descriptive statistics. 106

Table 8.2: SAS variable names and labels. 111

Table 8.3: Correlation analysis for assurance dependent variable and continuous covariates. ...112

Table 8.4: Effectiveness of assurance functions multivariate model results. 114

Table 8.5: Effectiveness of assurance functions multivariate model results. 116

Table 9.1: Comparison of significant findings for the three core function activities for the main independent variables. 118

LIST OF FIGURES

Page

Figure 1.1: Public health core functions and essential services relationship. 4

Figure 1.2: Core Function-Related Practice Performance Measures, 1995. 5

Figure 2.1: Determinants of health model. 10

Figure 3.1: Participation, collaboration and network theory layers. 21

Figure 3.2: Illustration of the participation theory layer. 22

Figure 3.3: Illustration of the collaboration theory layer. 26

Figure 3.4: Illustration of the network theory layer. 33

Figure 5.1: Practice performance measures for assessment activities. 65

Figure 5.2: Practice performance measures for policy development activities. 66

Figure 5.3: Practice performance measures for assurance activities. 66

Figure 6.1: Histogram of perceived effectiveness of assessment activities 81

Figure 6.2: Plot of LHD contribution to assessment activities against perceived effectiveness of assessment activities. 83

Figure 7.1: Histogram of perceived effectiveness of policy development activities 95

Figure 7.2: Plot of LHD contribution to policy development activities against perceived effectiveness of policy development activities. 96

Figure 8.1: Histogram of perceived effectiveness of assurance activities 108

Figure 8.2: Plot of LHD contribution to assurance activities against perceived effectiveness of assurance activities 109

CHAPTER 1

INTRODUCTION

From its inception in the nineteenth century, the United States public health system has promoted ideas and promulgated change which significantly improved the health status and increased life expectancy of the American public. Millions of lives have been saved by programs to address food and waterborne illness, maternal and infant health, and identification and response to various infectious diseases (Institute of Medicine, 1988). In the field of vaccine-preventable diseases, the Centers for Disease Control and Prevention cites a recent study that estimated prevention of 42,000 deaths and 20 million cases of disease per birth cohort. Programs to address tobacco control and improvement of transportation safety are also considered to be very successful (MMWR, 2011). To achieve these successes (and a variety of failures) the public health system has been forced to grow and change. As with many public sector shifts that occurred in the twentieth century, the public health system has struggled to redefine its societal role and delineate the responsibilities of federal, state and local agencies.

Public health in the United States has been characterized by rapidly evolving understanding of public health threats and continuous resource constraints, which in turn have spawned complex, far-reaching, and oft-changing roles for local public health departments (LHDs).

Organized and coordinated public health efforts in the United States were often preceded by federal (largely military) attempts to address significant threats to health posed by ports, warfare, and other national concerns. The Marine Hospital Service and its Supervising Surgeon were formed in 1870-71 and became the Commissioned Corps of the Public Health Service in

1889. The Supervising Surgeon became the Surgeon General, who led the uniformed Public Health Service and reported to the Secretary of Health. The Communicable Disease Center (CDC – now the Centers for Disease Control) was commissioned in 1946 as a peacetime continuation of the Malaria Control in War Areas organization.

In the late nineteenth and early twentieth centuries, state and local health departments were established and charged with prevention and control of infectious diseases (Turnock, 2009). By the mid-twentieth century, these initial core functions expanded to include vital statistics (birth and death records), environmental sanitation, maternal and child health services, public health education, and public health laboratory services (Turnock, 2009).

Core Functions

The currently recognized core local public health functions are organized into three broad categories of activity: assessment, policy development, and assurance, as described in the landmark 1988 Institute of Medicine (IOM) report *The Future of Public Health* (Institute of Medicine, 1988). Assessment activities include health needs surveys, resource assessments, and participation in preventative services. Policy development activities include advising policymakers about public health issues and priorities, building a network of relationships for communicating health-related information with various public organizations and the media, communication with public officials about health impact of policy decisions, and prioritization of health needs. Assurance activities include resource allocation and deployment, organizational self-assessment, evaluations, and monitoring of programs.

In 1994 the Department of Health and Human Services organized a core public health functions steering committee, which included representatives from U.S. public health agencies

and other major public health organizations. This committee developed a framework for 10 Essential Public Health Services to correspond to the three core function areas (U.S. Centers for Disease Control and Prevention, 2011). The Essential Services define public health and provide a guideline for responsibilities of local public health systems. The 10 essential services are listed below in Table 1.1, and their relationship to the three core function areas is shown in Figure 1.1.

Table 1.1: Ten essential public health services.

- Monitor health status to identify community health problems
- Diagnose and investigate health problems and health hazards in the community
- Inform, educate, and empower people about health issues
- Mobilize community partnerships to identify and solve health problems
- Develop policies and plans that support individual and community health efforts
- Enforce laws and regulations that protect health and ensure safety
- Link people to needed personal health services and assure the provision of health care when otherwise unavailable
- Assure a competent public health and personal health care workforce
- Evaluate effectiveness, accessibility, and quality of personal and population-based health services
- Research for new insights and innovative solutions to health problems

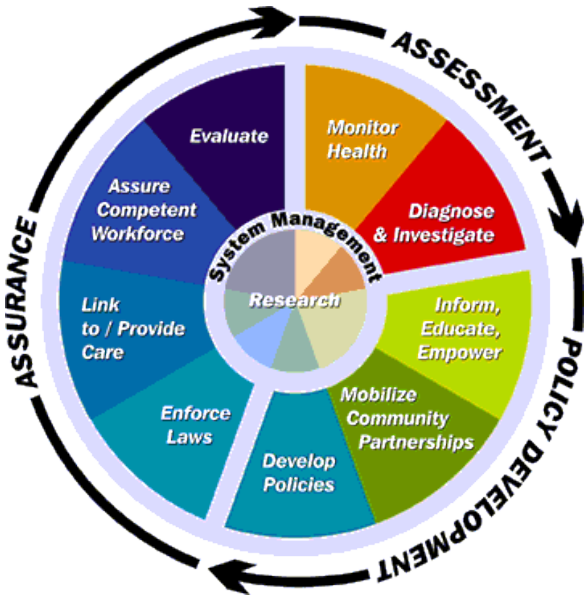

Figure 1.1: Public health core functions and essential services relationship.
Source: Department of Health and Human Services. Public Domain.

The first aim of this dissertation is to provide an overview of core functions of local public health systems and to discuss how the functions have evolved over time.

Measuring Core Function Performance

Following the 1988 IOM report, the U.S. Centers for Disease Control and Prevention commissioned a series of projects in the mid 1990s to identify services and activities considered important for protecting and improving public health at the community level, and that would serve as performance indicators for local public health systems (Mays et al 2004). Through this process, which included field tests and performance studies, a consensus set of 20 practice performance measures were derived from the three core public health functions and 10 essential services. Figure 1.2 lists the 20 core function-related practice performance measures.

Assessment activities

1. In your jurisdiction, is there a community needs assessment process that systematically describes the prevailing health status in the community?
2. In the past three years in your jurisdiction, has a survey of the population for behavioral risk factors been conducted?
3. In your jurisdiction, are timely investigations of adverse health events conducted on an ongoing basis, including communicable disease outbreaks and environmental health hazards?
4. Are the necessary laboratory services available to the local public health agency to support investigations of adverse health events and meet routine diagnostic and surveillance needs?
5. In your jurisdiction, has an analysis been completed of the determinants of and contributing factors to priority health needs, the adequacy of existing health resources, and the population groups most effected?
6. In the past three years in your jurisdiction, has the local public health agency conducted an analysis of age-specific participation in preventive and screening services?

Policy development activities

7. In your jurisdiction, is there a network of support and communication relationships that includes health-related organizations, the media, and the general public?
8. In the past year in your jurisdiction, has there been a formal attempt by the local public health agency to inform officials about the potential public health impact of decisions under their consideration?
9. In your local public health agency, has there been a prioritization of the community health needs that have been identified from a community needs assessment?
10. In the past three years in your jurisdiction, has the local public health agency implemented community health initiatives consistent with established priorities?
11. In your jurisdiction, has a community health action plan been developed with community participation to address community health needs?
12. In the past three years in your jurisdiction, has the local public health agency developed plans to allocate resources in a manner consistent with community health action plans?

Assurance activities

13. In your jurisdiction, have resources been deployed as necessary to address priority health needs identified in the community health needs assessment?
14. In the past three years in your jurisdiction, has the local public health agency conducted an organizational self-assessment?
15. In your jurisdiction, are age-specific priority health needs effectively addressed through the provision of or linkage to appropriate services?
16. In your jurisdiction, have there been regular evaluations of the effects of public health services on community health status?
17. In the past three years in your jurisdiction, has the local public health agency used professionally recognized processes and outcome measures to monitor programs and to redirect resources as appropriate?
18. In your jurisdiction, is the public regularly provided with information about current health status, health care needs, positive health behaviors, and health care policy issues?
19. Within the past year in your jurisdiction, has the media received reports on a regular basis about health issues affecting the community?
20. In the past three years in your jurisdiction, has there been an instance in which the local public health agency failed to implement a mandated public health program or service as required by state or local law, ordinance, or regulation?

Figure 1.2: Core Function-Related Practice Performance Measures, 1995.

Mays et al (2004) note that previous efforts to measure the availability and adequacy of essential public health services at the community level found evidence of wide variation and substantial gaps in performance, citing studies by Turnock et al (1994), Richards et al (1995), and Turnock et al (1998). Mays et al. (2004) also noted that others (Baker et al, 1994; Miller et al, 1994; Halverson et al, 1996) have pointed to the importance of examining contributions of nongovernmental organizations in assessing the adequacy of the public health infrastructure; however, these organizations have not been systematically categorized, reviewed, and evaluated in previous studies. For these reasons, Mays and colleagues conducted a survey in 1998 to evaluate the 20 core function practice performance measures in local public health department (LHD) jurisdictions in the U.S. that served over 100,000 people (Mays et al, 2004).

The survey asked health department directors in these most populous jurisdictions to rate the effectiveness of community delivery of the core functions. Mays found that only two-thirds of the functions were performed in the jurisdictions surveyed, and the perceived effectiveness rating was just 35 percent of the maximum rating possible (Mays et al, 2004). Local public health agencies contributed an average of 67 percent of total effort toward the 20 public health activities. Significant factors associated with higher perceived effectiveness in multivariate models were lower community poverty rates, a lower percentage of racial minority population, and presence of local boards of health. Other community and institutional characteristics were not significant, including type of governmental jurisdiction, types of services offered by the LHD, and measures of hospital and physician resources.

Given the evidence of wide variation and substantial functional gaps in public health capacity in the nation's largest jurisdictions, the question arises whether effectiveness has improved and gaps have narrowed over time since the original study. This line of inquiry is an

important aspect of the nascent field of public health systems and services research (PHSSR). In order to lay the groundwork for a third aim of this study, a second aim will be to describe the field of PHSSR with emphasis on core function effectiveness studies. The third aim of this dissertation, then, is to extend and expand upon the Mays' 1998 study. A follow-up survey was conducted in 2006 using the same instrument and data collection methods, and was administered to the same respondents as the 1998 survey. This research reexamines the Mays' findings with the addition of 2006 survey data. Additionally, the research examines public health system factors that were not examined in the Mays' 1998 study.

Study Aims

The primary aims of the dissertation are to: 1) describe the history of the local public health system in the U.S. with emphasis on how core functions have changed over time, 2) describe the field of public health systems and services research with a review of core function effectiveness studies, and 3) examine the effects of system characteristics on the perceived effectiveness of community delivery of assessment, policy development, and assurance core public health functions.

Chapter Layout

The dissertation chapters proceed as follows. In chapter 2, the history of the local public health system in the United States is presented, with emphasis on how core functions have changed over time. Chapter 3 discusses the theoretical underpinnings of participation in the public health system and synthesizes the recent studies of core function effectiveness. Chapter 4 lays out the research questions and hypotheses, while chapter 5 describes the data and analysis

methods. Results are presented in chapters 6 through 8, and chapter 9 provides a summary and discussion of the future of the field of public health systems research.

CHAPTER 2

HISTORY OF CORE FUNCTIONS OF THE LOCAL PUBLIC HEALTH SYSTEM IN THE UNITED STATES

This chapter describes the history of the local public health system in the United States, with emphasis on how core functions have evolved over the past 150 years. It begins by defining what is meant by the terms “public health” and the “public health system”, and then turns to the history of the local (city or county) public health system. The chapter describes some of the early influences on and development of local health departments, continuing through the evolution of local public health roles over time, and concluding with core functions in the modern day.

Definitions

Charles-Edward Amory Winslow was a widely respected bacteriologist and public health educator who founded the Yale Department of Public Health in 1915. He provided a definition of public health in 1920 that is still widely cited today: "... the science and art of preventing disease, prolonging life and promoting health and efficiency through organized community effort for the sanitation of the environment, the control of communicable infections, the education of the individual in personal hygiene, the organization of medical and nursing services for the early diagnosis and preventive treatment of disease, and for the development of the social machinery to insure everyone a standard of living adequate for the maintenance of health, so organizing these benefits as to enable every citizen to realize his birthright of health and longevity" (Winslow 1920; p 23). The phrase “organized community effort” in this definition highlights the significance of public health at the local level.

Another well-known definition of public health was promulgated by the World Health Organization in the 1970s, which specifically refers to the "health" aspect of public health: "a state of complete well-being, physical, social, and mental, and not merely the absence of disease or infirmity" (World Health Organization, as quoted by Hanlon and Pickett, 1984).

This broad view of public health examines the impact of poverty, hunger, education, urbanization and many other determinants of health (as opposed to the traditional pursuit of infectious diseases and industrial toxins). The biopsychosocial model of disease (Engel, 1977) and its successor "determinants of health" model inform the current definitions of public health (Figure 2.1).

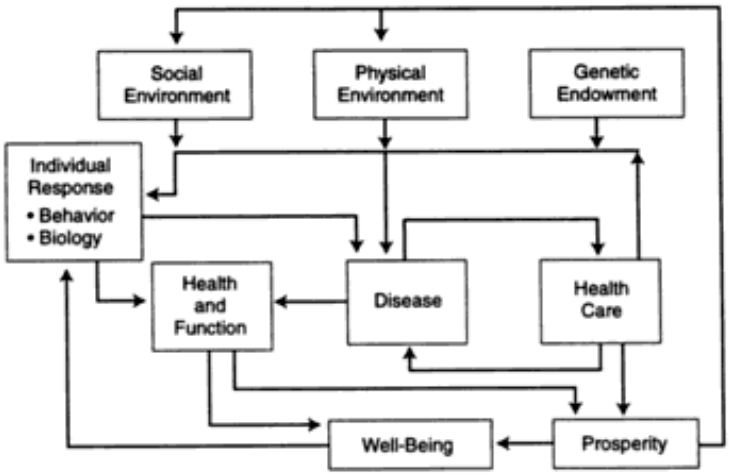

Figure 2.1: Determinants of health model.

Source: Evans and Stoddart, 1990

The IOM in *The Future of Public Health* acknowledges these definitions, but goes farther to define public health based on its mission and substance. They define the mission of public health as "the fulfillment of society's interest in assuring the conditions in which people can be healthy" (Institute of Medicine, 1988, pg 40). The substance of public health is defined as

"organized community efforts aimed at the prevention of disease and promotion of health. It links many disciplines and rests upon the scientific core of epidemiology" (Institute of Medicine, 1988, pg 41). In defining public health in this way, i.e. based on its mission and substance, the IOM asserts that government activities are placed within a broader framework that can guide a wide range of institutional participants.

It is also important for this research to define what is meant by a *public health system*. A public health system includes "the full complement of public and private organizations that contribute to the delivery of public health services for a given population, including governmental public health agencies as well as private and voluntary entities" (Mays et al, 2003; pg 180).

Early Influences and Development of the Local Public Health System

Before the mid-nineteenth century, public health activities in the United States were minimal and sporadic, with little in the way of collective action at any level of government. Government public health agencies were located only in major urban areas and seaport cities at that time, with the first city health department opening in Baltimore in 1798. As of 1876, there were only eight state health departments (Hinman, 1990), and there were no county health departments until 1908 (Turnock, 2009).

The period prior to 1850 was characterized by numerous epidemics, including cholera, smallpox, typhoid, tuberculosis, and yellow fever. Infectious diseases and disease outbreaks were historically seen as signs of poor moral and spiritual conditions in the community, but by the eighteenth century, sanitation programs, isolation and quarantine became increasingly common for containing contagious diseases (Turnock, 2009). Public perception began to change, and

diseases were thought to be more controllable through public action. One of the earliest organized public efforts to combat epidemics took the form of boards of health, or "local boards of distinguished citizens", which became forerunners of later local boards of public health. These boards were set up to address specific disease outbreaks, and were given the task of organizing local response.

In the second half of the nineteenth century and through the first half of the twentieth century, the development of local health agencies grew rapidly to carry out the science-based control measures such as quarantine, isolation, and vaccination. Winslow (1923) referred to the nineteenth century as the "great sanitary awakening." The sanitary movement represents a major period of public health achievement. The movement originated in Western Europe, when Edwin Chadwick, a British lawyer and secretary of the Poor Law Commission in 1838, wrote about the basis of the "sanitary idea," a remedy based on the assumption that diseases are caused by foul air from waste decomposition. Therefore, it was necessary to build a drainage network to remove sewage and waste. This was to be accomplished by the appointment of a national board of health, local boards in each district, and district medical officers (Chave, 1984).

Meanwhile in the United States, Lemuel Shattuck's "Report of the Sanitary Commission of Massachusetts," published in 1850, called for the establishment of state and local health departments to organize efforts including sanitary inspections, food sanitation, communicable disease control, vital statistics, and services for infants and children. This report became "America's blueprint for development of a public health system" (Turnock, 2009; pg. 6), although its recommendations were not realized until the latter part of the nineteenth century. Shattuck wrote that "the word sanitary means relating to health. When we speak of the sanitary condition of a town, we include a description of those circumstances which relate to, or have an

effect upon, the health of its inhabitants. When applied to the inhabitants of a town or district, in their social capacity, it relates to public health; when to individuals, it relates to personal or private health" (Shattuck, 1850; pg. 1). Many local health departments have continued to use "sanitation" in department titles, underscoring the perceived importance of this role despite major advances in developed countries.

At the close of the nineteenth century, another major breakthrough occurred that had major influence on public health: the science of bacteriology. In 1877, Louis Pasteur, a French chemist, proved that anthrax is caused by bacteria. By 1884, he had created artificial immunization against the disease. In the following few years, both American and European scientists discovered bacteriologic agents of diseases including tuberculosis, diphtheria, typhoid, and yellow fever (Winslow, 1923). Interventions such as immunization and water purification were at the forefront of public health, and their successes are still lauded today. (Ten Great Public Health Achievements – United States 2001-2010, CDC MMWR, May 2011.) Agencies that had developed to conduct and enforce sanitary measures expanded their roles to include laboratory science and epidemiology.

Expanding Roles of Public Health

Around the mid-twentieth century, gaps in the delivery of medical care to the poor and the availability of federal grant dollars acted together to promote public provision of personal health services (Turnock, 2009). The role of local public health agencies expanded to include providing medical care and other essential services for indigent populations. This time period following the Great Depression also saw shifting public perceptions of government's role in personal health services.

Local, state, and federal public health responsibilities continued to grow from the 1930s through the 1970s. Roosevelt's New Deal in the 1930s and Johnson's Great Society of the 1960s both reflected the social values of this period, which included an expanded social contract and significant government role in the health and welfare of individual citizens. As the IOM (1988) report notes, "Although science provided a foundation for public health, social values have shaped the system" (pg. 70). With regards to local health departments, federal programs influenced the further growth of local public health through financial and technical assistance in areas such as maternal and child health, family planning, immunization, venereal disease control, and tuberculosis control (Institute of Medicine, 1988). Agencies also increased activities in environmental sanitation, epidemiology and health statistics.

In the mid 1940s, the American Public Health Association (APHA) Committee on Administrative Practice worked to develop a blueprint for a national network of LHDs that would provide every American with health department services. The 1945 report from this committee, which would be widely known as the Emerson Report, outlines the "Basic Six Services of Local Public Health": 1) vital statistics collection and interpretation, 2) sanitation, 3) communicable disease control including immunization and quarantine, 4) maternal and child health, 5) health education, and 6) laboratory services (Shonick, 1995). Turnock (2009) notes that this was not a new formulation of basic services, but rather, it was essentially drawing attention to what had been considered core public health functions of LHDs for several decades leading to the 1940s. The report's extensive recommendations never developed into national public policy, but they did promote positive changes in many states. The Committee continued to reexamine and redefine the extent of local public health practice through the 1980s. In the 1950s, the basic six were considered to be only the minimal level of local HD presence in a community,

and the following services were added: analysis and recording of state health data, health education and information, supervision and regulation, provision of direct environmental health services, administration of personal health services, and coordination of activities and services within the community (Shonick, 1995). In the 1960s, operation of health facilities and area-wide planning and coordination were added, while in the 1970s, coordinating, monitoring, and assessing adequacy of health services were also added to the list.

The expanded (or formally acknowledged) list of public health services brought with it a growing concern regarding financing of these services, accompanied by reduced citizen support of the role of government in personal health decisionmaking in the late twentieth century. This leads us to the description of the modern day local public health system.

Modern Day

This period begins with the milestone report by the Institute of Medicine (IOM) in 1988, titled *The Future of Public Health*. The IOM report describes the period beginning in the late twentieth century as "a crisis in care and financing", characterized by a public health system in disarray and public health capacity inadequate to meet current and future needs.

As of the 1988 IOM report, there were over 3,000 local health departments in the United States carrying out activities under authority delegated by their state or local jurisdictions. Jurisdictions vary, with some health departments serving a single county and others serving a group of counties. Still others are municipal, which unlike county health departments, may exercise power autonomously (Institute of Medicine, 1988). Also at the time of the IOM report, the number of health departments by state ranged from 159 in Georgia to none in Rhode Island, Vermont, Delaware, and the District of Columbia. Most health department directors have a

medical degree, while many allow non-physicians to act as health department directors if they have prior public health or administrative experience. Local health departments vary in their relationships with the state agency, in their organization, size, and resources, and in the programs they operate. In terms of activities, the IOM report notes that most health departments are mainly involved in providing health education, personal health services, environmental health services, and in conducting safety and sanitation inspections.

Assessment, Policy Development, and Assurance

The currently recognized core functions are organized into three broad categories of activity: assessment, policy development, and assurance functions (Institute of Medicine, 1988). The IOM notes that these activities, or functions, correspond to the major phases of public problem-solving: problem identification (assessment), mobilization of necessary effort and resources (policy development), and assurance that vital conditions are in place and that crucial services are received (assurance). Assessment activities include health needs surveys, resource assessments, and participation in preventative services. Policy development activities include building a network of relationships with health-related organizations and the media, communication with public officials about health impact of policy decisions, and prioritization of health needs. Assurance activities include resource deployment, organizational self-assessment, evaluations, and monitoring of programs.

The IOM argues that assessment is inherently a public function because policy formulation requires objective, relevant information in order to make decisions based on limited resources (Institute of Medicine, 1988). The private sector generates a broad range of useful information, but is constrained by the need to pursue profit, special interests, or both.

Government has an important responsibility to develop a broader knowledge base to ensure that policy is not driven by purely short-range issues or limited by inappropriate or incomplete information. Furthermore, assessment rarely has its own constituency in the policy process. For these reasons, the IOM asserts that "a fully developed assessment function is an absolutely essential part of the ideal public health system…" (Institute of Medicine, 1988; pg 44).

In selecting policy development as one of the three core public health functions, the IOM argues that government is obligated to ensure that the public interest is served by whatever measures are adopted, and the public health agency bears this responsibility. The public health agency must also pay attention to the policy process itself, rather than just the particular decisions. "It must raise crucial questions that no one else raises; initiate communication with all affected parties, including the public-at-large; consider long-range issues in addition to crises; plan ahead as well as react; speak on behalf of persons and groups who have difficulty being heard in the process; build bridges between fragmented concerns; and strive for fairness and balance" (Institute of Medicine, 1988; pg 45). The public health agency should be equipped for this role by its technical knowledge and professional expertise.

In selecting assurance as one of the three public health core functions, the IOM (1988) points out that carrying out the assurance function requires the exercise of authority which cannot be delegated to the private sector. As part of the assurance function, public health agencies guarantee certain health services to every citizen. When the services are not otherwise available in the community, the public health agency provides them and bears the costs (via taxation). In this way, a community consensus forms a social contract that provides access to certain health services. The IOM notes that the responsibility for the health of the people should be a focal point of one agency charged with taking the lead in assurance functions. Although it

may sometimes be appropriate for responsibilities to be allocated among more than one agency, the committee argues that fulfilling the assurance function requires that there be one place of ultimately responsibility and accountability.

Ten Essential Public Health Services

In 1994, a core public health functions steering committee, which included representatives from U.S. Public Health Service agencies and other major public health organizations, developed a framework for 10 Essential Public Health Services to correspond to the three core function areas (U.S. Centers for Disease Control and Prevention 2011). The Essential Services define essential public health services and provide a guideline for responsibilities of local public health systems. The ten essential services are listed in Table 1.1 in the previous chapter, and their relationship to the three core function areas is shown in Figure 1.1.

Given the crisis in care and financing, it is ever more important to assess factors associated with effectiveness of delivery of these core public health functions. In recent years, a field of research known as Public Health Systems and Services Research (PHSSR) has developed to examine these issues in the local public health system.

The Field of Public Health Systems and Services Research

In June 2009, the Public Health Systems Interest Group of AcademyHealth defined public health systems research as “a field of study that examines the organization, financing, and delivery of public health services within communities, and the impact of these services on public health” (Scutchfield, 2009; pg 1773). Although studies of public health organization, financing,

and delivery are not new, characterizing the studies as a distinct field of research is a relatively new effort.

PHSSR is largely funded by the Robert Wood Johnson (RWJ) Foundation. In the fall of 2005, RWJ began funding the Center for Public Health Systems and Services Research (CPHSSR) in the College of Public Health at the University of Kentucky. The CPHSSR seeks to explore the impact of specific public health strategies on the quality and performance of the United States public health system. Since 2008, the CPHSSR has hosted an annual research meeting that brings together public health systems and services researchers to discuss the latest research in the field and directions for new research. The CPHSSR also developed and maintains a database for PHSSR in conjunction with the National Library of Medicine (NLM) to strengthen the capacity to conduct research and encourage new investigators to engage in research using datasets described in the NLM's Health Services Research Resources.

PHSSR is closely related to the established field of Health Services Research (HSR) which focuses on the medical care setting, as opposed to PHSSR's focus on public health. The premier annual conference of health services researchers, the AcademyHealth Annual Research Meeting, now includes a Public Health Interest Group meeting.

One focus of research in PHSSR is the effectiveness of delivery of core public health functions. The next chapter reviews the recent research on community effectiveness of core functions after first providing a theoretical foundation for participation and collaboration in the public health system.

CHAPTER 3

THEORY AND PRACTICE OF PARTICIPATION AND COLLABORATION IN THE SYSTEM AND SYSTEM EFFECTIVENESS

Many different organizations in a given community perform multiple tasks such as emergency services or health needs assessment that contribute to public health. The community delivery of core functions can be thought of as multi-organizational collaborations, partnerships, systems, or networks. Multi-agency partnerships that include both public and private sectors are a prominent strategy for achieving today's public health missions (Varda et al, 2008; Roussos and Fawcett, 2000; Zahner, 2005; Mays and Scutchfield, 2010). The public health system is increasingly moving away from one of direct provision of services to the formation of partnerships for community health planning and actions to improve community health (Health Resources and Service Administration 1995; Center for Studying Health System Change 1996).

The aim of this section is to describe theory related to participation and collaboration, and to develop the theoretical connection between participation in the system and system effectiveness. The chapters that follow will explore the models with data from the local public health system.

For purposes of delineating the different bodies of theory or approaches to understanding community delivery of public health functions, this section is organized into frameworks with three different layers of theory. These layers are arranged with increasing specificity as to the nature of the relationships between participating organizations. The first layer concerns whether or not organizations participate in a community function, regardless of whether or not they are

collaborating with each other. The second layer of theory adds collaboration or partnership to the participation. The third layer is network theory, which is a more specific type of collaboration. Each of these layers of theory can contribute to our understanding of participation in core function delivery in the community, and the relationship between participation and effectiveness. An illustration of these "layers" is shown in Figure 3.1. Each is discussed in turn in the next sections, followed by a review of the empirical literature.

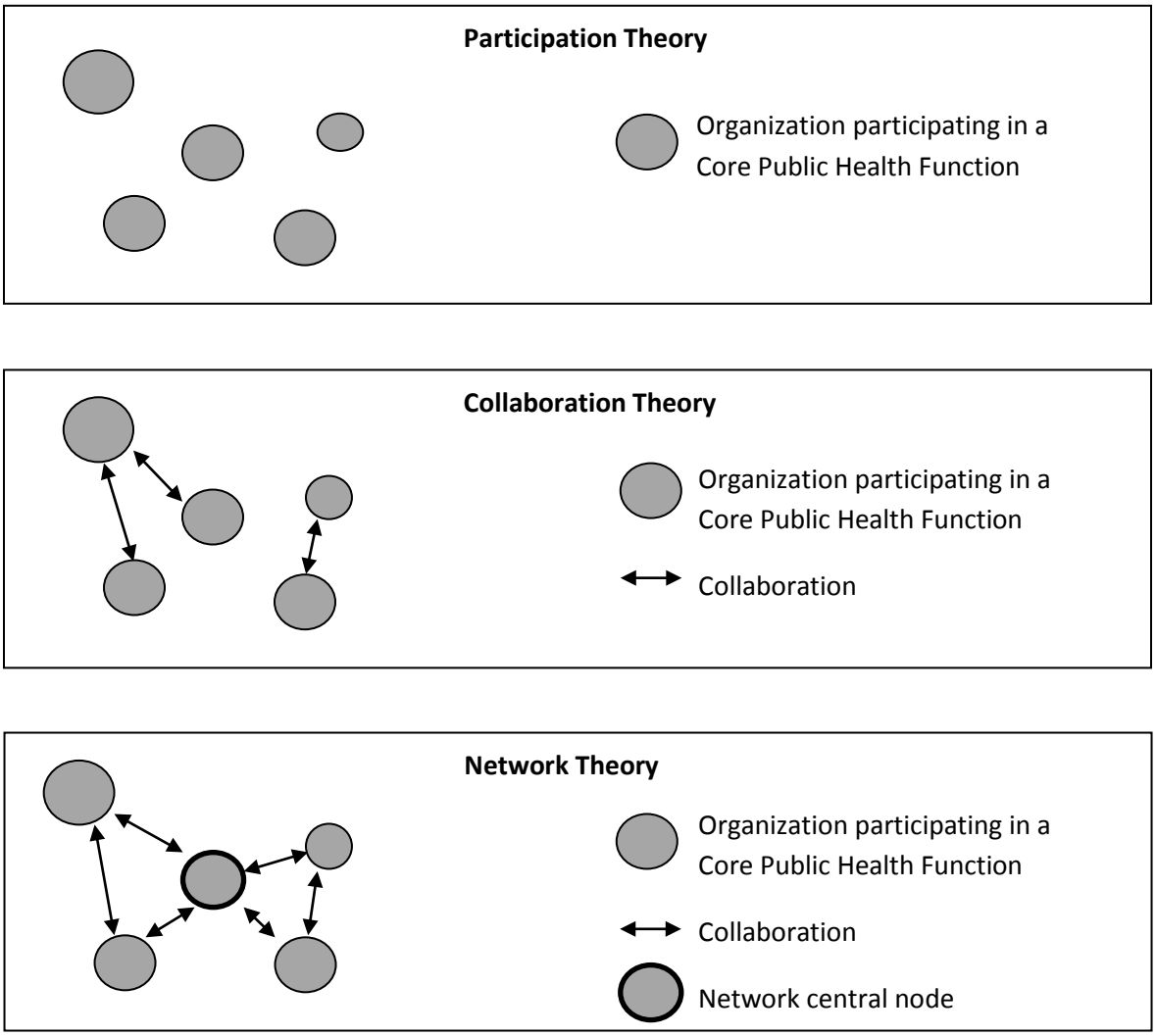

Figure 3.1: Participation, collaboration and network theory layers.

A Participation Theory Perspective

Stoker (1997) defined political participation as members of the public "taking part in any of the processes or formulation, passage, and implementation of public policies" (pg. 157). Participation of citizens in the work of government is a central tenet in theories of new governance. Bingham and O'Leary (2005) argue that new governance involves not only horizontal networks of public, private and nonprofit organizations, but also "involves people – the tool makers and tool users – and the processes through which they participate in the work of government" (p. 547).

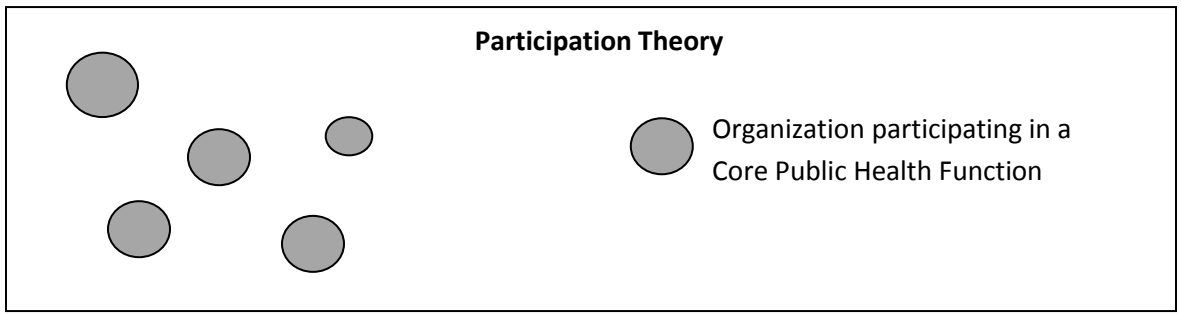

Figure 3.2: Illustration of the participation theory layer.

Motivations for Participation

One way to understand the motivations for participation is through economic theories, which focus on the individual as a rational actor who decides whether or not to participate based on the benefits and costs of participation (White, 1976). Rationality requires that the expected gains exceed the expected costs.

An area in which the economic theories of participation have been developed is in public goods theory, where the term "public" refers to the public in general rather than an individual

(White, 1976). A public good is one in which consumption by one person does not decrease its availability by another person (Samuelson, 1954). The most basic argument is that when people desire a policy that is public, participation will not exist because each assumes others will. As White (1976) states, the question is whether benefits are jointly supplied to participants and nonparticipants alike. If they are, then there is no reason to participate. A second way that public goods are defined is by a concept known as "excludability." If nonparticipants cannot be excluded from the benefits, then a public good results.

It can be argued that public health is a public good. The overall health of a community benefits participants and nonparticipants alike, and nonparticipants cannot be excluded from its benefits. As described earlier in this paper, the IOM defines public health based on its mission and substance. They define the mission of public health as "the fulfillment of society's interest in assuring the conditions in which people can be healthy" (Institute of Medicine, 1988, pg 40). The substance of public health is defined as "organized community efforts aimed at the prevention of disease and promotion of health. It links many disciplines and rests upon the scientific core of epidemiology" (Institute of Medicine, 1988, pg 41). In defining public health in this way, i.e. based on its mission and substance, the IOM asserts that government activities are placed within a broader framework that can guide a wide range of institutional participants. But if public health is indeed a public good and thus the economic theories are applicable, then what motivates individuals to participate? Taken a step further, what motivates organizations to participate in public health core functions?

White (1976) describes two problems with public goods. First, the pricing mechanism of the market does not function, so the appropriate amount and nature of public goods to be provided is unclear. Second, the demand for public goods is also unclear. Mancur Olson (1968)

explored the implications of these two problems when he used public goods theory to explain the conditions for which people will participate in political activity. Olson assumes that people will behave rationally, wanting to get the most out of their resources. These resources in the political realm include money, time and energy. The concept of efficacy is central to Olson's position: no one person has any efficacy in influencing the provision of a public good, where efficacy refers to social pressure and influence on the activity of others. An important caveat is that when the size of the group is small, people will pay a cost to attain a public good, because in this case they have more efficacy in influencing the contribution of others. But when the group is large, there is less efficacy or no efficacy to influence the contribution of others, and additionally there are organization costs.

The above paragraph provides an explanation for individuals participating in a public good, but only when the group is small. It does not explain participation in political activity, when the group is large. White (1976) cites Olson's (1968, p 51) argument in this case that such activity is a spillover from activity to gain "selective benefits," where a selective (or private) benefit is one that can only be obtained by working for it. White (1976) notes that this is analogous to an economics concept of goods that an individual can own or appropriate. White goes on to explain that a benefit can be considered "private" in its effects on motivation if two things are true. First, even though the benefit is jointly supplied, it has such a specific impact that those who see it in their interest to participate would not expect others who are minimally impacted to work for it. They would expect their own contribution to be essential to obtaining it. Second, a good can also be considered private if the people immediately affected by it have something in common such that each would expect his activity to have an influence on the others who are affected by it. White uses the example of a neighborhood to explain that the probability

of social influence in a neighborhood is such that individuals would have considerable efficacy. Therefore, an individual would behave as though he were receiving a private or selective benefit.

We can extend these concepts to the case of organizations (more specifically, individuals within an organization) in a community participating in public health activities (a public good, as argued above). Although public health is a public good, organizations in the community will be motivated to participate based on the expectation that their contribution is essential to obtaining it, and that they have efficacy in influencing others in the activity.

Levels of Participation

Prominent theoretical frameworks for participation recognize that there are different levels of participation. Arnstein's (1969) ladder of participation includes eight levels of citizen involvement: manipulation, therapy, informing, consultation, placation, partnership, delegate power, and citizen control. Burns et al (1994) modified the ladder of participation into a ladder of citizen power, which represents a shift towards understanding participation in terms of individual and community empowerment. Wilcox (1999) identifies five interconnected levels of community participation: supporting individual community initiates, acting together, deciding together, consultation, and information.

In these levels of participation, use of the terms "partnership", "acting together", and "deciding together" are indicative of collaborative efforts. In this way, collaboration is a form of participation, where individuals are not only participating in a community function, but are working together to solve community issues. The next section turns to a discussion of participation from an organizational collaboration perspective.

A Collaboration Theory Perspective

Cross-sector collaboration is increasingly assumed to be both a desirable and necessary strategy for dealing with difficult social problems and achieving community outcomes (Bryson, Crosby, and Stone 2006; Agranoff and McGuire 2003; Kickert, Klijn, and Koppenjan 1997; Rethemeyer 2005). With regards to the public health arena, in its 1988 landmark report, the Institute of Medicine emphasized the importance of collaboration between public health agencies and community stakeholders in improving public health (Institute of Medicine, 1988). Collaboration was further emphasized in a 2002 report that encouraged the development of collaborations that represent diverse community perspectives, use community resources, and actively engage the population in public health activities (Institute of Medicine, 2002). Collaborative partnerships in public health attempt to improve conditions and outcomes related to the health and well being of entire communities (Roussos and Fawcett, 2000).

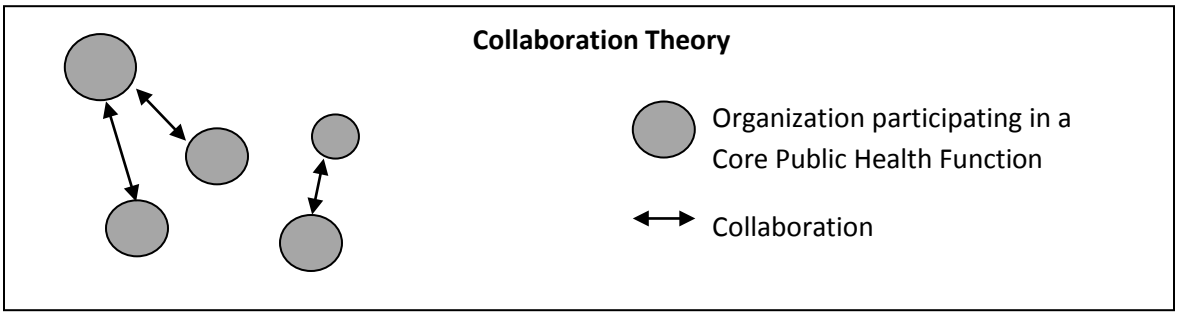

Figure 3.3: Illustration of the collaboration theory layer.

Collaborative activities have increased in all sectors of many countries over the past few decades (Selsky and Parker 2005). In the health sector in the United States, collaboration around health issues is promoted through funding mechanisms of foundations and government agencies

(Lasker, Weiss, and Miller, 2001; Butterfross, Goodman, and Wandersman, 1996). Thousands of alliances, coalitions, consortia, and other health partnerships have been formed as a result of these initiatives as well as grassroots efforts (Lasker, Weiss, and Miller, 2001).

Gray (1989, p 5) defined collaboration as "a process through which parties who see different aspects of a problem can explore constructively their differences and search for solutions that go beyond their own limited vision of what is possible." Bryson, Crosby and Stone (2006, p 44) defined cross-sector collaboration as "the linking or sharing of information, resources, activities, and capabilities by organizations in two or more sectors to achieve jointly an outcome that could not be achieved by organizations in one sector separately." In this definition, cross-sector refers to partnerships involving government, business, nonprofits and philanthropies, communities, and/or the public as a whole. Similarly, Gray (1989) defined collaboration as "a process through which parties who see different aspects of a problem can explore constructively their differences and search for solutions that go beyond their own limited vision of what is possible" (pg 5).

As Bazzoli et al. (1997) notes, there are two broad types of collaborative networks explored in the health research: 1) local coalitions of public and private stakeholders that focus on public health and community planning, and 2) service delivery networks that seek to coordinate and provide collaboratively a continuum of services. Bazzoli et al (1997) focused their research on public-private partnerships that join the two types of networks - 1) local coalitions of public and private stakeholders that focus on public health and community planning, and 2) service delivery networks that seek to coordinate and provide collaboratively a continuum of services - with the objective of identifying the range of collaborative activities in which these broad-based partnerships are engaged and to assess the factors that may affect the

types and extent of their collaborations. They found that health market environmental characteristics were important, with many strong levels of association with collaborative activities. Notably, the presence and growth of HMOs appeared to be motivating partners to collaborate on identifying and reducing costly illnesses for which health and human service providers could bear financial risk. The financial pressures that managed care creates may also motivate collaboration to reduce redundancies and increase efficiencies. On the other hand, very few variables related to munificence of local resources, underlying health conditions, and partnership characteristics were significantly related to collaboration.

Motivation for Collaboration

Why do organizations collaborate? What does the literature say about the motivations for collaborating? An intellectual challenge of research dealing with cross-sector collaboration is the need to blend multiple theoretical and research perspectives (Bryson, Crosby, and Stone 2006; Rethemeyer 2005; Selsky and Parker 2005). Alter and Hage (1993) offer an approach for synthesizing the many rich theories relating to collaborative action and the factors likely to influence it. They argue that collaborative action is motivated by the *perceived need* to collaborate and the *willingness* to collaborate. Bazzoli et al (1997) explain *perceived need* and *willingness* to collaborate through the lens of different theoretical approaches, including resource dependence and interorganizational relations theories, political science, community organization/development, and public finance economics. In addition to the perceived need to and willingness to collaborate, the strategic management literature also adds the ability of organizations to collaborate. Resource dependence and interorganizational theories focus on dependencies among organizations and on organizations' environments as they seek to achieve

their own objectives (Bazzoli et al 1997). Alter and Hage (1993) describe these potential dependencies, including the need for human or financial resources by a partner organization, the need for working capital, the need to manage business risks, and the importance of maintaining flexibility to adapt to a changing market.

Bazzoli et al (1997) note that political science largely concerns organizational willingness to participate and the ways in which the structure and actions of members may influence this willingness to participate. Actions of members concerns the importance of coalitions in negotiating conflict among members, while the structure and environment impact the strategies and actions of coalitions. The political science literature also suggests that some organizations hold more power and vested interest in the coalition that can be used to shape objectives and distribute benefits (Kingdon 1984).

The community organization/development literature emphasizes "coalition efforts to improve understanding of perceived need and the role of key organizations in maintaining organizational willingness to collaborate" (Bazzoli et al 1997). It is important to build upon existing structures and historical configurations that the community views as credible, legitimate and with value.

In contrast, public finance economics focuses on the willingness to collaborate based on the type of service or activity that organizations seek to produce (Bazzoli et al 1997). Public-private collaboration is a form of collective action in which independent organizations join forces to achieve a common objective (Olson 1976). The net benefits of collaboration need to exceed those that could be obtained by organizations operating independently.

Bazzoli et al (1997) describe that in addition to perceived need and willingness to participate, the strategic management literature also emphasizes organizations' ability to

collaborate. This literature focuses on the capabilities of organizations to respond to environmental changes and collaborate with others (Shortell and Zajac 1990). These capabilities include “financial and human resources, specific technical competencies, and underlying capabilities like information systems” (Bazzoli et al 1997, p 537).

Bryson, Crosby and Stone (2006) describe the initial conditions affecting the formation of collaborations. These include environmental factors and sector failure. Environmental factors such as complexity influence the necessity of organizations to collaborate by increasing stability and decreasing uncertainty. Collaboration, and cross-sector collaboration in particular, are influenced by the failure of organizations acting alone. The authors refer to sector failure as “the often-observed situation that single-sector efforts to solve a public problem are tried first and found wanting before cross-sector efforts are attempted” (Bryson, Crosby and Stone 2006, p 46). In addition to environmental factors and sector failure, Bryson, Crosby and Stone (2006) note that other direct antecedent conditions of collaboration formation include that a brokering organization can facilitate collaboration formation, that there is initial agreement on a problem definition, and that prior or existing relationships or networks are present. Prior or existing relationships establish a history of trust and legitimacy between stakeholders.

Selsky and Parker argue that the management and organization research regarding cross-sector partnerships are grounded in one of two analytic platforms: resource dependence and social issues. They add to this what they call the societal sector platform. Resource dependence has already been described above in both the Bazzoli (1997) and Bryson, Crosby and Stone (2006) discussions: organizations enter into partnerships to meet organizational needs and/or to solve organizational problems (i.e., deal with the environment). Conversely, by a *social issues platform*, Selsky and Parker are referring to social issues management, where organizations are

seen as stakeholders of issues rather than stakeholders of organizations (Waddell, 2005). Coalition members or partners join forces to tackle a social issue, but retain organizational autonomy. In the societal sector platform, the general argument is that government, business, and civil society spheres are embedded within each other such that there is a blurring of sector boundaries. The idea here is that traditional sector solutions are unable to address certain challenges and must therefore be enhanced by learning from organizations in other sectors. One sector may substitute for another, or the sectors may partner with each other to address emergent social issues.

Synergy

The above paragraphs reviewed reasons or motivations for collaborating. But once organizations are participating in collaborative activities, what is it about collaboration that makes it better than organizations working alone? Lasker, Weiss and Miller (2001) assert that synergy is the unique advantage of collaboration, where synergy is defined as the power to combine the perspectives, resources, and skills of a group of people and organizations. They assert that this distinguishing feature of collaboration is the key mechanism through which partnerships have an advantage over single agents in addressing health and health system issues. Specifically, synergy is "manifested in the thinking and actions that result from collaboration, and also in the relationship of partnerships to the broader community" (Lasker, Weiss and Miller, pg 184). They note that the capacity of partnerships to respond to problems may be greater when they bring together diverse partners that are able to carry out multipronged interventions that coordinate a variety of reinforcing services, strategies, programs, sectors and systems.

Effectiveness of Collaboration

In a review of 34 studies that looked at public health collaborations that involved partners ranging from 1 to 57, Roussos and Fawcett (2000) concluded that the results suggest that collaborative partnerships are associated with improvements in population-level health outcomes. However, they note the limitations in generalizing findings of collaborative partnerships, including weak outcomes, contradictory results, or null effects even in the more methodologically rigorous studies.

Roussos and Fawcett (2000) also note that collaborative partnerships seek to change the environment in which behaviors and factors related to health occur. In order to accomplish environmental change in communities and systems, collaborations engage a wide variety of partners at multiple levels and in multiple sectors or settings.

The next section turns to a network theory perspective, where a network is a specific type of collaboration.

A Network Theory Perspective

According to Mandell and Steelman (2003), networks are one of the most tightly intermingled collaborative arrangements (along with coalitions). Networks involve interdependent and strategic actions and "take on broad tasks that reach beyond the simultaneous actions of independently operating organizations" (Mandell and Steelman 2003, p 204). The focus of government and private networks is on large-scale outcomes that can be accomplished through collective efforts of multiple organizations (Provan et al, 2007). McGuire (2006) notes that a network is "a structure that involves multiple nodes—agencies and organizations—with

multiple linkages" (p 35). O'Toole (1997) defines a network as "structures of interdependence involving multiple organizations or parts thereof, where one unit is not merely the formal subordinate of the others in some larger hierarchical arrangement" (p. 45). Accordingly, the study of networks emphasizes relationships among actors, administrative units, or organizations (Lynn, 1996). As such, the focus is not on individual behaviors but on the ways that individuals are influenced and constrained by their relationships within the network. While network concepts characterize structures of relationships, properties of networks account for aggregate behavior and influence (Lynn, 1996).

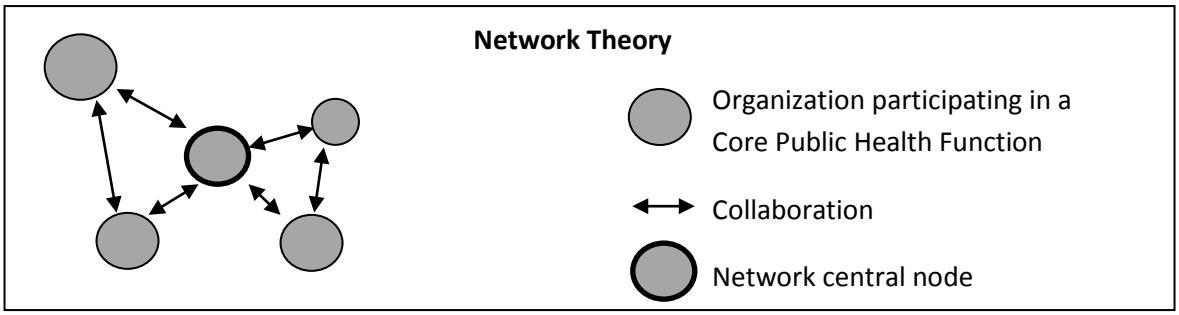

Figure 3.4: Illustration of the network theory layer.

In his research of 12 networks in various policy areas, Agronoff (2003) demonstrated that there are four different types of networks based on the scope of activities performed within the network. Informational networks involve multiple stakeholders who come together to exchange information and explore solutions to problems. Action within the network occurs within the members' home organizations. Developmental networks also involve the exchange of information but also includes education to enhance the ability of each member to take action within their home agencies. Outreach networks involve the exchange of information and education, but also include programming strategies for clients. These strategies are carried out outside the agency, and usually within partner organizations, but still not at the network level.

The fourth type of network is an action network, which is the most extensive form of networks. Action networks involve network-level courses of action and often deliver services.

Brief Historical Background on Networks

As a mechanism for delivery of public programs, networks have been around for several decades dating at least to the 1960s (Hall & O'Toole, 2000). On the other hand, the network approach to the study of public administration has been around only for a couple of decades (Milward & Provan, 1998). The network field of inquiry for public administration is one of several that originated from the social sciences that can help public managers by offering "sources of explanatory heuristics bearing on the motivations, strategies, and choices of public managers" (Lynn, 1996, p. 114). From a broader perspective of the originations of the study of networks in social inquiry, Perrow (1986) describes a progression in our consideration of the environment, beginning with "anything out there" that interested a researcher to defining those things that we should try to find. More specifically, the early days of network research involved the analysis of two or three interacting organizations (so called "interorganizational analysis") with emphasis on the effects on a focal organization. Next came a consideration of the set of organizations, including what organizations should comprise the set, and finally to the idea of networks where we focus on the properties of networks rather than on individual organizations with the network. Perrow (1986) proclaimed that it as "the most exciting development in this new occupation with the environment" (p. 192).

In a slightly different angle on historical development of the network approach to public management research, Kettl (2002) describes the response of public administrationists to the increasing interconnectedness between public, private, and nonprofit organizations and its impact

on traditional concepts of administration. A network approach was developed with a foundation these informal relationships instead of concepts rooted in hierarchy and authority.

Streams of Network Research and Theory

Like the collaboration literature in general, there are different streams of network research and theory which results in a complex and confusing field to review. Berry et al (2004) identify three major streams of network research in the sociology, political science and public administration/public management literature: 1) social network analysis, 2) policy change and political science networks, and 3) public management networks. The authors note that each of these streams has been active for more than two decades, with public management being the youngest and dating to the mid-1980s. Not surprisingly, this division of the literature results in a lack of a coherent body of research about networks for one to synthesize. Berry et al (2004) note that these separate bodies of literature have often ignored each other's work.

Through the collaboration of organizations, a social network is formed which allows the exchange of information and ideas. In this way, social network theory can help elucidate the collaborations, particularly concepts that relate the structure of the network to performance. As Knoke (1990, p. 9) notes, "The structure of relations among actors and the location of individual actors in the network have important behavioural, perceptual, and attitudinal consequences both for the individual units and for the system as a whole."

The Public Management Network Literature

A common theme in the public administration and public management literature is that networks are here to stay, and they will become increasingly utilized for the delivery of public

goods and services. Berry et al (2004) suggests that there are two primary categories of questions in the network management literature: 1) managing in networks, and 2) effectiveness of networks. In addition to these two categories, I delineate two other categories for the public management network literature: network structure and implementation in a network. In a review of the literature, these four areas – managing, effectiveness, structure and implementation - emerged as distinguishable themes.

Managing in Networks

There are several variations on this research theme. The research of two prominent scholars in this area, Laurence O'Toole and Kenneth Meier, offers quantitative empirical investigations that explore how managers operate in networks and whether they affect program outcomes. In a study published in 2003, they examine these questions in the "test case" of public education (Meier and O'Toole, 2003). More specifically, they sought to investigate how managers operating in networks contributed to the educational performance of their students. They focus on measures of time, energy and directions of effort of managers (school district superintendents in this case). The authors note the importance of network development as an opportunity for superintendents to manage their districts effectively. Unlike previous work in network settings, the authors offer theoretical explanations and a large-n study setting that can control for other sources of program influence. In an analysis of data partitioned into five quintiles of levels of performance for separate modeling, network management was more important at the low and high ends of the performance scale. Also, high performing organizations were less constrained by past performance. Lastly, they run models by levels of management for districts run by superintendents who reported a high level of contact (network management) to determine the interaction between levels of network management and resources

and constraints. While there are some limitations as noted by the authors, this paper offers a rare large-n, quantitative study of managing in networks. The argument for large-n rather than, or in addition to, small-n studies is also presented in other work by the authors (Meier and O'Toole, 2005).

At the core of research regarding managing in a network is whether or not management matters in this context, and if so, how this compares to management in non-networked public management settings. O'Toole argues that the case can be made that public management matters even more for governmental performance in network settings (O'Toole, 2000).

McGuire (2002) notes the contributions and limitations of earlier work by Meier and O'Toole as well as others that account for the frequency and regularity of network management, but argues that this work fails to account for the multiple operational behaviors that managers assume. A research agenda for network management, argues McGuire, must include these three components: 1) a description of behaviors chosen by the network manager, 2) an explanation of why managers make such choice, and 3) an evaluation of these choices. Previous research mainly focuses on the third component, evaluation of choices with network management as the dependent variable, while ignoring specific behaviors of managers. Contingency logic, or a classification of behaviors, is proposed as a means of focusing network management research and to test ideas about when, why and how network managers undertake different behaviors. This is important because managerial resources in network settings vary across space and time, making it more complex to identify managerial behaviors and how these behaviors are matched with specific governing contexts. The product of this paper is a research strategy that the author contends does not imply rationality or a normative position on networks or specific management strategies.

Effectiveness in Networks/Evaluating Networks

Provan and Milward (2001) emphasize the importance of evaluating networks for their effectiveness in delivering services to a community. Their proposed framework for evaluating public-sector organization networks is comprised of three levels: community, network, and organization. At the community level, networks are evaluated based on their contribution to the communities they serve. Networks must be evaluated as service-delivery vehicles at the community level. Some ways to evaluate networks at this level include assessing: 1) aggregate outcomes for the population of clients, 2) overall costs of treatment and service, 3) satisfaction of the stakeholder groups, and 4) contribution to the building of social capital. Effectiveness at the network level can be evaluated by assessing: 1) the ebb and flow of agencies to and from the network, 2) the range of services provides by the network, 3) the strength of the relationships between and among network members, and 3) its network structure. At the organization level, effectiveness can be evaluated by looking at the following indicators: 1) the organization survival, 2) client outcomes, 3) legitimacy, 4) resource acquisition, and 5) cost. The authors argue that the only way to realize the full effectiveness of a network is to minimally satisfy the needs of each group (principals, agents and clients.) The interplay of these three levels across the community, network and organization make analysis especially difficult. The authors conclude that despite problems with evaluation, networks funded by the public sector can and should be evaluated, and the network and organization level effectiveness can be largely satisfied by focusing on community level goals because networks will ultimately be judged by the community-level stakeholders.

Network Structure

Milward and Provan (1998) present two studies (mental health services and drug abuse) based on social network analysis as a technique for studying structural relationships between organizations. The goal for both studies was to measure the structural ties in the network based on various types of relationships that exist in a given field of practice. “These linkages are the ties that bind the networks on their degree and type of integration.” They argue that links in a network are one way that scholars can compare networks in similar or different policy domains. Also, analyzing linkages in an organization’s network is an effective and practical means of determining how well integrated any given organization is in a network.

Implementation in Networks

O’Toole (1996) describes implementation in networks, which require cooperation and coordination for policy success. The author states that the study of inter-organizational policy implementation is in much need of further research in order to advance scholarly study of the subject and to encourage better public management practice. A rational choice approach is used to explore the idea of modeling implementation. Most research thus far has been inductive, and deductive approaches have been limited in scope. There are two broad reasons that interorganizational action is more difficult than intraunit: the use of mechanisms within an organization can create problems between organizations, and the forms of inducements to cooperation are typically weaker than those for other structures. There are two general complications of implementation analysis: uncertainty and institutional analysis. O’Toole describes a game theory approach to implementation analysis. While it is not possible in most cases to deduce rigorous model predictions, the rational choice and game theory approaches nevertheless identify ways in which managers can increase odds of cooperation for policy success in interorganizational networks.

Levels of Network Analysis

Network perspectives can be categorized by two levels of analysis: 1) the view from the individual organization (the actor level) and 2) the view from the network level. Provan et al (2007) present the possible combinations of dependent and independent variables for network research (Table 3.1).

Table 3.1: A typology of interorganizational network research.

Independent Variable or Input Focus	Dependent Variable or Outcome Focus	
	Individual Organizations	Collectives of Organizations
Organizational variables	Impact of organizations on other organizations through dyadic interactions	Impact of individual organizations on a network
Relational or network variables	Impact of a network on individual organizations	Whole networks or network-level interactions

Provan et al (2007) note that it is less common for researchers to use organization variables to explain how individual organizations and their actions might affect outcomes at the network level, such as structure, stability and effectiveness. On the other hand, theories and perspectives that focus on individual or organizational actors have guided most of the knowledge about networks (egocentric). This research can answer questions such as 1) the impact of dyadic or network ties on organizational performance, 2) which types of links are most or least beneficial to individual network members, 3) which network positions might be most or least influential (i.e. centrality in the network), and 4) how the position of the organization might shift over time in response to changes within and outside the network.

Past research at the network level has increased over the past decade, but has primarily been conceptual, anecdotal, or based on single, descriptive case studies performed at one point in time (Provan et al 2007). The questions asked in this type of research include, "How much density is beneficial versus detrimental to effectiveness of the network?" Higher levels of density are not necessarily advantageous, especially in light of the increased coordination burden placed on network members. Another question posed in this type of research is, "To what extent are one or a few organizations in the considerably more centrally connected than others?"

Whole Networks

Within the public management research, the study of whole networks is an even more recent addition to the literature. A whole network consists of multiple organizations linked through multilateral ties, whereby linkage can occur through many types of connections and flows, such as information, materials, resources, services, and social support (Provan et al, 2007). Unlike traditional research, whole network research focuses on the structures and processes of the entire network rather than on the organizations that comprise the network. Similarly, network-level theories focus on the network overall, such as centralization or density of the network as a whole.

In 2007, Provan et al published a key review article of the last 20 years of network research at the interorganizational network level. The broadest conclusion from this review was that very little research has been conducted at the network level of analysis. Rather, most network research has been organization centered. The authors proclaim however that only by examining the whole network can we understand how networks evolve, how they are governed, and ultimately, how collective outcomes might be generated.

There are several issues that complicate the study of networks. The definition of "network" is not clear, the use of the word "network" is not consistent, and there is not a common lexicon for studying networks (Provan et al, 2007). Likewise, the boundary of a network may be fuzzy or self-defined. Broadly speaking, whole networks are bounded by including only those organizations that interact with on another in an effort to achieve a common purpose. Participation in a network may be formal or informal. Informal networks tend to be emergent structures used for service delivery, problem solving, information sharing and capacity building (Isett et al, 2011).

In this dissertation, inclusion is limited to those organizations that are participating in providing specific core public health services to their community. The exact nature of the relationship between participating organizations is unknown from the survey data. Although this is a limitation of the study, nonetheless the data capture the willingness of different types of organizations to participate in providing core public health functions at whatever level of formality of linkages between organizations.

There are a few distinct themes from the Provan et al (2007) literature review. First, most studies were comparative in nature (contrasted two or more whole networks, comparing substructures, often longitudinally). Second, the studies often addressed networks within the health and human services sector (14 of 26 studies). The authors hypothesize that many of the studies were conducted in the health sector because organizations in the health and human services sector are more mission-driven and focused on broad client-based outcomes. As such, community needs and interests play an important role in guiding organizational behavior. Third, the studies were evenly divided between cross-sectional and longitudinal studies, with longitudinal studies being more recent (9 of 13 studies were conducted since 2000).

The research findings from the Provan et al (2007) review fall into two broad categories: 1) network properties and processes associated with whole networks (structure, development, and governance), and 2) network outcomes. Structure focused particularly on density, centralization and existence of subnetworks or cliques. Findings from structure characteristics include:

- General structure and position of the organization within the network influence the information that is conveyed through the network
- Density of ties tends to increase over time
- Density and centralization cannot simultaneously be maximized, and the existence of a large number of ties does not necessarily mean the network is centralized
- Some past structures exert stronger effects on performance than current ones
- High differentiation occurs at low centralization, suggesting that attempting a broad scope of activity is difficult to centrally coordinate
- Resource availability also strongly influences the ability to gain legitimacy and facilitate network development

Whole Network Effectiveness

At a time when multi-organizational collaboration is increasingly utilized (Provan et al, 2007; Andrews and Entwistle, 2010; Isett et al, 2011), very little is known regarding the impact of network characteristics on the effectiveness of network delivery of services. There are very few systematic, empirical studies of network effectiveness (Provan et al, 2007; Andrews and Entwistle, 2010; Herranz, 2010). The small number of studies in this area has been limited in scope to a single community or to a single cross-section of time (Isett et al, 2011). Kenis and Provan (2009) note that after a period of “network euphoria,” questions have arisen as to whether

and under what conditions networks are performing at a level that justifies the costs of collaboration.

In the network outcomes category of findings, effectiveness was an underlying theme in much of the research reviewed in Provan et al (2007), although few studies explicitly measured effectiveness. Network performance is rarely a dependent variable in network research (Kenis and Provan 2009). Provan et al (2007) noted that they found the relative lack of studies examining network effectiveness to be somewhat surprising, but they offer a couple of reasons for why this is the case. First, the time periods for most studies are too short for examining effectiveness, and second, network effectiveness is not readily measured or understood. Third, network research is time consuming and costly. Studying whole networks would require studying interactions among 30, 50 or more organizations to research a single network (in my research, the community of organizations is the network; the tie is the community.) In addition, network bounding is not clear in many cases, as noted earlier.

Provan and Milward's 1995 study of mental health networks was the first attempt to study effectiveness (Provan and Milward 1995); most of the relatively few other studies have also been in the health and human services sector. As mentioned previously, the authors hypothesize that this may be because they generally provide services, to which organizations need to be responsive to collective indicators of effectiveness.

Most studies indicated performance enhancing effects of networks, but inter-organizational networks do not always result in positive outcomes. Provan and Milward (1995) found that networks that are formally constructed and that do no emerge out of previous relationships are more likely to fail. Core organizations tend to stabilize the network while more peripheral organizations will destabilize it. Provan and Milward (1995) also found that greater

integration led to increased network performance among mental health networks in four U.S. cities.

A handful of other studies of whole network performance have been published since the Provan et al 2007 paper. These include a study on cross-sectoral partnerships by Andrews and Entwistle (2010) and a study on management of networks and performance by Harranz (2009). Andrews and Entwistle found that public-public partnership was positively associated with effectiveness, efficiency and equity in a network, while public-private partnership was negatively associated with effectiveness and equity. There were no significant findings for the public-nonprofit partnership. Herranz found that different forms of network coordination were associated with differential multilevel network performance.

Two studies that looked at centrality and network performance found that greater centrality promoted performance. Centrality refers to the relative influence of a single organization in a network. Sandstrom and Carlsson (2008) conducted a comparative case study among four networks in higher education, finding that an efficient and innovative policy network consisted of actors that were centrally and densely integrated. Higher centralization levels point to hierarchy, which in turn points to a higher level of closure. A network characterized by closure is one in which there are either many strong connections between network members or a common contact. Other studies that have looked at the effects of centrality have focused on the effect on organizational performance in the network rather than overall network performance. For instance, Schalk et al (2009) found that degree centrality, a measure of network ties, was important in organizational performance (network performance was not measured). Provan et al. (2009) argue that an organization's structural embeddedness, as measured by its centrality in the

network, is related to its trustworthiness, reputation, and influence according to other network members.

Sandstrom and Carlsson (2008) also found that networks that were densely integrated were efficient and innovative. Density refers to a measure of connections among network participants. It is calculated by dividing the actual number of connections by the total possible number of connections (Scott, 2000). Sandstrom and Carlsson (2008) note that higher density points to a greater level of interconnectedness, which means a higher level of activity and closure. However, Provan et al (2007) argue that higher levels of density are not necessarily advantageous, especially in light of the increased coordination burden placed on network members. Further, O'Toole (1988) suggests that it may not be the number of actors that matters in a network, but rather the arrangement of actors.

Andrews and Entwistle published a recent study (2010) that looked at network performance based on type of sectoral partnership. They found that public-public partnerships were positively associated with network efficiency, effectiveness, and equity, while public-private partnership was negatively associated with effectiveness and equity. There were no significant findings for the public-nonprofit partnership. Similarly, Hasnian-Wynia et al (2003) found that networks with more diversity were less effective due to management challenges. Two other studies that looked at diversity and network performance found that greater diversity promoted performance. Sandstrom and Carlsson (2008) conducted a comparative case study among four networks in higher education, finding support for the notion of importance of network heterogeneity on performance of the network. In a study of local health departments in Wisconsin, Zahner (2005) also found that partnership effectiveness was predicted in part by

having a broader array of participating organizations (interestingly, characteristics of the local health departments did not predict partnership effectiveness in this study).

Criticisms and Strengths of the Network Approach

As an approach to the study of public administration, Klijn and Koppenjan (2000) sort out criticisms of the network approach into five main categories: 1) a lack of theoretical foundation, 2) highly descriptive explanatory approach, 3) neglect of power as a driver of relationships, and too much emphasis on the role of cooperation and consensus 4) lack of clear evaluation criteria that considers the goals of governments, and 5) neglect of key unique facets of government agencies and their roles in a network setting (a normative objection). The goal of this particular cited work was to evaluate the network approach and these criticisms it has amassed, with the purpose of improving "network theory as a framework for the explanation, evaluation and improvement of public policy and public management" (p. 137). The paper includes a listing of the theoretical assumptions for the policy network approach. Although it might be helpful in some contexts to explicitly present these assumptions, these assumptions are so basic that they contribute no new insights to building theory specific to networks. Upon discussing each of the criticisms of the network approach, the authors argue that the policy network approach has indeed developed into a "relatively elaborate, empirically grounded and recognizable theoretical framework" (p. 154) and that while description and explanation have been the primary focus, network theory will have prescriptive ability with further development, testing and validating. However, many questions remain about how exactly to develop, test and validate network theory.

In a much earlier critique, Perrow (1986) cautioned that open inquiry in network analysis, like organizational analysis, can be hampered by preconceived notions of social processes and human nature. But he goes on to say that at a minimum, network analysis can force us to consider levels above the organization and offers more flexibility. This benefit of greater flexibility in network analysis as compared to other types of organizational analysis is a reoccurring theme throughout the public administration literature.

As a delivery mechanism for public goods and services, Milward and Provan (2000) also offer some cautionary notes. While they acknowledge that networks are the "mainstay of hollow states", they are also note that networks are inherently weaker forms of social action. Part of this weakness lies in that fact that they are less stable than traditional, formal hierarchical arrangements. In networks, managers face negotiation, coordination, monitoring, holding third-parties accountable, and writing and enforcing contracts. Networks are also prone to information asymmetry between the principal (government) and the agent (nongovernmental organization).

A problem that plagues both researchers and practitioners of public management is the "fuzzy boundaries" problem. This phrase describes the vague boundaries that determine responsibilities and accountabilities in public management. This was a problem even before networks, and creates an even bigger challenge in the network setting. When multiple partners are acting in a network, who is responsible for what actions, and more importantly, who is accountable to the public? How do we determine and measure accountability in complex arrangements? As Kettl points out, a challenge faced by public administration is finding fresh insight to address the issue of boundaries. The issue of "fuzzy boundaries" can be seen as encompassing many of the measurement problems public management, especially networked public management. What are the boundaries of a network? What control variables are included

in a model when boundaries are not continuous and span many geographic areas (for instance)? (Meier and O'Toole (2005) provide an insightful discuss measurement and research design issues in a recent paper published in Administration & Society.)

Strengths

There are many notable strengths to the network approach to studying public management. Lynn (1996) highlights some of these strengths. First, the concept of networks complements rational and normative theories relationships between and within organizations. Second, network the network approach facilitates analysis of how informal communications amend and rearrange formal hierarchical relationships and reallocate resources. It is likely that actors are likely to depend on network forms of reallocation under conditions of ambiguity and uncertainty that overpower rational means of control and communication. Third, network concepts have significant implications for management of change, coalition development, negotiation and conflict resolution, evaluation and monitoring, and understanding sources of power and influence.

Milward and Provan (1998) proclaim that, "The reason network analysis is so important to public management lies in the observation that we seem to have an overdeveloped capacity for policy analysis and an underdeveloped capacity for administrative analysis. Network analysis holds the prospect of righting the balance" (p388). In other words, network analysis emphasizes the administrative aspects (public management) and relationships between organizations, as opposed to a focus on capacities for analysis in the policy realm (e.g., transaction costs and evaluation).

Finally, as Perrow (1986) suggests, networks can force us to consider factors beyond the organization. I agree with this statement completely, and add that this expansion of research

boundaries is perhaps one of the most important contributions of the network approach in terms of lasting impact on the study of public management.

Implications for Enduring Issues in the Field of Public Administration

Two ongoing areas of debate in the field of public administration – democracy and accountability - are acutely important in a networked environment for delivering public goods and services. In addition to these ongoing issues in the field, networks are paramount in the more recent concept of governance.

Values in a democratic society are not immune to the new networked environment. Networked public administration has important implications for democracy, including changing responsibilities for the public interest, for meeting public preferences, and for the enhancement of political deliberation, civility and trust (O'Toole, 1997). Yet, a networked environment also brings new possibilities for strengthening governance. Values and actions of public administrators play a major role in determining the outcomes.

A theme much related to democracy is accountability. Indeed, as O'Toole (1997) points out, the question of whether networked public management threatens democratic ideals is often framed as an accountability question. Clearly, complex arrays that are a characteristic of many networks offer challenges to democratic values. A more complex assessment that includes responsibility, responsiveness, and trust is warranted in a network setting. Kettl (2002) frames the accountability issue in his discussion of the "fuzzy boundaries" problem. These issues involve determining how to "apportion responsibilities among the elements of complex policy networks; how to hold individual members of the networks responsible for their contributions; and how to ensure that these contributions combine into prudent policy" (p. 166-7). Further

complicating the matter is that networks have been layered on top of hierarchical arrangements. Public managers may have duel responsibilities in both a hierarchical setting and a horizontal partnership setting.

Networks for public management are a significant feature of governance. Milward and Provan (2000) argue that networks are the "mainstay of the hollow state" (p. 363). "Hollow state" is used as a metaphor that describes the central government as power is devolved to state and local governments.

In a similar vein, Lynn, Heinrich, and Hill (2001) point out the study of governance has two primary intellectual antecedents. This first is institutionalism, especially by public choice scholars. Research in this area has concluded, in general, that structural arrangements matter by shaping behavior, performance and relationships with external actors. The second intellectual underpinning of governance is the study of networks, which emphasizes the role of multiple actors interacting in negotiations, implementation and delivery of services. Frederickson and Smith (2003) note that governance and network concepts are common in that they both operate on 3 levels:

1. Institutional level: stable formal and informal rules, hierarchies, boundaries, procedures, regime values, and authority; draws on public choice, control of bureaucracy; aimed at understanding the formation, adoption and implementation of public policy.
2. Organizational or managerial level: hierarchical bureaus, departments, commissions, executive agencies, and other NGOs linked to public authority by contract, other incentives or mandates; draws on agency theory, leadership theory

and network theory; primary concern is understanding incentives, administrative discretion, performance measures, and civil service or NGO agency functioning.

3. Technical level: represents the task environment or where public policy is carried out at street level; draws on analytical and theoretical techniques for efficiency, management, organizational leadership, accountability, incentives, and performance measurement; concerns are professionalism, technical competence, motivation, accountability, and performance are main interests at this level.

Networks and Public Health

> Conventional forms of problem framing, action planning, and evaluation often exclude or ignore precisely those features of dynamic complexity that make public health challenges so formidable and public health responses so innovative. Through studies grounded in an explicit systems orientation, we may recognize both the value of understanding health as a system of structured relationships and the value of diverse methodologies that exist for learning how such systems are organized, how they behave over time, and how they can be better governed in dynamic and democratic contexts. (Leischow & Milstein, 2006, p. 403)

This excerpt is from the March 2006 issue of the American Journal of Public Health (AJPH), the flagship publication of the American Public Health Association. One of the goals of this issue is to stimulate interest in systems approaches and models for public health inquiry, and one of the most interesting points is recognition of "dynamic complexity" posed by distinctly human challenges: Behavioral risk factors for disease, environmental exposures driven by industrial and agricultural society, stressors imposed by urbanization, and many others. This complexity is especially interesting in the context of public management because much of the descriptive language is shared: Interconnectedness (relational perspective), nonreductionist approach, integrating systems thinking into practice, embedded systems, causality (especially

non-linear), feedback loops, stocks and flows, progressive approximation, dynamic system across time, boundaries, multidisciplinary approach, chaos, complexity and autopoesis (McLeroy, 2006, p. 402).

Systems or network approaches may be enormously valuable in this context. Networks are a common approach to address community needs, especially in health and human services. As is evident from the quote above and from the papers included in the AJPH issue, meanings of the words "system" in public health and "network" in public administration are synonymous. In the context of public network management, the new emphasis on a systems approach to the study of public health is interesting both for its potential to learn from work in networks in public administration, and for its potential to contribute data and findings to help build theory in the broader field of public network management research. While networks are certainly not new to the field of public health delivery of services, an explicit consideration of networks is new in the field of public health research. Conversely, studies of networks in the field of public administration often include a health application.

Public management network research can draw on public health systems analysis to enrich its perspective on relationships within a specific domain. Public health researchers are consistently forced to consider the contextual framework within which health and disease play their roles, and to control for multitudes of known health risks that contribute to specific health threats. For example, a study of systems related to immunization programs for children must consider a plethora of behavioral shortcomings that impact compliance, enforcement of educational system requirements, private-sector pharmaceutical profit motive, government accountability, current well-child program structure and function, health insurance and access to

care, religious views, and a bewildering array of other social and economic factors that may be important.

Another interesting facet of public health administration research is the recognized need within the field to cultivate and maximize network-type systems routinely. Resource scarcity forces public health to innovate within their networks. Managers in public health networks are driven by this resource scarcity to look for partners with common objectives who can bring resources to the table. This phenomenon occurs at all levels of government in assuring the nation's health.

The Empiric Literature of Public Health Systems

Who Participates in the Public Health System

A handful of studies have looked at the contribution and participation of local health departments and other agencies and organizations to public health activities. In 1998, Mays and colleagues conducted a survey of local public health department (LHD) jurisdictions in the U.S. that served over 100,000 people (Mays et al, 2004), finding that local public health agencies contributed an average of 67 percent of total effort toward 20 different public health activities. The average local health department contribution was higher for assurance activities (80%) compared to assessment and policy development activities (60% and 58%, respectively). In addition to the local health department, the authors found that in most jurisdictions, a mix of state and local governmental agencies, medical care providers, and nonprofit community organizations contributed to performing public health activities. Participation by federal agencies, managed care plans, and community health centers was less common. However, the

authors noted that participation of community health centers was much higher in the 75% subset of jurisdictions that had centers located within their boundaries. With regards to scope of activities performed, hospitals and state government agencies participated in the largest range of activities on average (37% of 20 activities), followed by local government agencies and community nonprofit organizations (32%). Federal agencies and managed care plans participated in the most limited scope of activities. Lastly, for most types of organizations, participation in policy development activities occurred more often than participation in assessment and assurance activities.

Zahner (2005) looked at partnerships in the local public health system in Wisconsin. She found that partnerships were more frequently with other government agencies, hospitals, medical practices or clinics, community-based organizations, and schools. Overall, the mean number of types of partners was 5 (95% CI 5.14, 5.58), and the number of types of partners varied considerably by primary focus area addressed. For instance, the mean partner types for community assessment and planning was 8.95 (95% CI 7.13, 9.07), while the mean partner types for environmental health was just 3 (95% CI 2.46, 4.44). Also, LHDs that served the largest jurisdictions in Wisconsin (2000 mean population = 209,741) reported significantly more partner types (mean=6, 95% CI 5.30, 6.11) than LHDs that served smaller jurisdictions (mean=5, 95% CI 3.98, 5.09).

Two other studies of local public health collaborations have been conducted among heath departments in North Carolina (Studnicki et al, 2011; Lovelace, 2000). In the first study, the authors found that local public health departments interacted more frequently with boards of health, state agencies, community members, schools, city and county government agencies, and nonprofit agencies (Studnicki et al, 2011). Large majorities of the 64 local health department

directors who responded to the survey reported productive relationships with boards of health, state agencies, city and county government agencies, schools, nonprofit agencies, and hospitals. In the second study, researchers found extensive variation in the level of collaboration between local health officials and external collaborators (Lovelace, 2000). While the range of total involvement varied by health department, health department officials maintained similar patterns of relationships, with community advisory boards and local boards of health being most involved and experts and elected officials being least involved.

Factors Related to Effectiveness

Two studies have looked at the association between collaboration and performance. Lovelace (2000) found that a greater frequency of interaction with several types of partners was associated with better performance. Similarly, Zahner (2005) found that partnerships effectiveness was predicted in part by having a broader array of organizations involved and by having more partners contributing financially.

Several studies have looked at other factors that influence effectiveness of the local public health system. In the Mays and colleagues 1998 study mentioned in the section above, the survey asked health department directors in the most populous jurisdictions to rate the effectiveness of community delivery of 20 core public health functions (Mays et al, 2004). Key findings from that study were that only two-thirds of the 20 functions were performed in the jurisdictions surveyed, and the perceived effectiveness rating was just 35 percent of the maximum rating possible (Mays et al, 2004). Significant factors associated with perceived effectiveness were poverty rates, racial composition, and presence of local boards of health. Specifically, a 10-percentage-point decrease in the community poverty rate was associated with a

1% increase in the perceived effectiveness. A decrease in percentage of population non-white was associated with an increase in perceived effectiveness. The authors concluded from this work that availability and perceived effectiveness of public health activities appeared to be far from ideal within the communities in which most Americans reside (i.e., those with 100,000 or more population).

A recent review article (Erwin et al, 2008) summarized 23 papers on LHD core function performance published since the landmark 1998 Institute of Medicine report on the future of public health. The review found that the most common significant predictors of performance are related to LHD size, jurisdictional size, and funding. Larger staffs, greater jurisdiction size, and higher funding per capita were more often higher performing than LHDs with smaller staffs and jurisdiction size and less funding. Also, greater community interaction, having a LHD director with a higher academic degree, and leadership functioning within a management team were all significantly related to performance. A more recent study also found that local system performance was influenced by population size, presence of a local board of health that makes policy, education of the LHD top executive, and jurisdiction type (Bhandari et al, 2010).

However, there are some contradictions in the literature. Handler et al (1996) found that LHD effectiveness in addressing core functions was not related to jurisdiction size or type, while effectiveness was related to having a full-time agency head, having a larger budget from a larger number of funding sources, and having a larger staff. Effectiveness was also related to providing a greater number of services directly - particularly personal preventative and treatment services. The conclusion of this article was that only a few inputs are correlated with core-function related effectiveness.

Moving Forward

Taken together, the current state of theories related to participation, collaboration and network effectiveness, as well as the empirical literature in public health, point to a need for understanding more about factors that impact participation in and effectiveness of collaborative efforts.

As we saw in the sections on participation and collaboration theories, there is a gap in the literature regarding the relationship of participation or collaboration with effectiveness. Regarding network theory, Provan et al (2007) present several future directions for whole network research. In the area of network properties and processes, specific questions for future research are: Are certain structures more effective than others? Does change in the network density/centrality impact effectiveness? For example, is a more stable network more effective than a less stable network? What is the effect of similarity of members? Does more diversity of participants lead to more or less effectiveness? For network outcomes, the authors focus on effectiveness, noting that outcomes and particularly effectiveness "are critical issues when studying whole networks." Some questions for future research are: What is the meaning of network effectiveness and how is it operationalized? Are there certain network outcomes that can be alternatives to direct measurement of effectiveness? Is the addition of more organizations to a network (more density) a cumulative effect, or does this constrain effectiveness? What effect, if any, does effectiveness have on the development of a network?

In sum, the discordance and gaps in the previous literature point to the need for additional research that describes who participates in the public health system, and to assess the factors that influence effectiveness of participation, collaboration and networks. The research questions and

hypotheses are presented in the following chapter. Chapter 5 details the data and analysis methods of this study, and the final four chapters present results and conclusions.

CHAPTER 4

RESEARCH QUESTIONS AND HYPOTHESES

As demonstrated in chapter 3, the extant, limited theoretical development and empirical literature on the relationship between system performance and participation, collaboration and networks in general, and particularly in the public health field, is notably lacking. A key area ripe for research concerns the impact of organizational participation in community activities on system effectiveness. Three research questions in particular are: 1) What is the impact of public health department level of participation in the community function on perceived effectiveness of the system?, 2) What is the impact of the participation of other types of agencies/organizations on perceived effectiveness of the system?, and 3) What is the impact of percentage of types of organizations that participate on the perceived effectiveness of the system?

One way to think of these factors – public health department level of participation and the participation other organizations – is using the centrality and density and diversity constructs from network theory discussed in Chapter 3. As Mays and Scutchfield (2010) note, the magnitude and influence of the network centrality and density constructs are largely unknown in the public health field. Although not an exact fit to the way these constructs are traditionally operationalized in the network research literature, the theory related to centrality in a network can nonetheless help elucidate the relationships between the level of health department contribution to effort and perceived effectiveness of public health core functions. Recall that centrality refers to the relative influence of a single organization in a network. For this application, centrality is defined as the percent of effort of the organization (the LHD) to core

function delivery in the community: the more the LHD contributes to effort, the more central is the LHD in the system. As illustrated in Chapter 3, theoretical development and the empirical literature relating the concept of centrality with effectiveness of a network or system are limited and inconclusive. One might speculate that an organization being more personally involved in the delivery of a core public health function leads to a greater perceived effectiveness of community delivery of the core function. On the other hand, being more involved in delivery of a core function may expose the agency to the issues and challenges associated with the core function delivery, resulting in a more negative view of the effectiveness of the core function.

Regarding the relationship between participation of other community organizations in core function delivery and perceived effectiveness of the system, we can think of these factors in terms of density and diversity. As shown in Chapter 3 above, the theory and literature regarding the relationships between these constructs and effectiveness of the system is inconclusive. One might speculate that when a broader array of participants is involved with core function delivery, the health department director may perceive effectiveness of the network to be greater. On the other hand, as some authors have noted, working with a greater number and/or broader array of partners has transaction costs. It is more difficult to coordinate and collaborate when more organizations are involved.

Applying the theoretical framework and literature to the three public health core functions presented in Chapter 2 – assessment, policy development, and assurance – leads to nine research questions and hypotheses presented below. Due to the limited theoretical guidance and inconclusive literature in the participation, collaboration and network theory work regarding impact of participation on effectiveness as described in Chapter 3, the direction of the effects are

not specified, only that there will be an effect of participation on the perceived effectiveness of assessment, policy development, and assurance core function areas in public health.

Public Health Assessment Core Functions

Research question 1: What is the effect of level of health department contribution to effort on the perceived effectiveness of public health assessment core functions?

H1: The level of contribution of the LHD to core functions will have an effect on perceived network effectiveness of public health assessment core functions.

Research question 2: What is the effect of participation of other types of agencies/organizations on the perceived effectiveness of public health assessment core functions?

H2: Participation of other agencies/organizations will affect perceived effectiveness of public health assessment core functions.

Research question 3: What is the effect of percentage of other types of agencies/organizations that participate on the perceived effectiveness of public health assessment core functions?

H3: The percentage of other agencies/organizations that participate in a core function activity will affect the perceived effectiveness of public health assessment core functions.

Public Health Policy Development Core Functions

Research question 4: What is the effect of level of health department contribution to effort on the perceived effectiveness of public health policy development core functions?

H4: The level of contribution of the LHD to core functions will have an effect on perceived network effectiveness of public health policy development core functions.

Research question 5: What is the effect of participation of other types of agencies/organizations on the perceived effectiveness of public health policy development core functions?

H5: Participation of other agencies/organizations will affect perceived effectiveness of public health policy development core functions.

Research question 6: What is the effect of percentage of other types of agencies/organizations that participate on the perceived effectiveness of public health policy development core functions?

H6: The percentage of other agencies/organizations that participate in a core function activity will affect the perceived effectiveness of public health policy development core functions.

Public Health Assurance Core Functions

Research question 7: What is the effect of level of health department contribution to effort on the perceived effectiveness of public health assurance core functions?

H7: The level of contribution of the LHD to core functions will have an effect on perceived network effectiveness of public health assurance core functions.

Research question 8: What is the effect of participation of other types of agencies/organizations on the perceived effectiveness of public health assurance core functions?

H8: Participation of other agencies/organizations will affect perceived effectiveness of public health assurance core functions.

Research question 9: What is the effect of percentage of other types of agencies/organizations that participate on the perceived effectiveness of public health assurance core functions?

H9: The percentage of other agencies/organizations that participate in a core function activity will affect the perceived effectiveness of public health assurance core functions.

CHAPTER 5

DATA AND ANALYSIS METHODS

The primary source of data for this research is the National Longitudinal Survey of Local Public Health Systems. The survey was administered in 1998, with a follow-up of respondents in 2006. The instrument collected data from health department directors in local public health jurisdictions with 100,000 or more residents. These health departments were identified in a 1997 National Association of County and City Health Officials (NACCHO) Profile survey of all local health departments in the U.S. Although only the larger jurisdictions are represented, health departments in these larger jurisdictions serve approximately 70 percent of the U.S. population and exhibit greater homogeneity in terms of resources when compared to smaller jurisdictions. In addition, no evidence of systematic over- or under-reporting was found during extensive in-person site visits conducted in the jurisdictions of 10 agencies that participated in survey instrument development and validation during 1995 (Mays et al, 2000).

The survey asks four questions for each of 20 core public health functions: 1) whether the service is provided in the community, 2) how well the community is performing the function (the effectiveness measure), 3) what types of organizations contribute to providing the service, and 4) the proportion of contribution from the health department. The 20 core function questions and their respective categories (assessment, policy development, or assurance) are shown in Appendix A.

Response rates for the 1998 and 2006 survey administrations are shown in Table 5.1. There was a 71 percent (n=354) response to the 1998 survey, 67 percent (n=236) of whom

participated in the 2006 survey. Overall, 47 percent of the original survey sample completed both the 1998 and 2006 surveys.

Table 5.1: Survey response.

	Sample Size	Survey Responses	Responded to NACCHO Survey*
1998	497	354	334
2006	354	236	213
Total	851	590	547

*NACCHO 1997 and 2005 Profile survey years.

Three Dependent Variables

Figure 5.1 shows the assessment activity performance measures.

Assessment activities

1. In your jurisdiction, is there a community needs assessment process that systematically describes the prevailing health status in the community?
2. In the past three years in your jurisdiction, has a survey of the population for behavioral risk factors been conducted?
3. In your jurisdiction, are timely investigations of adverse health events conducted on an ongoing basis, including communicable disease outbreaks and environmental health hazards?
4. Are the necessary laboratory services available to the local public health agency to support investigations of adverse health events and meet routine diagnostic and surveillance needs?
5. In your jurisdiction, has an analysis been completed of the determinants of and contributing factors to priority health needs, the adequacy of existing health resources, and the population groups most effected?
6. In the past three years in your jurisdiction, has the local public health agency conducted an analysis of age-specific participation in preventive and screening services?

Figure 5.1: Practice performance measures for assessment activities.

Survey responses to the effectiveness questions (i.e., Overall, how well is this activity performed within your jurisdiction?) were reported on a five-point Likert scale (poor, fair, moderate, good, or excellent). The responses to the six assessment questions were averaged to

create a composite score for the effectiveness of the assessment function. Analysis was conducted for the composite measure.

Figure 5.2 shows the policy development activity performance measures.

Policy development activities

1. In your jurisdiction, is there a network of support and communication relationships that includes health-related organizations, the media, and the general public?
2. In the past year in your jurisdiction, has there been a formal attempt by the local public health agency to inform officials about the potential public health impact of decisions under their consideration?
3. In your local public health agency, has there been a prioritization of the community health needs that have been identified from a community needs assessment?
4. In the past three years in your jurisdiction, has the local public health agency implemented community health initiatives consistent with established priorities?
5. In your jurisdiction, has a community health action plan been developed with community participation to address community health needs?
6. In the past three years in your jurisdiction, has the local public health agency developed plans to allocate resources in a manner consistent with community health action plans?

Figure 5.2: Practice performance measures for policy development activities.

Survey responses to the effectiveness questions (i.e., Overall, how well is this activity performed within your jurisdiction?) were reported on a five-point Likert scale (poor, fair, moderate, good, or excellent). The responses to the six policy development questions were averaged to create a composite score for the effectiveness of the policy development function. Analysis was conducted for the composite measure.

Figure 5.3 shows the assurance activity performance measures.

Assurance activities

1. In your jurisdiction, have resources been deployed as necessary to address priority health needs identified in the community health needs assessment?
2. In the past three years in your jurisdiction, has the local public health agency conducted an organizational self-assessment?
3. In your jurisdiction, are age-specific priority health needs effectively addressed through the provision of or linkage to appropriate services?
4. In your jurisdiction, have there been regular evaluations of the effects of public health services on community health status?
5. In the past three years in your jurisdiction, has the local public health agency used professionally

recognized processes and outcome measures to monitor programs and to redirect resources as appropriate?

6. In your jurisdiction, is the public regularly provided with information about current health status, health care needs, positive health behaviors, and health care policy issues?
7. Within the past year in your jurisdiction, has the media received reports on a regular basis about health issues affecting the community?
8. In the past three years in your jurisdiction, has there been an instance in which the local public health agency failed to implement a mandated public health program or service as required by state or local law, ordinance, or regulation?

Figure 5.3: Practice performance measures for assurance activities.

Survey responses to the effectiveness questions (i.e., Overall, how well is this activity performed within your jurisdiction?) were reported on a five-point Likert scale (poor, fair, moderate, good, or excellent). The responses to the eight assurance questions were averaged to create a composite score for the effectiveness of the assurance function. Analysis was conducted for the composite measure.

It is important to note that while these dependent variables are the perceptions of the health department directors, the measures are objective, self-reports. Each of the questions captures information on activities performed in the jurisdiction. The schematic below illustrates the differences between subjective and objective measures and where the dependent variables fall in the table. It is also important to note that the survey data collectors conducted field audits at a sample of health departments to verify the self-reported data, and did not any evidence of under- or over-reporting of activities.

Table 5.2: Illustration of dependent variables in the subjective/objective category.

	Subjective	Objective
Self-reports of activities		X (dependent variables)
External evaluation		X

Three Main Independent Variables

The main independent variable, mean level of health department contribution to effort, will be measured from the survey question for each core function, "What proportion of the total community effort for this activity is contributed by your local public health agency?" Responses to each question were reported on a five point Likert scale as shown in Table 5.3. Responses to individual questions were averaged to obtain mean measures for the assessment, policy development, and assurance core function questions.

Table 5.3: Survey item for health department contribution main independent variable.				
What proportion of the total community effort for this activity is contributed by your local public health agency?				
1-None	☐2-Some but not half of effort	☐3-About half of the effort	☐4-Most but not all of the effort	☐5-All of the effort

The second main independent variable (which is actually a set of variables), types of organizations contributing to the system, will be measured from the survey question for each core function, "What types of organizations are involved in performing this activity in your jurisdiction?" Response options were as shown in Table 5.4. Each type of organization was coded 1 if the organization participated or 0 if the organization did not participate. These values were averaged across the assessment, policy development and assurance sets of questions.

Table 5.4: Survey item for participation of other agencies/organizations main independent set of variables.			
What types of organizations are involved in performing this activity in your jurisdiction? (mark all that apply) ☐ none			
☐ state health agency	☐ faith-based orgs	☐ physician practices	☐ schools (K-12)

☐ other state gov't agency	☐ other nonprofits	☐ hospitals	☐ colleges/universities
☐ local gov't agencies	☐ health insurers	☐ community health centers	
☐ federal gov't agency	☐ employers/business groups	☐ Other-specify:_____	

The third main independent variable is a measure of the percent of organization types that participated in the assessment, policy development and assurance core function areas. As with the second main independent variable described above, this variable was created from the survey question shown in Table 5.4 above. The average participation was calculated by dividing the number of participating organizations by the total number of organization types. This value was then averaged across the survey questions that comprise the assessment, policy development and assurance core functions.

Regarding model building with the three main independent variables, the contribution of the local health department was included in each model, along with either the mean participation rate of each individual organization type (the second main independent variable described above), or the mean percentage of types of agencies/organizations participating (the third main independent variable described above).

Control Variables

Data for control variables were collected from several sources and linked to the Longitudinal Survey of Local Public Health Systems. Data were linked by jurisdiction, whereby the majority of health departments serve a single county. The main source of control variables was the NACCHO Health Department Profile Survey data from the years just prior to the Longitudinal Survey years (i.e., 1997 for 1998 Mays' survey and 2005 for the 2006 Mays' survey). Overall, 43 percent of the original survey sample responded to both years of the Longitudinal Survey as well as to both years of the NACCHO survey. Variables from the

NACCHO survey include Board of Health characteristics (whether or not it exists, whether it has policy making authority, and whether it is the governing board), staff full-time equivalents (FTEs) per capita, type of jurisdiction (centralized, mixed, or other), and local health department expenditures per capita.

Other sources of control variable data include the U.S. Census data, the Health Resources and Services Administration's (HRSA) county-level Area Resource File (ARF), and the US Department of Agriculture (USDA). The U.S. Census data included the following measures: percent population non-white, percent population below the poverty level, population size of the jurisdiction, and percent of population with a college education. The USDA data is the measure of rural/urban continuum (RUCA), which is a measure of whether the jurisdiction is a metropolitan or a smaller, micropolitan area. Lastly, the ARF includes data on mortality and health care resource and outcomes data. Table 5.5 lists all the independent variables and their sources.

Table 5.5: Independent variables and sources.

Main Independent Variables	**Source**
Mean LHD contribution percentage	National Longitudinal Survey of LPHS
Mean participation rate for each organization type	National Longitudinal Survey of LPHS
Mean percent of organizations participating	National Longitudinal Survey of LPHS
Control Variables	
Year of the survey (1998, 2006)	National Longitudinal Survey of LPHS
State	National Longitudinal Survey of LPHS
Board of health characteristics: board of health exists, has policy making authority, is	NACCHO Profile Survey

governing board	
FTEs per capita	NACCHO Profile Survey and U.S. Census
Type of jurisdiction: centralized, mixed, or decentralized	NACCHO Profile Survey
Local health department expenditures per capita	NACCHO Profile Survey
Metro- or micropolitan area (rural/urban continuum)	USDA
Percent population non-white	U.S. Census
Percent population below the poverty level	U.S. Census
Population size of jurisdiction	U.S. Census
Percent of population with a college education	U.S. Census
MDs per 100,000 population	HRSA Area Resource File
Hospital beds per 100,000 population	HRSA Area Resource File
Mortality measures: infant mortality rate, ischemic heart disease mortality rate	HRSA Area Resource File

Rationale and hypotheses for control variables

Year of the survey and state variables were included in the models due to the design of the study. The survey was administered in 1998 and in 2006. It is reasonable to expect that there are differences in survey responses by year, and that year of the survey needed to be controlled for when assessing the impact of the other variables. Regarding the indicator variables for the states, counties are nested within states (hierarchical), so this needed to be accounted for in the models. It is reasonable to expect that health department director responses for counties within a given state will be correlated with responses from other counties within the same state.

For board of health characteristics, Mays et al (2004) found that having a local board of health with policy making authority was significantly associated with a higher perceived effectiveness of core public health function activities, compared to a board of health with no policy making authority. For the current analysis, the board of health variable was categorized as either a board of health with policy making and governing authority, a board of health with only policy making authority, a board of health with only governing authority, a board of health with neither function, or no board of health at all. Having no board of health was the referent group for analysis. Based on the previous Mays et al (2004) analysis, it is expected that there will be differences in perceived effectiveness based on these board of health characteristics. Specifically, a board of health with policy making authority will be associated with a higher perceived effectiveness than when no board of health with policy making authority exists. There are no expectations about direction of effects for a board of health with governing authority.

For jurisdiction type, the Mays et al (2004) analysis of the baseline 1998 data found no difference in perceived effectiveness based on jurisdiction type being either centralized, decentralized, or mixed. Based on this prior study, it is not expected in the current analysis that jurisdiction type will have a significant effect on perceived effectiveness. However, in keeping with the 1998 Mays' analysis, this variable is still included in the original, full models as a potential control variable.

For LHD FTEs and expenditures per capita, it is expected, again based on the Mays et al (2004) analysis of 1998 data showing that a greater expenditure per capita will have a positive effect on perceived effectiveness of core function activities. Besides the evidence in the Mays et al (2004) paper, it is reasonable to expect that more spending on public health will lead to a greater agency director's perception of performance. Likewise, it is expected that having a

greater number of LHD FTEs per capita will be associated with a higher perceived effectiveness of public health core functions. This is because of the general perception that a greater number of staff can do more in an agency compared to one with a lesser number of staff. It is also expected that LHD FTEs per capita and expenditures per capita are positively correlated with each other. This will be a consideration for correlation analysis and for model building.

For rural/urban continuum and similarly, for population size of the jurisdiction, it is expected that jurisdictions with larger populations will have a lower perceived effectiveness of public health core function activities. The Mays et al (2004) analysis also looked at population size, but found that this variable was not significantly associated with perceived effectiveness.

Three of the covariates are measures of socio-economic status. These include the percentage of population non-white, the percentage of population below the federal poverty level, and the percentage of population with a college education. As is generally the case in health studies, it is expected that outcomes are worse in areas with less financial means and lower economic status. It is also the case that minorities experience worse health outcomes in general when compared to whites. Based on a basic knowledge of the health literature, it is expected that health department directors will report a lower perceived effectiveness in jurisdictions with a greater percentage of population non-white and in areas with a greater percentage of population below the federal poverty level. Further, the Mays et al (2004) study included percentage of the population below the federal poverty level and percentage of population non-white, finding that both were negatively and significantly associated with a lower perceived effectiveness of core function activities. On the other hand, it is expected that directors will report a higher perceived effectiveness in areas with a greater percentage of the population with a college education (this variable was not reported in the Mays study).

The final four control variables are measures of health care availability and outcomes. Mays et al (2004) also included the measures of MDs per 100,000 population and the number of hospital beds per 100,000 population, finding that both were positively, but not significantly, associated with perceived effectiveness. Thus, for this analysis, it is expected that these two measures will be positively associated with perceived effectiveness of assessment, policy development and assurance core function activities. The other two health outcome measures are the infant mortality rate and the ischemic heart disease mortality rate. These measures were not included in the Mays et al (2004) analysis. For this analysis, it is expected that health department directors in jurisdictions with higher infant and ischemic heart disease mortality rates will report a lower perceived effectiveness of public health core functions. One thing to note is that health professionals are generally more aware of infant mortality rates in their areas and how they compare with other areas, than they are of ischemic heart disease mortality rates. This may mean that there is a stronger negative effect of infant mortality rates on perceived effectiveness compared to ischemic heart disease mortality rates.

Analysis Methods

Analytic methods include univariate, bivariate, and multivariate analysis. Univariate analysis includes descriptive statistics for summarizing variable frequencies and distributions for statistical analysis assumptions. Bivariate analysis includes correlation analysis for the continuous variables, although the tables presented in the results are only for the dependent variables and the continuous control variables.

Multivariate regression analysis took into account the longitudinal and hierarchical design of the study. Due to the two-level structure of the data set (health departments within

state) and the longitudinal design with two time periods, it is inappropriate to use a traditional linear model approach. A SAS mixed model procedure (PROC MIXED) that accounts for auto-correlation in the data, as well as the nesting of health departments within a state (multilevel modeling), was employed. A key advantage of this approach is that it does not discard responses at time 1 (1998) if time 2 (2006) was not completed, thereby resulting in a larger sample size with more power to detect significant differences. The disadvantages of this approach are the more complex models and interpretation of results as compared to simpler statistical methods. The dependent variables in this approach were the continuous mean composite measures of effectiveness for the assessment, policy development, and assurance functions.

Both fixed and random effects models can be used to estimate data when observations are clustered, such as within states. In the context of this study, fixed effects models assume that all local health departments within a state share a unique intercept in the linear model and this intercept is fixed. On the other hand, random effects models have a random intercept. There are advantages and disadvantages to each model. Fixed effects models use more degrees of freedom, resulting in less precise estimates, while random effects models impose more restrictive assumptions on the variance-covariance structure of the error terms. That is, that individual observations in the different states are independent. Given this more restrictive assumption of the random effects model, the fixed effects model was selected for this analysis.

For the covariance structure for the longitudinal design of the survey, a general covariance matrix was selected after comparing the model fit parameters (AIC, BIC) between models that specified unstructured, a first-order autoregressive structure (AR1) or compound symmetric (CS) showed similar or slightly better model fit for unstructured covariance. With

only two time periods of data, the unstructured covariance makes sense in this context. Table 5.6 lists the statistical model specifications.

Table 5.6: Statistical model specifications.

SAS Procedure: Proc Mixed
Covariance Structure: Unstructured
Subject Effect: Health Department nested within State
State was entered as a fixed effect.
Estimation Method: REML
Residual Variance Method: None
Fixed Effects SE Method: Empirical
Degrees of Freedom Method: Between-Within

In the final model specification, the dependent variables were log transformed to reduce skewness in the data and for ease in interpretation of results. The main independent variables were standardized by their standard deviations. Continuous covariates were log-transformed to reduce skewness (based on inspection of histograms of every variable, not shown here) and for ease in interpretation of results. Convergence criteria were met for all full and reduced models. The model building steps began with including all the variables in the models. Second, independent variables with a p-value of greater than .80 were excluded from the models. The dropping of variables from the original full models also included a consideration of the correlation analysis. In the final step, independent variables with a p-value of greater than 0.50 were excluded from the models. In the all the reduced models, the main independent variables of interest were kept in the models even if the p-values were above these p-value cut points.

Limitations

Some limitations of this research should be noted. First, because the survey was administered to only those health department directors for the largest communities, study results cannot be generalized to all communities. Nevertheless, as noted earlier, 70 percent of the U.S. population is served by these large jurisdictions (100,000+ population).

Second, as with any survey data source, there are self-reporting limitations of the survey data. The performance measure is based on health department directors' perceptions of community effectiveness in delivering core public health functions. However, it is reassuring that information gathered on a sub-sample of participating health departments indicated no under- or over-reporting in survey responses (Mays et al, 2000). In addition to the self-reporting limitations, there is also the potential for different directors of the same health department for the two time periods to respond differently to the surveys. In such cases, the differences over time for a particular health department may not be accurately captured.

A third limitation is the potential differences in respondent interpretation of the term "effective". As Kenis and Provan (2009) note, when speaking of effectiveness or performance of a network, the criteria that are being considered should be clearly specified. For example, is it efficiency, goal attainment, equity, survival or client satisfaction that is being considered? Effectiveness is not clearly defined in the survey instrument for this study.

Lastly, the survey does not collect information regarding the total number of organizations of each type that participate in delivery of a core function, but only which of the listed types participate in each function. This limits the density measure somewhat in that the magnitude of contribution of each type of organization is not captured. For example, while a

health department director may report that educational institutions participate in a particular function in their community, there may only be one educational institution that participates.

CHAPTER 6

RESULTS: EFFECTIVENESS OF PUBLIC HEALTH ASSESSMENT CORE FUNCTIONS

Descriptive Statistics

Table 6.1 shows the descriptive statistics and percent change over time for the assessment core function dependent variable and the independent variables at time 1 (1998) and time 2 (2006). The perceived effectiveness of assessment activities increased 29% between 1998 and 2006, from 0.41 to 0.53 (on a 0 to 1 scale). Overall, the mean perceived effectiveness for assessment activities was 0.46 with a standard deviation of 0.17 and a range of 0 to 1. Figure 6.1 and shows the distribution of the dependent variable.

For the main independent variables, LHD contribution to assessment increased by a small amount, 5%, from 0.38 to 0.40. For the participation of other agencies and organizations, participation rates were generally low for the assessment activities, ranging from a low of 0.07 for health insurer participation in 2006 to a high of 0.59 for state health agency participation in 1998. Regarding change over time, the largest increase was seen for community health centers, with a 145% increase in participation between 1998 and 2006. However, the participation rate was still relatively low for community health centers, at only 0.27 in 2006. Most other agency/organization types also increased participation in assessment activities, including local and federal government agencies, physician practices, hospitals, schools, colleges and other. Only state health agency and health insurer participation in assessment activities decreased over this time period.

For the continuous covariates, there were both increases and decreases between 1998 and 2006. Mean FTEs per capita, mean percentage of population below the poverty level, mean

infant mortality rate, mean ischemic heart disease mortality rate, and mean number of hospital beds per 100,000 population all decreased over time. The largest percentage decrease was seen for the mean number of hospital beds per 100,000 population, which decreased 17%, from 342.5 to 292.3. Mean population of the jurisdiction, mean LHD expenditures per capita, mean

Table 6.1: Variable descriptive statistics.

	Time 1: 1998 (n=334)	Time 2: 2006 (n=213)	Percent change
Dependent variable:			
Mean effectiveness of Assessment activities (SD)	0.41 (0.15)	0.53 (0.17)	+29%
Main independent variables:			
Mean LHD contribution to Assessment (SD)	0.38 (0.18)	0.40 (0.16)	+5%
Mean state health agency participation (SD)	0.59 (0.23)	0.56 (0.23)	-5
Mean Other state gov't agency participation (SD)	0.17 (0.21)	0.17 (0.20)	0
Mean local gov't agency participation (SD)	0.30 (0.25)	0.50 (0.28)	+67
Mean federal gov't agency participation (SD)	0.09 (0.16)	0.14 (0.19)	+56
Mean faith-based orgs participation (SD)	0.14 (0.18)	0.14 (0.18)	0
Mean other nonprofits participation (SD)	0.25 (0.21)	0.25 (0.21)	0
Mean health insurers participation (SD)	0.08 (0.17)	0.07 (0.15)	-13
Mean employers/business groups participation (SD)	0.15 (0.18)	0.15 (0.19)	0
Mean physician practices participation (SD)	0.22 (0.22)	0.27 (0.23)	+23
Mean hospitals participation (SD)	0.41 (0.26)	0.46 (0.24)	+12
Mean community health centers participation (SD)	0.11 (0.19)	0.27 (0.24)	+145
Mean schools participation (SD)	0.26 (0.23)	0.27 (0.23)	+4
Mean colleges/universities participation (SD)	0.17 (0.21)	0.21 (0.23)	+24
Mean other participation (SD)	0.09 (0.15)	0.10 (0.16)	+11
Continuous Covariates:			
Mean FTEs per capita (SD)	60.8 (41.5)	54.2 (35.0)	-11%
Mean percentage of population below federal poverty level (SD)	12.5 (5.6)	10.7 (3.9)	-14%
Mean population of jurisdiction (thousands) (SD)	405 (744)	494 (963)	+22%
Mean LHD expenditures per capita, $ (SD)	35.7 (35.7)	40.8 (29.4)	+15%
Mean percentage of population with college education (SD)	24.7 (8.8)	24.7 (9.1)	--
Mean percentage of population non-White (SD)	22.8 (16.7)	27.1 (16.9)	+19
Mean infant mortality rate (SD)	22.7 (16.7)	19.3 (9.6)	-15
Mean ischemic heart disease mortality rate (SD)	171.2 (61.8)	160.1 (56.7)	-6
Mean MDs per 100,000 pop (SD)	246.3 (209.8)	265.9 (199.7)	+8
Mean hospital beds per 100,000 pop (SD)	342.5 (226.7)	292.3 (182.5)	-17%
Categorical variables			
Board of Health Characteristics, %			
BOH has policymaking and governing	26.4	45.1	+71
BOH has policymaking authority only	14.4	8.0	-44

BOH is governing board only	9.9	3.3	-67
BOH exists, but neither function	25.8	16.4	-36
BOH does not exist	23.7	27.2	+15
Rural/urban continuum, %			
Metropolitan area	93.7	94.8	+1
Micropolitan area	6.3	5.2	-17
Jurisdiction type, %			
Centralized	12.6	12.7	+1
Mixed	18.6	14.1	-24
Decentralized	68.9	73.2	+6

percentage of population non-white, and mean MDs per 100,000 population all increased over time. The largest percentage increase was seen for the mean population of the jurisdiction, which increased by 22%, from 405 to 494 thousand. For the categorical variables, there was a notable increase (71%) in the boards of health with both policymaking and governing authority. Roughly 94% of the jurisdictions were metropolitan as opposed to micropolitan in both 1998 and 2006. Most jurisdictions were decentralized, at 68.9% in 1998 and 73.2% in 2006. The remainder of the jurisdictions were about evenly split between the centralized and mixed types.

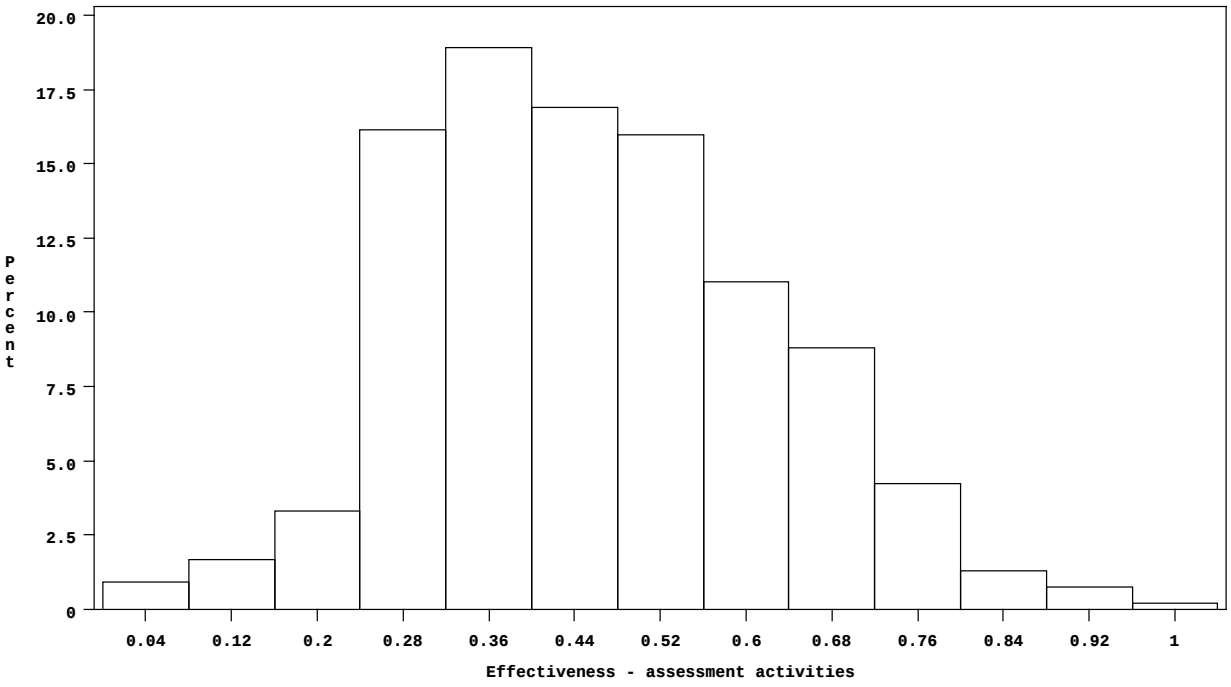

Figure 6.1: Histogram of perceived effectiveness of assessment activities.

Bivariate Analysis

Figure 6.2 is a simple scatter plot that shows an increase in perceived effectiveness of assessment activities as the main independent variable, LHD contribution to assessment activities, increases. Not shown are scatter plots for the participation rates of the individual agency/organization types against the dependent variable. These plots showed variability in the linear relationships between perceived effectiveness of assessment activities and the participation of different types of organizations in assessment activities.

Pearson correlations, p-values, and samples sizes for the first year of data (1998) are shown in Table 6.3 for the log-transformed dependent variable and the continuous covariates. (Table 6.2 provides the sas variable names and labels corresponding to table 6.3.) This table shows that several covariates are significantly correlated with the dependent variable, as well as with each other. Correlation between covariates is an indicator of potential collinearity isues in the original full model specification. As noted in the methods section, these correlations were considered in the model reduction steps, along with the p-values of effect estimates. At the $p<.05$ level, the following covariates were correlated with the perceived effectiveness of assessment activities (l_effass): the percent nonwhite population (l_pctnonwh), the percent with

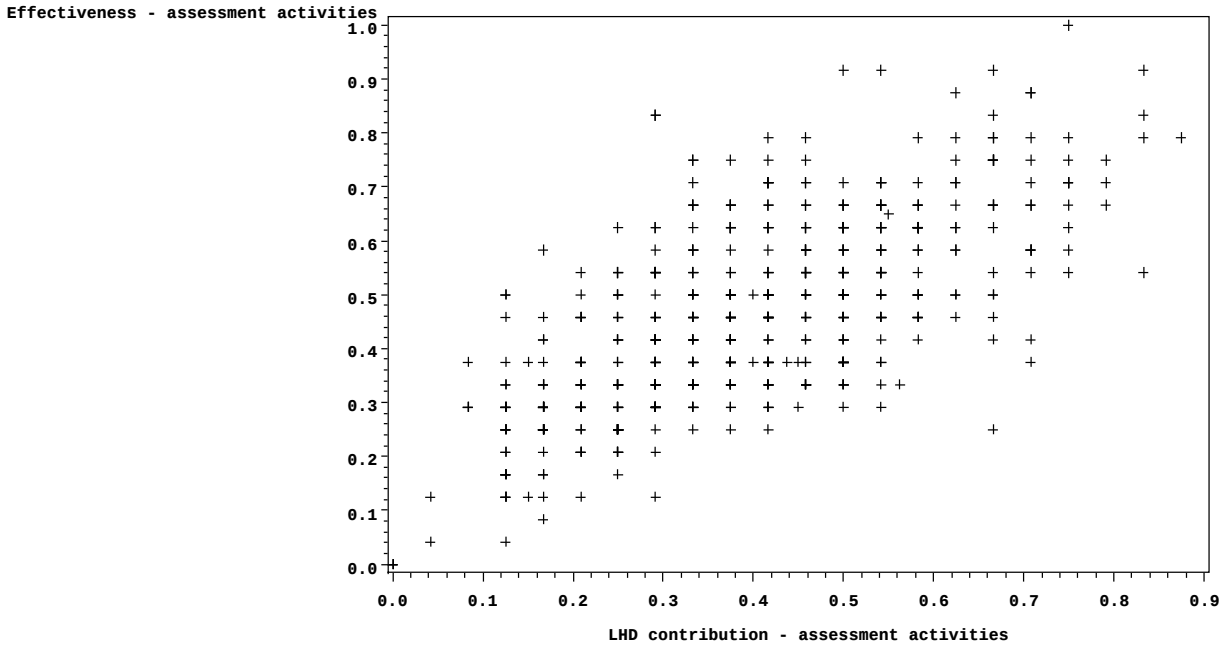

Figure 6.2: Plot of LHD contribution to assessment activities against perceived effectiveness of assessment activities.

a college education (l_collpct), and the percent below the poverty level (l_povpct). However, although statistically significant, the correlation coefficients were relatively small, approximately in the range of 0.1 to 0.2. There were several significant correlations between the covariates. As expected, the mean LHD expenditures per capita (l_expcap) was highly correlated with the mean LHD FTEs per capita (l_ftecap) (Rho=0.85364). The next largest Rho values were 0.60270 ($p<0.0001$) for the correlation between infant mortality rate (l_dratinf) and percentage of population nonwhite (l_pctnonwh). The remaining Rho values were between -0.48593 for the correlation between percentage of population with a college education (l_collpct) and percentage

of population below the poverty level (l_povpct), and 0.57965 ($p<0.0001$) for the correlation between the number of MDs per capita (l_mdpcap) and the percentage of population with a college education (l_collpct).

Table 6.2: SAS variable names and labels.	
SAS variable name	Label
l_effass	Log of effectiveness of assessment core functions
l_ftecap	Log of FTEs per capita
l_pctnonwh	Log of percent population nonwhite
l_collpct	Log of percent of population with a college degree
l_povpct	Log of percent of population below the federal poverty level
l_pop	Log of population size
l_expcap	Log of expenditures per capita
l_dratinf	Log of infant mortality rate
l_draihd	Log of Ischemic heart disease mortality rate
l_mdpcap	Log of MDs per 100,000 population
l_bedpcap	Log of hospital beds per 100,000 population

Table 6.3: Correlation analysis for assessment dependent variable and continuous covariates.

	l_effass	l_ftecap	l_pctnonwh	l_collpct	l_povpct	l_pop	l_expcap	l_dratinf	l_draihd	l_mdpcap	l_bedpcap
l_effass	1.00000 329	0.06443 0.2468 325	-0.21169 0.0001 329	0.10831 0.0497 329	-0.20024 0.0003 329	0.07807 0.1577 329	0.08736 0.1177 322	-0.06410 0.2463 329	0.02121 0.7015 329	0.03662 0.5080 329	-0.03467 0.5334 325
l_ftecap		1.00000 330	0.15242 0.0055 330	-0.17772 0.0012 330	0.23877 <.0001 330	-0.09380 0.0889 330	0.85364 <.0001 323	0.02194 0.6913 330	0.02603 0.6375 330	-0.02817 0.6101 330	0.02439 0.6608 326
l_pctnonwh			1.00000 334	0.04392 0.4237 334	0.53555 <.0001 334	0.37164 <.0001 334	0.18562 0.0007 327	0.60270 <.0001 334	-0.10340 0.0591 334	0.30557 <.0001 334	0.25544 <.0001 330
l_collpct				1.00000 334	-0.48593 <.0001 334	0.26485 <.0001 334	-0.08190 0.1395 327	0.10706 0.0506 334	-0.43151 <.0001 334	0.57965 <.0001 334	-0.04571 0.4079 330
l_povpct					1.00000 334	0.11900 0.0297 334	0.23994 <.0001 327	0.37144 <.0001 334	0.26315 <.0001 334	0.03792 0.4898 334	0.47279 <.0001 330
l_pop						1.00000 334	0.06875 0.2150 327	0.39555 <.0001 334	-0.02203 0.6883 334	0.33429 <.0001 334	0.07857 0.1544 330
l_expcap							1.00000 327	0.07577 0.1716 327	0.01413 0.7990 327	0.03660 0.5095 327	0.02441 0.6621 323
l_dratinf								1.00000 334	0.34496 <.0001 334	0.50371 <.0001 334	0.46488 <.0001 330
l_draihd									1.00000 334	0.05087 0.3540 334	0.38618 <.0001 330
l_mdpcap										1.00000 334	0.57363 <.0001 330
l_bedpcap											1.00000 330

Multivariate Models

Models with individual organization participation variables

Full (all variables included) and reduced multivariate model results are shown in Table 6.4. There were 412 observations used in the full model and 414 observations used in the reduced model. The number of health departments included was 222 in the full model and 223 in the reduced model. For the full and reduced models, the main independent variable, LHD contribution to assessment activities, was positively and highly significantly associated with perceived effectiveness of assessment activities ($p<.01$). With a coefficient of 0.2203 in the reduced model, this means that for each standard deviation (0.17) increase in the LHD contribution to assessment activities, there is a 22% increase in the mean perceived effectiveness of the assessment activities. (Recall that the dependent variable was log transformed while the independent variable was standardized by its standard deviation.)

For the other set of main independent variables, the participation of state health agencies, local government agencies, other nonprofits, employers/business groups, and hospitals were also positively and significantly associated with perceived effectiveness of assessment activities at the $p<.01$ or .05 level. The smallest significant effect was for colleges/universities participation, with a 3% increase in perceived effectiveness with each standard deviation increase in colleges/universities mean participation rate. The largest positive and significant effect was seen for other nonprofits participation, with a 6.3% increase in perceived effectiveness of assessment activities with each standard deviation increase in mean other nonprofits participation. On the other hand, participation of faith-based organizations was negatively associated with perceived effectiveness of assessment activities ($p<.01$). Specifically, a one standard deviation (0.18)

decrease in the participation of faith-based organizations results in a 6% decrease in perceived effectiveness of assessment activities.

The following covariates were dropped in the final, reduced model: percent of population below the federal poverty level, percent of population with a college education, percent of population non-white, ischemic heart disease mortality rate, and hospital beds per capita. Only the covariate infant mortality rate was significant in the final reduced model. For each one percent increase in the infant mortality rate (since infant mortality was log transformed), there was a 10.8% decrease in the perceived effectiveness of assessment activities. Two categorical variables were significant in the final reduced model: rural/urban continuum and year of the survey. For rural/urban continuum, there was a 10.4% lower perceived effectiveness for metropolitan compared to micropolitan jurisdiction. In other words, the larger the jurisdiction, the lower the perceived effectiveness of assessment activities. For year of the survey, there was a 17.9% lower perceived effectiveness for 1998 compared to 2006. (Note that for all of the above interpretations of effect estimates, the stipulation is that the effects are after controlling for all other variables in the models.)

Regarding model fit, the final reduced model achieved a smaller AIC and BIC than the full models, as to be expected after dropping highly insignificant independent variables. Both the full and reduced models rejected the null likelihood ratio test hypotheses, with a p-value of 0.0249 for the full model and 0.0131 for the reduced model.

Table 6.4: Effectiveness of assessment functions multivariate model results.

	Full Model		**Reduced Model**	
Observations Read	547		547	
Observations Used	412		414	
Subjects (Health Departments)	222		223	
	Estimate (SE)		Estimate (SE)	
Main independent variables:				
LHD contribution to Assessment	0.2243 (0.0172)	***	0.2203 (0.0170)	***
State health agency participation	0.0509 (0.0158)	***	0.0529 (0.0158)	***
Other state gov't agency participation	-0.0160 (0.0149)		-0.0143 (0.0151)	
Local gov't agency participation	0.0404 (0.0151)	***	0.0390 (0.0151)	**
Federal gov't agency participation	-0.0181 (0.0129)		-0.0188 (0.0129)	
Faith-based orgs participation	-0.0634 (0.0194)	***	-0.0600 (0.0193)	***
Other nonprofits participation	0.0623 (0.0212)	***	0.0626 (0.0211)	***
Health insurers participation	-0.0044 (0.0148)		-0.0050 (0.0143)	
Employers/business groups participation	0.0477 (0.0184)	**	0.0436 (0.0174)	**
Physician practices participation	-0.0159 (0.0166)		-0.0151 (0.0171)	
Hospitals participation	0.0474 (0.0209)	**	0.0501 (0.0212)	**
Community health centers participation	-0.0050 (0.0159)		-0.0047 (0.0156)	
Schools participation	-0.0081 (0.0172)		-0.0072 (0.0168)	
Colleges/universities participation	0.0312 (0.0152)	**	0.0303 (0.0145)	**
Other participation	0.0192 (0.0124)		0.0185 (0.0122)	
Control variables:				
FTEs per capita (log)	-0.0376 (0.0323)		-0.0328 (0.0310)	
% population < poverty level (log)	-0.0154 (0.0640)			
Population (log)	0.0272 (0.0227)		0.0208 (0.0198)	
LHD expenditures/capita (log)	0.0354 (0.0270)		0.0353 (0.0268)	
% college education (log)	-0.0521 (0.0868)			
% population non-White (log)	0.0024 (0.0363)			
Infant mortality rate (log)	-0.1498 (0.0575)	***	-0.1078 (0.0354)	***
Ischemic heart disease mortality rate (log)	0.0320 (0.0709)			
MDs per 100,000 pop (log)	0.0455 (0.0463)		0.0280 (0.0241)	
Hospital beds per 100,000 pop (log)	0.0196 (0.0455)			
Board of Health Characteristics:				
Both policymaking and governing	0.1066 (0.0619)	*	0.1012 (0.0622)	
BOH has policymaking authority	-0.0181 (0.0676)		-0.0278 (0.0678)	
BOH is governing board	0.0827 (0.0774)		0.0846 (0.0747)	
Exists, but neither function	0.0373 (0.0492)		0.0386 (0.0495)	
No BOH	Ref		Ref	
Rural/urban continuum (ref=micro)	-0.0961 (0.0538)	*	-0.1037 (0.0548)	*
Jurisdiction type				
Centralized	0.1138 (0.0904)		0.0718 (0.0881)	
Mixed	0.0563 (0.1209)		0.0024 (0.1062)	
Decentralized	Ref		Ref	
Year of survey (ref=2006)	-0.1745 (0.0414)	***	-0.1789 (0.0356)	***
Fit Statistics:				
-2 Res Log Likelihood	311.0		291.9	
AIC	317.0		297.9	
BIC	327.2		208.1	
Null model Likelihood Ratio Test	p=0.0249		p=0.0131	

*** p-value for t is less than .01; ** p-value for t is less than .05; * p-value for t is less than .10
Not shown in the table: Effect estimates for the states (treated as a fixed effect).

Models with percent of organizations contributing variable

Table 6.5 shows the results for the full and reduced models for the models that include the mean percentage of organizations participating, instead of the individual organization participation rates. There were 512 observations used and 324 health departments in both the full and reduced models. This model has the advantage of having a larger sample size due to the averaging of the participation of organizations, rather than using each individual organization participation rate. In the case of using the individual organization participation rates, the observation is deleted if any of the responses are missing, whereas an average participation rate is calculated even if one or more responses is missing for a given observation.

In both the full and reduced models shown in table 6.4, the LHD contribution to assessment activities is positively and highly significantly associated with the perceived effectiveness of assessment activities. Each one standard deviation increase in LHD contribution to assessment activities results in a 22% increase in perceived effectiveness of assessment activities. Likewise, the percentage of organizations participating in assessment activities is positively and highly significantly associated with the perceived effectiveness of assessment activities. Each one standard deviation increase in percentage of organizations participating in assessment activities results in a 9.6% increase in perceived effectiveness of assessment activities.

There were only a few significant control variables in the final, reduced model. This included a 7.9% increase in perceived effectiveness for having a board of health with policymaking and governing authority compared to having no board of health. Just as in the previous model for individual organizational participation rates for assessment activities, the year of survey was statistically significant, with a 19.5% lower perceived effectiveness for 1998 compared to 2006. For the continuous covariates, LHD expenditures per capita and infant

mortality rate were significant. A one standard deviation increase in LHD expenditures per capita resulted in a 3.6% increase in perceived effectiveness, while a one standard deviation increase in infant mortality rate resulted in a 7.5% decrease in perceived effectiveness.

Although nearly significant at the $p<.10$ level, the null model likelihood ratio test was not rejected for these full and reduced models. In this sense, the previous models that included individual organization participation rates were a better fit to perceived effectiveness than these models that included only the average percent of organizations participating.

Table 6.5: Effectiveness of assessment functions multivariate model results.

	Full Model	**Reduced Model**
Observations Read	547	547
Observations Used	512	512
Subjects (Health Departments)	324	324
	Estimate (SE)	Estimate (SE)
Main independent variables:		
LHD contribution to Assessment	0.2211 (0.0164) ***	0.2212 (0.0163) ***
Percentage of orgs participating in assessment	0.0955 (0.0162) ***	0.0955 (0.0161) ***
Control variables:		
FTEs per capita (log)	-0.0224 (0.0278)	-0.0225 (0.0276)
% population < poverty level (log)	-0.0262 (0.0553)	
Population (log)	0.0269 (0.0178)	0.0282 (0.0175)
LHD expenditures/capita (log)	0.0365 (0.0211) *	0.0358 (0.0206) *
% college education (log)	0.0265 (0.0784)	0.0488 (0.0374)
% population non-White (log)	-0.0387 (0.0323)	-0.0436 (0.0292)
Infant mortality rate (log)	-0.0723 (0.0514)	-0.0751 (0.0440) *
Ischemic heart disease mortality rate (log)	0.0002 (0.0737)	
MDs per 100,000 pop (log)	0.0113 (0.0452)	
Hospital beds per 100,000 pop (log)	0.0399 (0.0464)	0.0404 (0.0331)
Board of Health Characteristics:		
Both policymaking and governing	0.0801 (0.0479) *	0.0792 (0.0477) *
BOH has policymaking authority	-0.0191 (0.0565)	-0.0199 (0.0561)
BOH is governing board	0.0841 (0.0592)	0.0821 (0.0581)
Exists, but neither function	0.0203 (0.0423)	0.0208 (0.0416)
No BOH	Ref	Ref
Rural/urban continuum (ref=micro)	-0.0718 (0.0517)	-0.0676 (0.0503)
Jurisdiction type		
Centralized	0.1011 (0.0889)	0.0920 (0.0872)
Mixed	-0.0531 (0.1199)	-0.0541 (0.1164)
Decentralized	Ref	Ref
Year of survey (ref=2006)	-0.1892 (0.0350) ***	-0.1948 (0.0331) ***
Fit Statistics:		
-2 Res Log Likelihood	291.6	280.3
AIC	297.6	286.3
BIC	308.9	297.7
Null model Likelihood Ratio Test	p=0.1399	p=0.1369

*** p-value for t is less than .01; ** p-value for t is less than .05; * p-value for t is less than .10
Not shown in the table: Effect estimates for the states (treated as a fixed effect).

CHAPTER 7

RESULTS: EFFECTIVENESS OF PUBLIC HEALTH POLICY DEVELOPMENT CORE FUNCTIONS

Descriptive Statistics

Table 7.1 shows the descriptive statistics and percent change over time for the policy development core function dependent variable and the independent variables at time 1 (1998) and time 2 (2006). The perceived effectiveness of policy development activities increased 56% between 1998 and 2006, from 0.27 to 0.42 (on a 0 to 1 scale). Overall, the mean perceived effectiveness for policy development activities was 0.33 with a standard deviation of 0.20 and a range of 0 to 0.96. Figure 7.1 and shows the distribution of the dependent variable.

For the main independent variables, LHD contribution to policy development activities increased 18%, which is quite a bit more than the increase seen for assessment activities (5%). As was the case with assessment activities, participation of other agencies and organizations in policy development activities was generally low, ranging from a low of 0.06 for federal government agency participation in 1998 to 0.58 for local government agency participation in 2006. Again, the largest increase in participation in policy development activities was seen for community health centers, with a 127% increase in participation between 1998 and 2006. However, the participation of community health centers was still relatively low, with only 0.34 participation in 2006. As with assessment activities, most other agency/organization types also increased participation in policy development activities, including local and federal government agencies, health insurers, physician practices, hospitals, and colleges/universities. Only

participation by state health agencies, schools, and the "other" category of agencies decreased for policy development activities.

The change in covariates over time was described in the previous chapter for assessment activities, and is repeated here. For the continuous covariates, there were some increases and

Table 7.1: Variable descriptive statistics.

	Time 1: 1998 (n=334)	Time 2: 2006 (n=213)	Percent change
Dependent variable:			
Mean effectiveness of Policy activities (SD)	0.27 (0.17)	0.42 (0.20)	+56%
Main independent variables:			
Mean LHD contribution to Policy (SD)	0.34 (0.19)	0.40 (0.18)	+18%
Mean state health agency participation (SD)	0.40 (0.29)	0.39 (0.28)	-3
Mean Other state gov't agency participation (SD)	0.18 (0.23)	0.18 (0.23)	0
Mean local gov't agency participation (SD)	0.40 (0.30)	0.58 (0.29)	+45
Mean federal gov't agency participation (SD)	0.06 (0.16)	0.10 (0.18)	+67
Mean faith-based orgs participation (SD)	0.28 (0.26)	0.28 (0.26)	0
Mean other nonprofits participation (SD)	0.43 (0.30)	0.43 (0.30)	0
Mean health insurers participation (SD)	0.10 (0.20)	0.12 (0.21)	+20
Mean employers/business groups participation (SD)	0.25 (0.25)	0.25 (0.25)	0
Mean physician practices participation (SD)	0.24 (0.25)	0.28 (0.26)	+17
Mean hospitals participation (SD)	0.43 (0.29)	0.46 (0.28)	+7
Mean community health centers participation (SD)	0.15 (0.24)	0.34 (0.30)	+127
Mean schools participation (SD)	0.36 (0.29)	0.35 (0.29)	-3
Mean colleges/universities participation (SD)	0.19 (0.25)	0.27 (0.28)	+42
Mean other participation (SD)	0.11 (0.20)	0.09 (0.17)	-18
Continuous Covariates:			
Mean FTEs per capita (SD)	60.8 (41.5)	54.2 (35.0)	-11%
Mean percentage of population below federal poverty level (SD)	12.5 (5.6)	10.7 (3.9)	-14%
Mean population of jurisdiction (thousands) (SD)	405 (744)	494 (963)	+22%
Mean LHD expenditures per capita, $ (SD)	35.7 (35.7)	40.8 (29.4)	+15%
Mean percentage of population with college education (SD)	24.7 (8.8)	24.7 (9.1)	--
Mean percentage of population non-White (SD)	22.8 (16.7)	27.1 (16.9)	+19
Mean infant mortality rate (SD)	22.7 (16.7)	19.3 (9.6)	-15
Mean ischemic heart disease mortality rate (SD)	171.2 (61.8)	160.1 (56.7)	-6
Mean MDs per 100,000 pop (SD)	246.3 (209.8)	265.9 (199.7)	+8
Mean hospital beds per 100,000 pop (SD)	342.5 (226.7)	292.3 (182.5)	-17%
Categorical variables			
Board of Health Characteristics, %			
BOH has policymaking and governing	26.4	45.1	+71
BOH has policymaking authority only	14.4	8.0	-44
BOH is governing board only	9.9	3.3	-67

BOH exists, but neither function	25.8	16.4	-36
BOH does not exist	23.7	27.2	+15
Rural/urban continuum, %			
Metropolitan area	93.7	94.8	+1
Micropolitan area	6.3	5.2	-17
Jurisdiction type, %			
Centralized	12.6	12.7	+1
Mixed	18.6	14.1	-24
Decentralized	68.9	73.2	+6

some decreases between 1998 and 2006. Mean FTEs per capita, mean percentage of population below the federal poverty level, mean infant mortality rate, mean ischemic heart disease mortality rate, and mean hospital beds per 100,000 population all decreased over time. The largest percentage decrease was for the mean number of hospital beds per 100,000 population, which decreased 17%, from 342.5 to 292.3. Mean population of the jurisdiction, mean LHD expenditures per capita, mean percentage of population non-white, and mean MDs per 100,000 population all increased over time. The largest percentage increase was seen for the mean population of the jurisdiction, which increased by 22%, from 405 to 494 thousand. For the categorical variables, there was a notable increase (71%) in the boards of health with both policymaking and governing authority. Roughly 94% of the jurisdictions were metropolitan as opposed to micropolitan in both 1998 and 2006. Most jurisdictions were decentralized, at 68.9% in 1998 and 73.2% in 2006. The remainder of the jurisdictions were about evenly split between the centralized and mixed jurisdiction types.

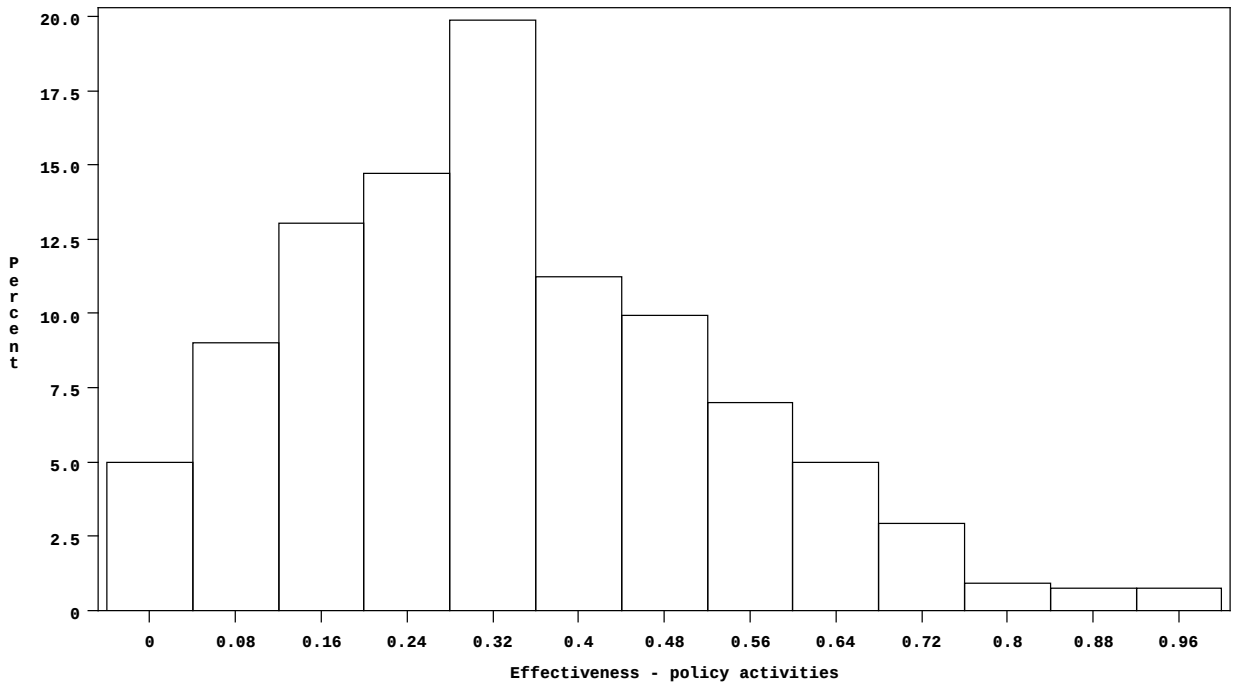

Figure 7.1: Histogram of perceived effectiveness of policy development activities.

Bivariate Analysis

Figure 7.2 is a simple scatter plot that shows an increase in perceived effectiveness of policy development activities as the main independent variable, LHD contribution to policy development activities, increases. Not shown are scatter plots for the participation rates of the individual agency/organization types against the dependent variable. These plots showed variability in the linear relationships between perceived effectiveness of policy development activities and the participation of different types of organizations in policy development activities.

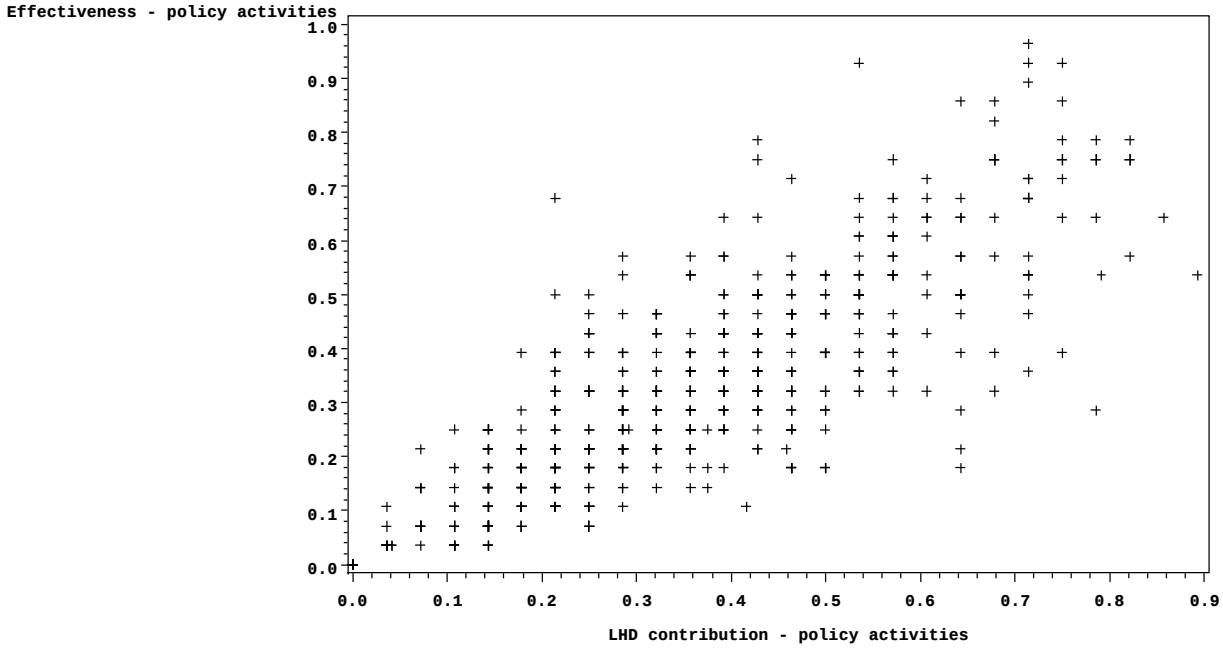

Figure 7.2: Plot of LHD contribution to policy development activities against perceived effectiveness of policy development activities.

Pearson correlations, p-values, and sample sizes for the first year of data (1998) are shown in Table 7.3 for the log-transformed dependent variable and continuous covariates. (Table 7.2 provides the sas variable names and labels corresponding to table 7.3.) This table shows that several covariates are significantly correlated with the dependent variable, as well as with each other. As described in the previous chapter, correlation between covariates is an indicator of potential collinearity issues in the original full model specification (all variables included). As noted in the methods section, these correlations were considered in the model reduction steps, along with the p-values of effect estimates. At the p<.05 level, the following covariates were correlated with the perceived effectiveness of policy development activities (l_effpol): the

percent non-white population (l_pctnonwh), the percent with a college education (l_collpct), and the percent below the federal poverty level (l_povpct). However, although

Table 7.2. SAS variable names and labels.	
SAS variable name	Label
l_effpol	Log of effectiveness of policy development core functions
l_ftecap	Log of FTEs per capita
l_pctnonwh	Log of percent population nonwhite
l_collpct	Log of percent of population with a college degree
l_povpct	Log of percent of population below the federal poverty level
l_pop	Log of population size
l_expcap	Log of expenditures per capita
l_dratinf	Log of infant mortality rate
l_draihd	Log of Ischemic heart disease mortality rate
l_mdpcap	Log of MDs per 100,000 population
l_bedpcap	Log of hospital beds per 100,000 population

Table 7.3: Correlation analysis for policy development dependent variable and continuous covariates.

	l_effpol	l_ftecap	l_pctnonwh	l_collpct	l_povpct	l_pop	l_expcap	l_dratinf	l_draihd	l_mdpcap	l_bedpcap
l_effpol	1.00000 322	0.04970 0.3770 318	-0.16785 0.0025 322	0.18188 0.0010 322	-0.20525 0.0002 322	-0.03359 0.5481 322	0.06038 0.2854 315	-0.04064 0.4674 322	0.00882 0.8748 322	0.09404 0.0921 322	0.03950 0.4827 318
l_ftecap		1.00000 330	0.15242 0.0055 330	-0.17772 0.0012 330	0.23877 <.0001 330	-0.09380 0.0889 330	0.85364 <.0001 323	0.02194 0.6913 330	0.02603 0.6375 330	-0.02817 0.6101 330	0.02439 0.6608 326
l_pctnonwh			1.00000 334	0.04392 0.4237 334	0.53555 <.0001 334	0.37164 <.0001 334	0.18562 0.0007 327	0.60270 <.0001 334	-0.10340 0.0591 334	0.30557 <.0001 334	0.25544 <.0001 330
l_collpct				1.00000 334	-0.48593 <.0001 334	0.26485 <.0001 334	-0.08190 0.1395 327	0.10706 0.0506 334	-0.43151 <.0001 334	0.57965 <.0001 334	-0.04571 0.4079 330
l_povpct					1.00000 334	0.11900 0.0297 334	0.23994 <.0001 327	0.37144 <.0001 334	0.26315 <.0001 334	0.03792 0.4898 334	0.47279 <.0001 330
l_pop						1.00000 334	0.06875 0.2150 327	0.39555 <.0001 334	-0.02203 0.6883 334	0.33429 <.0001 334	0.07857 0.1544 330
l_expcap							1.00000 327	0.07577 0.1716 327	0.01413 0.7990 327	0.03660 0.5095 327	0.02441 0.6621 323
l_dratinf								1.00000 334	0.34496 <.0001 334	0.50371 <.0001 334	0.46488 <.0001 330
l_draihd									1.00000 334	0.05087 0.3540 334	0.38618 <.0001 330
l_mdpcap										1.00000 334	0.57363 <.0001 330
l_bedpcap											1.00000 330

statistically significant, the correlation coefficients were relatively small, approximately in the range of 0.10 to 0.20. As described in the previous chapter on assessment function results, there were several significant correlations between the covariates. As expected, the mean LHD expenditures per capita (l_expcap) was highly correlated with the mean LHD FTEs per capita (l_ftecap) (Rho=0.85364). The next largest Rho values were 0.60270 ($p<0.0001$) for the correlation between infant mortality rate (l_dratinf) and percentage of population nonwhite (l_pctnonwh). The remaining Rho values were between -0.48593 for the correlation between percentage of population with a college education (l_collpct) and percentage of population below the poverty level (l_povpct), and 0.57965 ($p<0.0001$) for the correlation between the number of MDs per capita (l_mdpcap) and the percentage of population with a college education (l_collpct).

Multivariate Models

Models with individual organization participation variables

Full (all variables included) and reduced multivariate model results are shown in Table 7.4. There were 408 observations used in the full model and 408 observations used in the reduced model. The number of health departments included was 221 in the full model and 221 in the reduced model. For the full and reduced models, the main independent variable, LHD contribution to policy development activities, was positively and highly significantly associated with perceived effectiveness of policy development activities ($p<.01$). With a coefficient of 0.3797 in the final reduced model, this mean that for each standard deviation increase in the LHD contribution to policy development activities, there is a 38% increase in the mean

perceived effectiveness of the policy development activities. (Recall that the dependent variable was log transformed, while the independent variable was standardized by its standard deviation.)

For the other set of main independent variables, only the participation of local government agencies and hospitals were also positively and significantly associated with perceived effectiveness of policy development activities, both at the $p<.01$ level. The smallest significant positive effect was for participation of local government agencies, with a 8.9% increase in perceived effectiveness for each standard deviation increase in the participation of local government agencies. For each standard deviation increase in hospital participation, there was a 12.8% increase in perceived effectiveness of policy development activities. There were no significant negative associations for any of the organization/agency participation variables.

The following covariates were dropped in the final, reduced models for the policy development activities: board of health characteristics, percentage of population below the federal poverty level, population size of jurisdiction, percentage of population non-white, both mortality rates, and MDs per 100,000 population. Only a few remaining covariates were significant, including rural/urban continuum, jurisdiction type, and year of survey. For the rural/urban continuum variable, there was a 15.1% lower perceived effectiveness for metropolitan compared to micropolitan jurisdiction. For jurisdiction type, there was a 17.3% higher perceived effectiveness for centralized jurisdiction compared to decentralized. Finally, for year of the survey, there was a 25% lower perceived effectiveness for 1998 compared to 2006.

Regarding model fit, the final reduced model achieved a smaller (better) AIC and BIC than the full models, as to be expected after dropping highly insignificant independent variables. Both the full and reduced models failed to reject the null model likelihood ratio test; however the reduced model was nearly significant at $p=0.1477$.

Table 7.4: Effectiveness of policy development functions multivariate model results.

	Full Model	**Reduced Model**
Observations Read	547	547
Observations Used	408	408
Subjects (Health Departments)	221	221
	Estimate (SE)	Estimate (SE)
Main independent variables:		
LHD contribution to Policy	0.3774 (0.0234) ***	0.3797 (0.0231) ***
State health agency participation	0.0214 (0.0232)	0.0174 (0.0236)
Other state gov't agency participation	-0.0338 (0.0219)	-0.0314 (0.0215)
Local gov't agency participation	0.0890 (0.0248) ***	0.0892 (0.0245) ***
Federal gov't agency participation	0.0178 (0.0219)	0.0173 (0.0216)
Faith-based orgs participation	-0.0283 (0.0294)	-0.0382 (0.0279)
Other nonprofits participation	0.0180 (0.0242)	0.0250 (0.0231)
Health insurers participation	0.0254 (0.0208)	0.0201 (0.0202)
Employers/business groups participation	0.0355 (0.0267)	0.0376 (0.0265)
Physician practices participation	0.0118 (0.0205)	0.0177 (0.0211)
Hospitals participation	0.1267 (0.0300) ***	0.1276 (0.0288) ***
Community health centers participation	0.0218 (0.0206)	0.0162 (0.0198)
Schools participation	-0.0310 (0.0255)	-0.0277 (0.0256)
Colleges/universities participation	0.0104 (0.0200)	0.0084 (0.0200)
Other participation	0.0243 (0.0183)	0.0198 (0.0177)
Control variables:		
FTEs per capita (log)	-0.0376 (0.0388)	-0.0430 (0.0373)
% population < poverty level (log)	-0.0552 (0.1064)	
Population (log)	-0.0011 (0.0252)	
LHD expenditures/capita (log)	0.0509 (0.0313)	0.0466 (0.0298)
% college education (log)	0.0676 (0.1108)	0.0859 (0.0479)
% population non-White (log)	-0.0113 (0.0467)	
Infant mortality rate (log)	-0.0413 (0.0766)	
Ischemic heart disease mortality rate (log)	0.0517 (0.0973)	
MDs per 100,000 pop (log)	0.0240 (0.0656)	
Hospital beds per 100,000 pop (log)	0.0540 (0.0511)	0.0359 (0.0286)
Board of Health Characteristics:		
Both policymaking and governing	-0.0024 (0.0670)	
BOH has policymaking authority	0.0108 (0.0742)	
BOH is governing board	0.0215 (0.0977)	
Exists, but neither function	-0.0587 (0.0582)	
No BOH	Ref	
Rural/urban continuum (ref=micro)	-0.1499 (0.0893) *	-0.1510 (0.0856) *
Jurisdiction type		
Centralized	0.2411 (0.1158) **	0.1730 (0.0946) *
Mixed	-0.0994 (0.1420)	-0.1630 (0.1247)
Decentralized	Ref	Ref
Year of survey (ref=2006)	-0.2437 (0.0481) ***	-0.2501 (0.0385) ***
Fit Statistics:		
-2 Res Log Likelihood	473.7	440.5
AIC	479.7	446.5
BIC	489.9	456.7
Null model Likelihood Ratio Test	p=0.2129	p=0.1477

*** p-value for t is less than .01; ** p-value for t is less than .05; * p-value for t is less than .10
Not shown in the table: Effect estimates for states (treated as a fixed effect).

Models with percent of organizations contributing variable

Table 7.5 shows the results for the full and reduced models for the models that include the mean percentage of organizations participating, instead of the individual organization participation rates. There were 504 observations used in the full model and 519 observations used in the reduced model. There were 324 health departments in the full model and 327 in the reduced model. This model has the advantage of having a larger sample size due to the averaging of the participation of organizations, rather than using each individual organization participation rate. In the case of using the individual organization participation rates, the observation is deleted if any of the responses are missing, whereas an average participation rate is calculated even if one or more responses is missing for a given observation.

In both the full and reduced models shown in table 7.4, the LHD contribution to policy development activities is positively and highly significantly associated with the perceived effectiveness of policy development activities. Each one standard deviation increase in LHD contribution to policy development activities results in a 38% increase in perceived effectiveness of policy development activities. Likewise, the percentage of organizations participating in policy development activities is positively and highly significantly associated with the perceived effectiveness of policy development activities. Each one standard deviation increase in percentage of organizations participating in policy development activities results in a 23.1% increase in perceived effectiveness of policy development activities.

There were only a few significant control variables in the final, reduced model. This included percent of population below the federal poverty level, rural/urban continuum, percent of population non-white, and number of hospital beds per 100,000 population. For each standard deviation increase in percent of population below the federal poverty level, there was a 13%

decrease in perceived effectiveness of policy development activities. For each standard deviation increase in percent of population non-white, there was a 5.3% decrease in perceived effectiveness of policy development activities. For each standard deviation increase in number of hospital beds per 100,000 population, there was a 12.1% increase in perceived effectiveness of policy development activities. Lastly, there was a 12.3% lower perceived effectiveness of policy development activities for metropolitan compared to micropolitan area.

Both the full and reduced models rejected the null model likelihood ratio test, with p=0.0219 for the reduced, final model.

Table 7.5: Effectiveness of policy development functions multivariate model results.

	Full Model	**Reduced Model**
Observations Read	547	547
Observations Used	504	519
Subjects (Health Departments)	324	327
	Estimate (SE)	Estimate (SE)
Main independent variables:		
LHD contribution to Policy	0.3822 (0.0193) ***	0.3841 (0.0190) ***
Percentage of orgs participating in assessment	0.2310 (0.0201) ***	0.2305 (0.0200) ***
Covariates:		
FTEs per capita (log)	0.0121 (0.0369)	
% population < poverty level (log)	-0.0779 (0.0902)	-0.1342 (0.0652) **
Population (log)	0.0079 (0.0256)	
LHD expenditures/capita (log)	0.0331 (0.0265)	0.0499 (0.0255)
% college education (log)	0.0408 (0.1002)	
% population non-White (log)	-0.0628 (0.0412)	-0.0526 (0.0312) *
Infant mortality rate (log)	-0.0180 (0.0654)	
Ischemic heart disease mortality rate (log)	-0.0314 (0.0870)	
MDs per 100,000 pop (log)	-0.0095 (0.0591)	
Hospital beds per 100,000 pop (log)	0.1230 (0.0500) **	0.1206 (0.0361) ***
Board of Health Characteristics:		
Both policymaking and governing	-0.0556 (0.0590)	-0.0301 (0.0571)
BOH has policymaking authority	-0.0201 (0.0700)	0.0118 (0.0689)
BOH is governing board	-0.0548 (0.0830)	-0.0328 (0.0818)
Exists, but neither function	-0.0841 (0.0536)	-0.0729 (0.0513)
No BOH	Ref	Ref
Rural/urban continuum (ref=micro)	-0.1322 (0.0775) *	-0.1226 (0.0708) *
Jurisdiction type		
Centralized	-0.0327 (0.1418)	-0.0017 (0.1374)
Mixed	-0.0876 (0.1312)	-0.0506 (0.1179)
Decentralized	Ref	Ref
Year of survey (ref=2006)	-0.2559 (0.0417) ***	-0.2446 (0.0357)
Fit Statistics:		
-2 Res Log Likelihood	531.2	520.1
AIC	537.2	526.1
BIC	548.5	537.5
Null model Likelihood Ratio Test	p=0.0271	p=0.0219

*** p-value for t is less than .01; ** p-value for t is less than .05; * p-value for t is less than .10
Not shown in the table: Effect estimates for states (treated as a fixed effect).

CHAPTER 8

RESULTS: EFFECTIVENESS OF PUBLIC HEALTH ASSURANCE CORE FUNCTIONS

Descriptive Statistics

Table 8.1 shows the descriptive statistics and percent change over time for the assurance core function dependent variable and the independent variables at time 1 (1998) and time 2 (2006). The perceived effectiveness of assurance activities increased by 8% between 1998 and 2006, from 0.38 to 0.41 (on a 0 to 1 scale). Overall, the mean perceived effectiveness for assurance activities was 0.39 with a standard deviation of 0.18 and a range of 0 to 0.92. Figure 7.1 and shows the distribution of the dependent variable.

For the main independent variables, LHD contribution to assurance activities stayed the same between the two time periods, at 0.40. For the participation of other agencies and organizations, participation rates were generally low for the assurance activities, ranging from a low of 0.05 for federal government participation in 1998 to 0.47 for local government participation in 2006. Regarding change over time, just as the case for assessment and policy development activities, the largest increase was seen for community health centers, with 130% increase in participation between 1998 and 2006. However, the participation rate was still relatively low for community health centers, at only 0.23 in 2006. Most other agencies/organizations also increased participation in assurance activities, including local and federal government agencies, health insurers, physician practices and hospitals, colleges/universities, and the “other” category of agencies/organizations. Decreases in participation were seen for state health agency and other state government agencies, faith-based

organizations, employers/business groups, and schools. These decreases were relatively small, however, ranging from a 2% decrease for state health agency participation to a 9% decrease for employers/business groups participation.

The change in covariates over time was described in the previous chapter for assessment activities, and is repeated here. For the continuous covariates, there were some increases and

Table 8.1: Variable descriptive statistics.

	Time 1: 1998 (n=334)	Time 2: 2006 (n=213)	Percent change
Dependent variable:			
Mean effectiveness of Assurance activities (SD)	0.38 (0.16)	0.41 (0.20)	+8%
Main independent variables:			
Mean LHD contribution to Assurance (SD)	0.40 (0.21)	0.40 (0.20)	--
Mean state health agency participation (SD)	0.41 (0.26)	0.40 (0.26)	-2
Mean Other state gov't agency participation (SD)	0.15 (0.20)	0.14 (0.19)	-7
Mean local gov't agency participation (SD)	0.26 (0.24)	0.47 (0.29)	+81
Mean federal gov't agency participation (SD)	0.05 (0.12)	0.11 (0.18)	+120
Mean faith-based orgs participation (SD)	0.16 (0.18)	0.15 (0.18)	-6
Mean other nonprofits participation (SD)	0.28 (0.23)	0.28 (0.23)	0
Mean health insurers participation (SD)	0.08 (0.15)	0.10 (0.17)	+25
Mean employers/business groups participation (SD)	0.11 (0.17)	0.10 (0.16)	-9
Mean physician practices participation (SD)	0.15 (0.17)	0.18 (0.17)	+20
Mean hospitals participation (SD)	0.29 (0.21)	0.31 (0.22)	+7
Mean community health centers participation (SD)	0.10 (0.17)	0.23 (0.22)	+130
Mean schools participation (SD)	0.22 (0.21)	0.21 (0.21)	-5
Mean colleges/universities participation (SD)	0.11 (0.17)	0.17 (0.22)	+55
Mean other participation (SD)	0.06 (0.13)	0.08 (0.16)	+33
Continuous Covariates:			
Mean FTEs per capita (SD)	60.8 (41.5)	54.2 (35.0)	-11%
Mean percentage of population below federal poverty level (SD)	12.5 (5.6)	10.7 (3.9)	-14%
Mean population of jurisdiction (thousands) (SD)	405 (744)	494 (963)	+22%
Mean LHD expenditures per capita, $ (SD)	35.7 (35.7)	40.8 (29.4)	+15%
Mean percentage of population with college education (SD)	24.7 (8.8)	24.7 (9.1)	--
Mean percentage of population non-White (SD)	22.8 (16.7)	27.1 (16.9)	+19
Mean infant mortality rate (SD)	22.7 (16.7)	19.3 (9.6)	-15
Mean ischemic heart disease mortality rate (SD)	171.2 (61.8)	160.1 (56.7)	-6
Mean MDs per 100,000 pop (SD)	246.3 (209.8)	265.9 (199.7)	+8
Mean hospital beds per 100,000 pop (SD)	342.5 (226.7)	292.3 (182.5)	-17%
Categorical variables			
Board of Health Characteristics, %			
BOH has policymaking and governing	26.4	45.1	+71

BOH has policymaking authority only	14.4	8.0	-44
BOH is governing board only	9.9	3.3	-67
BOH exists, but neither function	25.8	16.4	-36
BOH does not exist	23.7	27.2	+15
Rural/urban continuum, %			
Metropolitan area	93.7	94.8	+1
Micropolitan area	6.3	5.2	-17
Jurisdiction type, %			
Centralized	12.6	12.7	+1
Mixed	18.6	14.1	-24
Decentralized	68.9	73.2	+6

some decreases between 1998 and 2006. Mean FTEs per capita, mean percentage of population below the federal poverty level, mean infant mortality rate, mean ischemic heart disease mortality rate, and mean hospital beds per 100,000 population all decreased over time. The largest percentage decrease was for the mean number of hospital beds per 100,000 population, which decreased 17%, from 342.5 to 292.3. Mean population of the jurisdiction, mean LHD expenditures per capita, mean percentage of population non-white, and mean MDs per 100,000 population all increased over time. The largest percentage increase was seen for the mean population of the jurisdiction, which increased by 22%, from 405 to 494 thousand. For the categorical variables, there was a notable increase (71%) in the boards of health with both policymaking and governing authority. Roughly 94% of the jurisdictions were metropolitan as opposed to micropolitan in both 1998 and 2006. Most jurisdictions were decentralized, at 68.9% in 1998 and 73.2% in 2006. The remainder of the jurisdictions were about evenly split between the centralized and mixed jurisdiction types.

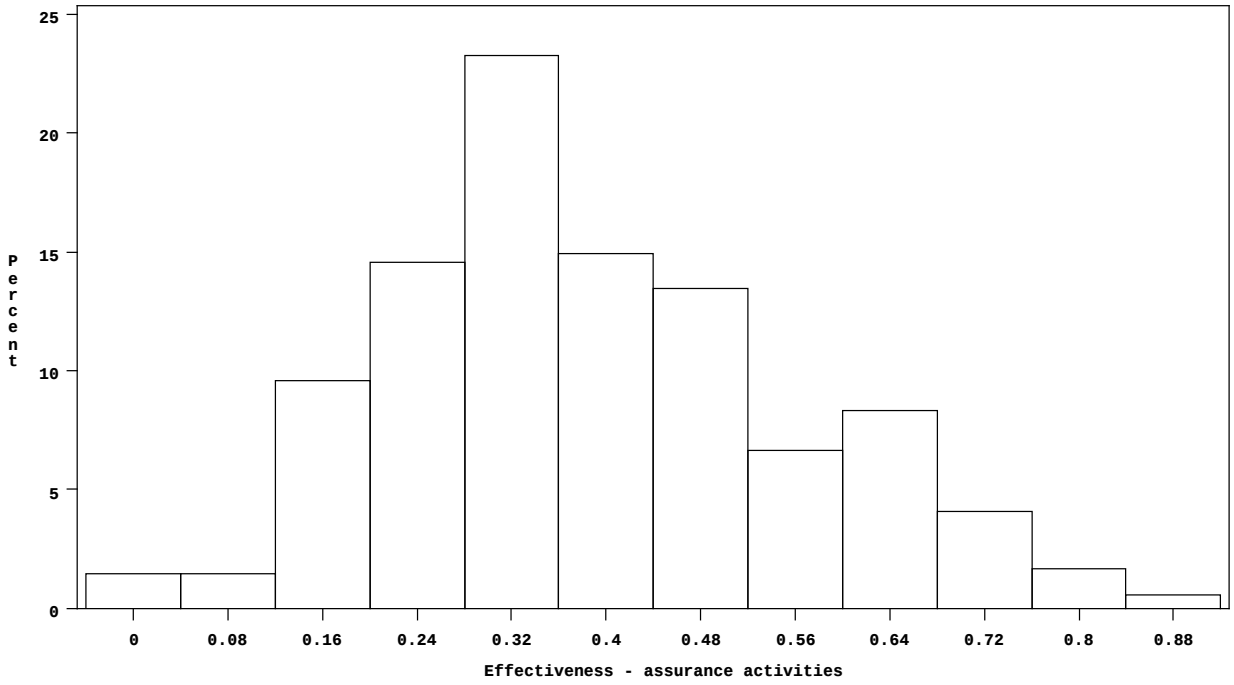

Figure 8.1. Histogram of perceived effectiveness of assurance activities.

Bivariate Analysis

Figure 8.2 is a simple scatter plot that shows an increase in perceived effectiveness of assurance activities as the main independent variable, LHD contribution to assurance activities, increases. Not shown are scatter plots for the participation rates of the individual agency/organization types against the dependent variable. These plots showed variability in the linear relationships between perceived effectiveness of assurance activities and the participation of different types of organizations in assurance activities.

Pearson correlations, p-values, and sample sizes for the first year of data (1998) are shown in Table 8.3 for the log-transformed dependent variable and continuous covariates. (Table

8.2 provides the sas variable names and labels corresponding to table 8.3.) This

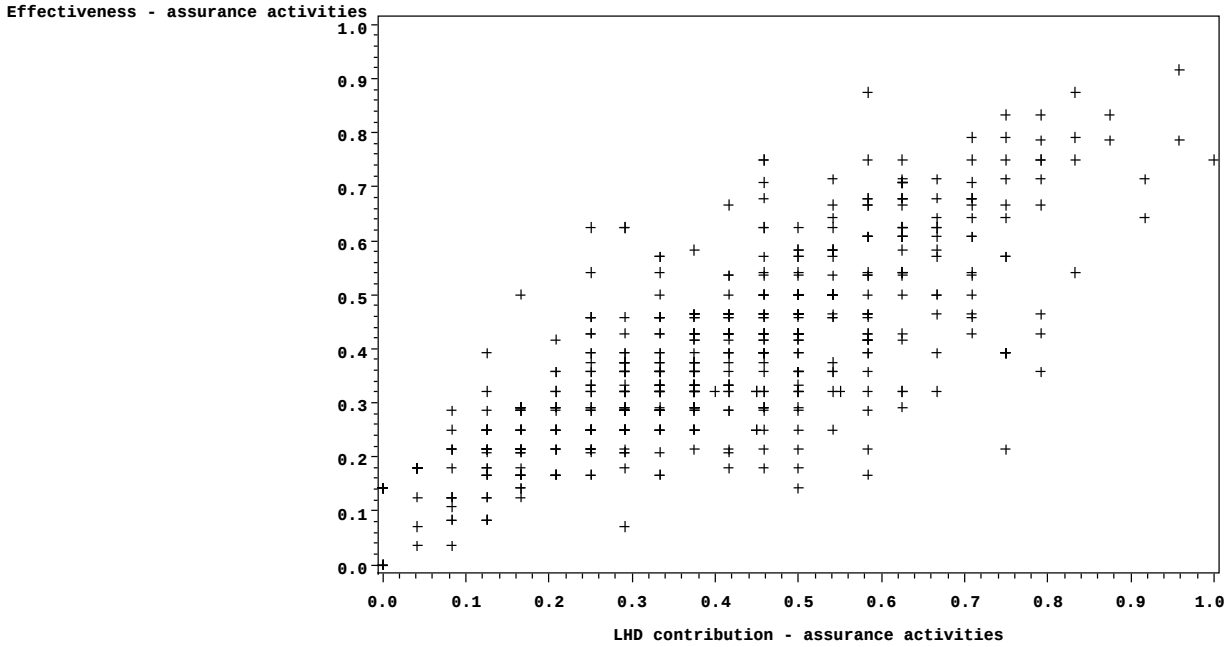

Figure 8.2: Plot of LHD contribution to assurance activities against perceived effectiveness of assurance activities.

table shows that several covariates are significantly correlated with the dependent variable, as well as with each other. As described in the previous chapter, correlation between covariates is an indicator of potential collinearity issues in the original full model specification (all variables included). As noted in the methods section, these correlations were considered in the model reduction steps, along with the p-values of effect estimates. At the $p<.05$ level, the following covariate was significantly negatively correlated with the perceived effectiveness of assurance activities (l_effasr): the percent non-white population (l_pctnonwh). However, although

statistically significant, the correlation coefficient is relatively small, at Rho=-0.14322. As described in the previous chapters on assessment policy development function results, there were several significant correlations between the covariates. As expected, the mean LHD expenditures per capita (l_expcap) was highly correlated with the mean LHD FTEs per capita (l_ftecap) (Rho=0.85364). The next largest Rho values were 0.60270 ($p<0.0001$) for the correlation between infant mortality rate (l_dratinf) and percentage of population nonwhite (l_pctnonwh). The remaining Rho values were between -0.48593 for the correlation between percentage of population with a college education (l_collpct) and percentage of population below the poverty level (l_povpct), and 0.57965 ($p<0.0001$) for the correlation between the number of MDs per capita (l_mdpcap) and the percentage of population with a college education (l_collpct).

Multivariate Models

Models with individual organization participation variables

Full (all variables included) and reduced multivariate model results are shown in Table 8.4. There 407 observations used in the full model and 409 observations used in the reduced model. The number of health departments included was 221 in the full model and 222 in the reduced model. For the reduced, final model, LHD contribution to assurance activities was positively and significantly associated with perceived effectiveness of assurance activities ($p<.01$). With a coefficient of 0.3434 in the reduced model, this means that for each standard deviation increase in the LHD contribution to assurance activities, there is a 34% increase in perceived effectiveness of assurance activities. (Recall that the dependent variable was log transformed while the independent variable was standardized by its standard deviation.)

Table 8.2. SAS variable names and labels.	
SAS variable name	Label
l_effasr	Log of effectiveness of assurance core functions
l_ftecap	Log of FTEs per capita
l_pctnonwh	Log of percent population nonwhite
l_collpct	Log of percent of population with a college degree
l_povpct	Log of percent of population below the federal poverty level
l_pop	Log of population size
l_expcap	Log of expenditures per capita
l_dratinf	Log of infant mortality rate
l_draihd	Log of Ischemic heart disease mortality rate
l_mdpcap	Log of MDs per 100,000 population
l_bedpcap	Log of hospital beds per 100,000 population

Table 8.3: Correlation analysis for assurance dependent variable and continuous covariates.

	l_effasr	l_ftecap	l_pctnonwh	l_collpct	l_povpct	l_pop	l_expcap	l_dratinf	l_draihd	l_mdpcap	l_bedpcap
l_effasr	1.00000 322	0.07106 0.2013 325	-0.14322 0.0093 329	0.03770 0.4956 329	-0.04646 0.4009 329	0.06723 0.2239 329	0.07885 0.1581 322	-0.05587 0.3123 329	-0.00501 0.9278 329	0.01276 0.8176 329	0.00532 0.9239 325
l_ftecap		1.00000 330	0.15242 0.0055 330	-0.17772 0.0012 330	0.23877 <.0001 330	-0.09380 0.0889 330	0.85364 <.0001 323	0.02194 0.6913 330	0.02603 0.6375 330	-0.02817 0.6101 330	0.02439 0.6608 326
l_pctnonwh			1.00000 334	0.04392 0.4237 334	0.53555 <.0001 334	0.37164 <.0001 334	0.18562 0.0007 327	0.60270 <.0001 334	-0.10340 0.0591 334	0.30557 <.0001 334	0.25544 <.0001 330
l_collpct				1.00000 334	-0.48593 <.0001 334	0.26485 <.0001 334	-0.08190 0.1395 327	0.10706 0.0506 334	-0.43151 <.0001 334	0.57965 <.0001 334	-0.04571 0.4079 330
l_povpct					1.00000 334	0.11900 0.0297 334	0.23994 <.0001 327	0.37144 <.0001 334	0.26315 <.0001 334	0.03792 0.4898 334	0.47279 <.0001 330
l_pop						1.00000 334	0.06875 0.2150 327	0.39555 <.0001 334	-0.02203 0.6883 334	0.33429 <.0001 334	0.07857 0.1544 330
l_expcap							1.00000 327	0.07577 0.1716 327	0.01413 0.7990 327	0.03660 0.5095 327	0.02441 0.6621 323
l_dratinf								1.00000 334	0.34496 <.0001 334	0.50371 <.0001 334	0.46488 <.0001 330
l_draihd									1.00000 334	0.05087 0.3540 334	0.38618 <.0001 330
l_mdpcap										1.00000 334	0.57363 <.0001 330
l_bedpcap											1.00000 330

For the other set of main independent variables, the participation of state health agencies, local government agencies, hospitals and colleges/universities were also positively and significantly associated with perceived effectiveness of assurance activities, each at the $p<.05$level. The smallest significant positive effect was for state health agency participation, with a 4.2% increase in perceived effectiveness of assurance activities for each standard deviation increase in state health agency participation. The largest significant positive effect was for hospitals participation, with a 6.3% increase in perceived effectiveness of assurance activities for each standard deviation increase in LHD contribution to assurance activities. There were no significant negative associations for participation of agencies/organizations with perceived effectiveness of assurance activities.

Only a few covariates remained and were significant in the reduced model. These included percentage of population with a college education, infant mortality rate, and MDs per 100,000 population. For each one percent increase in percentage with a college education, there was (interestingly) a 12.5% decrease in perceived effectiveness of assurance activities. For each one percent increase in infant mortality rate, there was a 11.6% decrease in perceived effectiveness of assurance activities. For each one percent increase in MDs per 100,000, there was a 7.2% increase in perceived effectiveness of assurance activities.

Regarding model fit, both the full and reduced models failed to reject the null model likelihood ratio test, with a p-value of 0.2645 for the full model and 0.3508 for the reduced model. By this measure, these assurance models were less of a good fit than either the assessment or policy development models. Nonetheless, these models were able to identify positive, significant associations between perceived effectiveness and the main independent variables.

Table 8.4: Effectiveness of assurance functions multivariate model results.

	Full Model	**Reduced Model**
Observations Read	547	547
Observations Used	407	409
Subjects (Health Departments)	221	222
	Estimate (SE)	Estimate (SE)
Main independent variables:		
LHD contribution to Assurance	0.3415 (0.0163) ***	0.3434 (0.0165) ***
State health agency participation	0.0419 (0.0196) **	0.0421 (0.0188) **
Other state gov't agency participation	-0.0186 (0.0204)	-0.0183 (0.0194)
Local gov't agency participation	0.0452 (0.0185) **	0.0464 (0.0183) **
Federal gov't agency participation	-0.0089 (0.0159)	-0.0090 (0.0160)
Faith-based orgs participation	0.0049 (0.0265)	0.0047 (0.0249)
Other nonprofits participation	0.0001 (0.0238)	0.0006 (0.0222)
Health insurers participation	0.0182 (0.0144)	0.0194 (0.0139)
Employers/business groups participation	0.0179 (0.0211)	0.0186 (0.0207)
Physician practices participation	0.0050 (0.0187)	0.0043 (0.0182)
Hospitals participation	0.0635 (0.0202) ***	0.0628 (0.0196) ***
Community health centers participation	-0.0127 (0.0188)	-0.0128 (0.0185)
Schools participation	-0.0307 (0.0230)	-0.0301 (0.0226)
Colleges/universities participation	0.0444 (0.0174) **	0.0442 (0.0172) **
Other participation	0.0062 (0.0136)	0.0070 (0.0131)
Control variables:		
FTEs per capita (log)	-0.0618 (0.0409)	-0.0643 (0.0403)
% population < poverty level (log)	-0.0055 (0.0809)	
Population (log)	0.0115 (0.0264)	
LHD expenditures/capita (log)	0.0474 (0.0288)	0.0455 (0.0291)
% college education (log)	-0.1712 (0.0996) *	-0.1248 (0.0663) *
% population non-White (log)	-0.0226 (0.0355)	
Infant mortality rate (log)	-0.0893 (0.0660)	-0.1160 (0.0482) **
Ischemic heart disease mortality rate (log)	-0.0489 (0.0851)	
MDs per 100,000 pop (log)	0.0929 (0.0564)	0.0721 (0.0426) *
Hospital beds per 100,000 pop (log)	-0.0172 (0.0519)	
Board of Health Characteristics:		
Both policymaking and governing	-0.0094 (0.0662)	
BOH has policymaking authority	0.0276 (0.0688)	
BOH is governing board	0.0444 (0.0743)	
Exists, but neither function	0.0210 (0.0508)	
No BOH	Ref	
Rural/urban continuum (ref=micro)	-0.0268 (0.0708)	
Jurisdiction type		
Centralized	-0.0106 (0.1218)	
Mixed	-0.0007 (0.1152)	
Decentralized	Ref	
Year of survey (ref=2006)	0.0212 (0.0387)	0.0307 (0.0345)
Fit Statistics:		
-2 Res Log Likelihood	365.0	326.9
AIC	371.0	332.9
BIC	381.2	343.1
Null model Likelihood Ratio Test	p=0.2654	p=0.3508

*** p-value for t is less than .01; ** p-value for t is less than .05; * p-value for t is less than .10

Models with percent of organizations contributing variable

Table 8.5 shows the results for the full and reduced models for the models that include the mean percentage of organizations participating, instead of the individual organization participation variables. There were 509 observations used in the full model and 514 observations used in the reduced model. There were 324 health departments in the full model, and 328 in the reduced model. This model has the advantage of having a larger sample size due to the averaging of the participation of organizations, rather than using each individual organization participation rate. In the case of using the individual organization participation rates, the observation is deleted if any of the responses are missing, whereas an average participation rate is calculated even if one or more responses is missing for a given observation.

In both the full and reduced models shown in table 8.4, the LHD contribution to assurance activities is positively and highly significantly associated with the perceived effectiveness of assurance activities. Each one standard deviation increase in LHD contribution to assurance activities results in a 32.9% increase in perceived effectiveness of assurance activities. Likewise, the percentage of organizations contributing to assurance activities is positively and highly significantly associated with perceived effectiveness of assurance activities. Each one standard deviation increase in the percentage of organizations participating in assurance activities is associated with an 11.5% increase in perceived effectiveness of assurance activities.

There were only two remaining and significant control variables in the final, reduced model. This included a 5.8% increase in perceived effectiveness of assurance activities for each

one percent increase in LHD expenditures per capita. Also, there was a 5.1% higher perceived effectiveness for 1998 compared to 2006, after controlling for the other factors.

Just as the null model likelihood ratio tests p-values were not significant in the assurance models that included the individual organization participation variables, these models that included the percent of organizations participating were also not significant.

Table 8.5: Effectiveness of assurance functions multivariate model results.

	Full Model	**Reduced Model**
Observations Read	547	547
Observations Used	509	514
Subjects (Health Departments)	324	328
	Estimate (SE)	Estimate (SE)
Main independent variables:		
LHD contribution to Assurance	0.3291 (0.0154) ***	0.3288 (0.0153) ***
Percentage of orgs participating in assessment	0.1156 (0.0160) ***	0.1146 (0.0156) ***
Control variables:		
FTEs per capita (log)	-0.0556 (0.0375)	-0.0569 (0.0355)
% population < poverty level (log)	0.0080 (0.0769)	
Population (log)	0.0151 (0.0245)	
LHD expenditures/capita (log)	0.0577 (0.0295) *	0.0577 (0.0286) **
% college education (log)	-0.0511 (0.0993)	
% population non-White (log)	-0.0250 (0.0340)	
Infant mortality rate (log)	-0.0504 (0.0589)	-0.0455 (0.0352)
Ischemic heart disease mortality rate (log)	-0.0346 (0.0788)	
MDs per 100,000 pop (log)	0.0312 (0.0467)	0.0196 (0.0239)
Hospital beds per 100,000 pop (log)	0.0208 (0.0455)	
Board of Health Characteristics:		
Both policymaking and governing	-0.0361 (0.0510)	
BOH has policymaking authority	0.0094 (0.0566)	
BOH is governing board	-0.0090 (0.0620)	
Exists, but neither function	-0.0372 (0.0454)	
No BOH	Ref	
Rural/urban continuum (ref=micro)	-0.0821 (0.0679)	-0.0826 (0.0639)
Jurisdiction type		
Centralized	-0.0087 (0.1445)	
Mixed	-0.0194 (0.1428)	
Decentralized	Ref	
Year of survey (ref=2006)	0.0403 (0.0359)	0.0509 (0.0303) *
Fit Statistics:		
-2 Res Log Likelihood	379.8	340.3
AIC	385.8	346.3
BIC	397.1	357.7
Null model Likelihood Ratio Test	p=0.3043	p=0.4799

*** p-value for t is less than .01; ** p-value for t is less than .05; * p-value for t is less than .10

CHAPTER 9

SUMMARY AND CONCLUSIONS

This is the first study to look at how local public health department contributions to core functions and the participation of other community agencies/organizations impact the perceived effectiveness of community delivery of core functions. It seeks to advance the state of knowledge on the implications of participation in core function delivery by contributing a rigorous empirical analysis of these important questions that are unanswered in the extant literature. Studying the relationship between core function effectiveness and system characteristics is a timely and needed study, not only for the field of public health, but for public administration as well.

This concluding chapter will first provide a summary of the study findings and then discuss the implications of the findings. Then, the final section will offer directions for further research in this important area of scholarship.

Summary of Findings

For all three core function activities – assessment, policy development, and assurance – perceived effectiveness increased over time, from an 8% increase for assurance activities (from 38% to 41%) to a 56% increase for policy development activities (from 27% to 42%). LHD contribution to assurance activities stayed the same, at 40%, while LHD contribution to assessment and policy development both increased. LHD contribution to assessment activities increased from 38% to 40%, while contribution to policy development increased from 34% to

40%. It is important to note that these rates of contribution are relatively low, all being under 50% of the total effort contributed to the three areas of activity. The mean participation rates for other agencies/organizations to each core function area were also relatively low, with state and local government agencies contributing the most to each activity area compared to other types of agencies/organizations. Hospitals also participated at higher rates for assessment and policy development activities.

An important finding in the multivariate model results was that LHD contribution to each core function area was positively and significantly associated with perceived effectiveness of the core function areas, all at the p<.01 level. Regarding the participation of other individual agencies/organizations, there were more significant findings for assessment activities and policy development activities compared to assurance activities. Table 9.1 compares the significant findings (and whether it was positive or negative) for other agencies/organizations for each core function activity. The participation of local government agencies and hospitals were positively and significantly associated with perceived effectiveness for all three core function areas.

Table 9.1: Comparison of significant findings for the three core function activities for the main independent variables.

Main independent variables:	Assessment	Policy Development	Assurance
LHD contribution	+***	+***	+***
State health agency participation	+***		+**
Other state gov't agency participation			
Local gov't agency participation	+**	+***	+**
Federal gov't agency participation			
Faith-based orgs participation	-***		
Other nonprofits participation	+***		
Health insurers participation			
Employers/business groups participation	+**		
Physician practices participation			
Hospitals participation	+**	+***	+***
Community health centers participation			

Schools participation			
Colleges/universities participation	+**		+**
Other participation			

Significant findings varied for the control variables in the final models across the three core function areas. No control variable was significant for all three areas. However, infant mortality rate was negatively and significantly associated with perceived effectiveness for the assessment and assurance core function areas in the models that included all of the individual types of agencies/organization participation. As the infant mortality rate decreased, perceived effectiveness increased for assessment and assurance core functions. The assessment and policy development core function areas had two control variable findings in common: a negative association with perceived effectiveness of these functions with a metropolitan versus micropolitan jurisdiction and for the year 1998 compared to 2006.

Implications

There are four key findings of this research. First is that an increase in LHD contribution to core function areas leads to an increase in perceived effectiveness of core function activities. Second, an increase in the percentage participation of other agencies/organizations is associated with an increase in perceived effectiveness of core function activities. Third, the participation of other types of agencies/organizations depends on the core function area, whether it is assessment, policy development, or assurance. Lastly, in terms of covariates, a decrease in infant mortality rate is associated with an increase in perceived effectiveness. In the next sections, I discuss the implications of each of these findings.

LHD contribution to effort

Local health department contribution rates to total effort were below 0.50 for all three core function areas (roughly 0.40 for each). However, as the participation of LHDs increases, health department directors' perceived effectiveness of assessment, policy development and assurance core functions. This finding has implications for each of the three levels of theory presented earlier in Chapter 3: participation theory, collaboration theory, and network theory. For participation theory, Chapter 3 discussed the concept of public health as a public good. The public health agency will be motivated to participate based on the expectation that their contribution is essential to obtaining the public good, and that they have efficacy in influencing others to participate in the activity. With a participation rate of only 0.40, it could be that although the health department believes their contribution is essential to obtaining public health goals, it is possible that they do not feel they have efficacy in influencing others to participate. This explanation is likely given the low participation rates of other agencies/organizations, as will be discussed in the next section below.

For collaboration theory, Chapter 3 discussed, among other things, that collaboration is motivated by an organizations perceived need, willingness and ability to collaborate. The relatively low rates of contribution of the local health departments to core functions activities could be due to any number of problems with perceived need, willingness and ability to collaborate. It is less likely that they do not feel the need to collaborate given the recent literature stating that collaboration is essential for achieving today's public health goals, as discussed in Chapter 3. However, the willingness and ability of health departments may be where the issues lie. For example, due to budget constraints and conflicting priorities, health department directors may not be willing or able to devote time and attention to collaborative activities. Start-up costs and management challenges may lead them to be unwilling or unable to collaborate.

For network theory, chapter 3 discussed the concept of whole networks and that implementation in networks requires coordination and cooperation for policy success. Although some studies showed that greater centrality is related to network effectiveness, this finding is not conclusive due to the limited number of such studies. For purposes of speculation regarding the participation of health departments in networks, if we view greater participation as greater centrality in the network, then the finding that a greater contribution of the health department to core functions is associated with a greater perceived effectiveness of core functions activities is consistent with the limited literature on network centrality. The more central the health department in the core function activity (i.e., the greater the contribution to total effort) then the greater the perceived effectiveness of the core function activity.

The practical implication of this finding is that it can inform public health agency leaders as to the need to increase participation in core function activities in the public health system, even as other agencies/organizations are participating in these activities. This implication is true for all three core function areas – assessment, policy development, and assurance.

The participation of other types of agencies and organizations

Similar to the health department participation**,** the findings show that the overall participation rate of other agencies/organizations is relatively low, but that as their overall participation increases, perceived effectiveness of the three core function areas also increases. This finding can be informed by - and can inform - participation, collaboration and network theory. First, as discussed above in the section on participation of the public health agency, organizations will be motivated to participate if they believe that their participation is essential to obtaining the public health goals, and if they feel they have efficacy in influencing others to

participate. Opposite to the speculation above that health department's will view their participation as essential but not necessarily efficacious, it is reasonable to argue that other agencies and organizations will likely not feel that their participation is essential in achieving a public health goal, but that if they do participate, they have a fair amount of efficacy in influencing others to participate. They may feel that their participation will lead other agencies/organizations to participate as well.

For collaboration theory, the findings show that for the most part, agencies may not have a perceived need, willingness or ability to collaborate to achieve public health goals. The agency/organization with the greatest participation was state health agencies, with around 0.50 participation rate for the three core function areas across the two time periods. The lowest participation (besides the 'other' category) was from federal government agencies and health insurers. It is reasonable the federal government agencies do not have the ability to participate in local public health activities, other than indirectly through funding mechanisms, due to practical and logistical constraints. On the other hand, it is surprising that health insurers have such low participation rates for the three core function areas. Health insurers, more so than many other types of agencies/organizations, have a substantial impact on achieving the core public health functions. They should perceive a need to participate in order to achieve the public health goals, but perhaps it is the willingness and ability that conflict with collaboration activities. Health insurers are profit driven, and therefore may perceive the time and other resource costs of collaborating as directly in contrast to their goals. They may also feel that they are not able to participate due to the financial pressures of the health insurance environment. In nonprofit health insurance settings, this may not be the case. For instance Kaiser Permanente is a non-profit

managed care organization that has as one of its goals to participate in community benefit activities through financial contributions and volunteer opportunities.

The findings also indicate that it is important to engage local government agencies and hospitals in order to increase the perceived effectiveness of core function delivery for all three core function areas. A possible explanation for the hospital finding may be that hospitals bring resources to the table, specifically financial resources. As the participation of hospitals increases, health department directors may feel that more resources are available to meet public health objectives and to carry out the core functions. For the participation of other local government agencies, it may be that other local government agencies are seen as allies when they are collaborating with the local health department to share limited resources in order to achieve public health goals. There may also be less coordination costs in working together with other local agencies, as compared to cross-sector collaboration.

For other types of agencies and organizations, the importance of participation depends on the specific core function area, whether it is assessment, policy development or assurance. The assessment core function area had the greatest number of significant findings for agencies/organizations participation. State health agency participation, local government agency participation, other nonprofits participation, employers/business groups participation, hospitals participation, and colleges/universities participation were positively and significantly associated with perceived effectiveness of the assessment core functions. One reason why the participation of more agencies/organizations was important for the assessment core function area compared to the policy development and assurance core function area is that participation of community agencies and organizations is really essential for assessing the health status of a community. For instance, in my experience working with the Louisville/Jefferson County Health Department in

the mid 1990s, we conducted a community health assessment that required data collection from numerous community agencies/organizations. Without their participation in the collaboration, the assessment would have been incomplete.

One interesting finding is that as faith-based organizations increase participation in assessment core function areas, the perceived effectiveness of assessment core functions goes down. This was in fact the only significant negative finding for any of the agencies/organizations and perceived effectiveness. One possible explanation for this finding may be that health department directors perceive faith-based organizations as a hindrance to achieving some of the more controversial public health goals, such as STD and teen pregnancy prevention. Assessing the status of the community in these areas raises attention to these areas, while some faith-based organizations may not want these subjects to be the concern of public health agencies.

Infant mortality rate

Lastly, since the findings show consistent significant associations between declining infant mortality rate and increasing perceived effectiveness across the assessment and assurance core function areas, this suggests that a key area for improvement in the community efforts is in reducing the infant mortality rate. This is a timely finding given the recent attention to the problem of infant mortality in the U.S. compared to other developed countries (Oestergaard et al, 2011).

A reason for the association between declining infant mortality rates and perceived effectiveness may be because the infant mortality rate is a well-known public health indicator for communities. It is likely that most health department directors are aware of where they stand on the infant mortality rate in their communities as compared to other surrounding counties and

other counties in their state. The infant mortality rate covariate in the models is an actual objective measure of the jurisdiction's infant mortality rate. If we think of infant mortality rate as a proxy measure for overall health status of a community, it makes sense that as this rate decreases for a jurisdiction, the health department director would perceive performance of core public health functions in their jurisdictions as higher performing.

In sum, this study is the first to shed light on the impact of participation in a public health system by the public health agency and other agencies/organizations on the perceived effectiveness of the system. It helps to fill the gap in the theory and research on the levels of participation and effort by the lead public agency and other agencies/organizations. The findings suggest that in a system environment where the public agency as well as many other types of agencies and organizations are contributing, the contribution of the public health agency is important regardless of the core function activity (at least in the public health setting). However, the importance of participation of other agencies and organizations depends on the type of activity being performed, with the exception of local government agencies and hospitals which were significant for all three core function areas.

Directions for Further Study

This chapter closes with three suggestions for further research in this important area of public health systems research. First, in the near future, a third wave of the data set will be available to extend the longitudinal analysis beyond two time periods. This will be important both for increasing the sample size of responses over time and for assessing stability of findings over time. A second area for further research, which was beyond the scope of this study, would be to conduct interviews with key informants in the public health systems arena. These

interviews could gather qualitative data on the implications of these study findings. Key informant interviews could provide valuable insight on the significant associations found in the study, and on the potential utility of these findings.

Lastly, this next steps section closes with three suggestions of external measures that could be used as new dependent variables in future research. This is related to the discussion of dependent variables in chapter 5, including Table 5.2 that looks at subjective and objective measures. The first dependent variable suggestion is an objective measure for the survey assessment core function question, “In your jurisdiction, are timely investigations of adverse health events conducted on an ongoing basis, including communicable disease outbreaks and environmental health hazards?” Instead of the measure being perceived effectiveness of this activity, an objective external measure could be the rate of timely investigations of adverse events reported to the health department, where “timely” is clearly defined (e.g., within 1 week). For policy development activities, the second external measure would require data collection from a sample of local health departments. The data collected would be the rate of formal attempts by local health agencies to inform officials about potential health impacts of decisions under their consideration per the number of decisions under their consideration with potential health implications. The final external measure suggestion is for the assurance core function area and concerns the reporting of health issues to the media on a regular basis. The number of such reports in a given year would be the external measure, with the implied notion that more reports are better.

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APPENDIX A

National Longitudinal Survey of Local Public Health Systems, 1998 and 2006

Survey Instrument

Overview of the Survey Instrument

This survey instrument is designed to collect information about the range of public health activities performed in local communities and the array of organizations that contribute to these activities. The instrument is designed as a self-administered questionnaire to be completed by administrators of local health departments and/or their designees. Ideal respondents are individuals who serve in senior administrative positions within local public health agencies and who have broad, general knowledge about the types of public health activities performed by their agencies and by other organizations within the community.

The survey instrument is based on twenty indicators of local public health system performance developed by Dr. Bernard J. Turnock (University of Illinois--Chicago), Dr. C. Arden Miller (University of North Carolina at Chapel Hill) and colleagues through a series of studies on local public health practice sponsored by the U. S. Centers for Disease Control and Prevention (CDC).1-4 Responses to the instrument are analyzed using a standard methodology developed by the investigators.4 The twenty Turnock/Miller questions are preceded by a brief set of demographic profile questions and followed by a small number of organizational questions.

The survey requires approximately 20 minutes of time to complete.

References

1. Miller CA, Moore KS, Richards TB, Monk JD. 1994. A proposed method for assessing the performance of local public health functions and practices. American Journal of Public Health. 84(11):1743-1749.

2. Richards TB, Rogers JJ, Christenson GM, Miller CA, Taylor MS, and Cooper AD. 1995. Evaluating local public health performance at a community level on a statewide basis. Journal of Public Health Management and Practice. 1(4):70-83.

3. Turnock BJ, Handler AS, Miller CA. 1998. Core function-related local public health practice effectiveness. Journal of Public Health Management and Practice. 4(5):26-32.

4. Mays GP, Halverson PK, Baker EL, Stevens R, Vann JJ. 2004. Availability and perceived effectiveness of public health activities in the nation’s most populous areas. American Journal of Public Health. 94(6):1019-26.

Assessment activities

1. In your jurisdiction, is there a community needs assessment process that systematically describes the prevailing health status in the community?
2. In the past three years in your jurisdiction, has a survey of the population for behavioral risk factors been conducted?
3. In your jurisdiction, are timely investigations of adverse health events conducted on an ongoing basis, including communicable disease outbreaks and environmental health hazards?
4. Are the necessary laboratory services available to the local public health agency to support investigations of adverse health events and meet routine diagnostic and surveillance needs?
5. In your jurisdiction, has an analysis been completed of the determinants of and contributing factors to priority health needs, the adequacy of existing health resources, and the population groups most effected?
6. In the past three years in your jurisdiction, has the local public health agency conducted an analysis of age-specific participation in preventive and screening services?

Policy development activities

7. In your jurisdiction, is there a network of support and communication relationships that includes health-related organizations, the media, and the general public?
8. In the past year in your jurisdiction, has there been a formal attempt by the local public health agency to inform officials about the potential public health impact of decisions under their consideration?
9. In your local public health agency, has there been a prioritization of the community health needs that have been identified from a community needs assessment?
10. In the past three years in your jurisdiction, has the local public health agency implemented community health initiatives consistent with established priorities?
11. In your jurisdiction, has a community health action plan been developed with community participation to address community health needs?
12. In the past three years in your jurisdiction, has the local public health agency developed plans to allocate resources in a manner consistent with community health action plans?

Assurance activities

13. In your jurisdiction, have resources been deployed as necessary to address priority health needs identified in the community health needs assessment?
14. In the past three years in your jurisdiction, has the local public health agency conducted an organizational self-assessment?

15. In your jurisdiction, are age-specific priority health needs effectively addressed through the provision of or linkage to appropriate services?
16. In your jurisdiction, have there been regular evaluations of the effects of public health services on community health status?
17. In the past three years in your jurisdiction, has the local public health agency used professionally recognized processes and outcome measures to monitor programs and to redirect resources as appropriate?
18. In your jurisdiction, is the public regularly provided with information about current health status, health care needs, positive health behaviors, and health care policy issues?
19. Within the past year in your jurisdiction, has the media received reports on a regular basis about health issues affecting the community?
20. In the past three years in your jurisdiction, has there been an instance in which the local public health agency failed to implement a mandated public health program or service as required by state or local law, ordinance, or regulation?

<insert each of the 20 function questions here>? ☐ yes ☐ no

If YES → Overall, how well is this activity performed within your jurisdiction?	☐1-Poor - meets none of the need for this activity ☐2-Fair - meets some of the need for this activity ☐3-Moderate - meets about half of the need ☐4-Good - meets most of the need for this activity ☐5-Excellent – fully meets need for this activity
If YES → What types of organizations are involved in performing this activity in your jurisdiction? (mark all that apply) ☐ none ☐ state health agency ☐ faith-based orgs ☐ physician practices ☐ schools (K-12) ☐ other state gov't agency ☐ other nonprofits ☐ hospitals ☐ colleges/universities ☐ local gov't agencies ☐ health insurers ☐ community health centers ☐ federal gov't agency ☐ employers/business groups ☐ Other-specify:_____	
If YES → What proportion of the total community effort for this activity is contributed by your local public health agency? 1-None ☐2-Some but not half of effort ☐3-About half of the effort ☐4-Most but not all of the effort ☐5-All of the effort	

APPENDIX B

ACRONYMS

CPHSSR	Center for Public Health Systems and Services Research
HRSA	Health Resources and Services Administration
IOM	Institute of Medicine
LHD	Local Health Department
NACCHO	National Association of County and City Health Officials
NLM	National Library of Medicine
PHSSR	Public Health Systems and Services Research
RWJ	Robert Wood Johnson Foundation, Inc.