Quantifying Value in Public Health: Using Economic Methods to Analyze System Change

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QUANTIFYING VALUE IN PUBLIC HEALTH:
USING ECONOMIC METHODS TO
ANALYZE SYSTEM CHANGE

by

Theresa M. Green

A dissertation submitted to the Graduate College
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
Interdisciplinary Health Sciences
Western Michigan University
December 2013

Doctoral Committee:

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Mark Messonnier, Ph.D.
Robert Wertkin, Ph.D.
Ann Dozier, Ph.D.
In this time of economic downturn, it is becoming increasingly important for organizations, including those in public health, to “prove their worth,” to show the value in improvement strategies. Health agencies have learned to discuss impact in terms of health outcome and mortality/morbidity measures. However, it is critical that these impacts are also expressed in a way that shows cost-efficiency and economic benefit especially for promising, evidence-based public health interventions. Although several methods of economic evaluation including cost-effective analysis, cost-utility analysis, or cost-benefit analysis and return on investment (ROI) have been used in social sciences and health research, fewer examples are found in public health systems research.

This dissertation explores common methods for financially quantifying value in public health system change, and these methods are used to assess cost-benefit in a real-world example: the development of the Center for Community Health (CCH), an academic–public health partnership anchored in the University of Rochester Medical Center (URMC). The value of the University’s investment in public health is analyzed by quantifying the costs and benefits of the Center. A multi-methods, retrospective
analysis of this naturally occurring experiment was conducted including collecting revenue data (internal and extramural) and expenses data over time, as well as interviewing key informants to quantify the Center’s contribution to the Essential Services of a public health department.

With the University’s annual contribution of around $1 million, the CCH has accumulated a $6.5 million annual budget within 6 years. This has resulted in an expanded public health workforce of 60 individuals and increased essential public health services delivered to the community including surveillance, research, policy investment, cancer screenings, prevention programs, and individual counseling. In addition to the increased budget and shifting to extramural funding, the CCH has achieved cost-effectiveness through disease prevention through programs and services.

This work serves as a practical and duplicable example for public health practitioners and systems researchers of how economic analysis of system change can be done. An analytical framework is presented, as well as a discussion of barriers and shortcomings for measuring value in public health interventions.
ACKNOWLEDGMENTS

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Finally, special thanks to my family for enduring the time, effort, resources, and mental capacity that contributed to this endeavor. To my husband, Eric, and my children, Ryan and Sarah, thank you for your continuous love and support.

Theresa M. Green
TABLE OF CONTENTS

ACKNOWLEDGMENTS .................................................................................................................. ii
LIST OF TABLES ............................................................................................................................... vi
LIST OF FIGURES ............................................................................................................................ vii

CHAPTER

I. INTRODUCTION ............................................................................................................................... 1
   Statement of the Problem .............................................................................................................. 1
   Significance of the Research ....................................................................................................... 8
   Purpose of the Study .................................................................................................................... 12
   Research Question ..................................................................................................................... 15
   Definition of Terms ..................................................................................................................... 15
   Chapter Summary ....................................................................................................................... 17

II. LITERATURE REVIEW ................................................................................................................... 19
   The Value of Public Health ........................................................................................................ 19
   Does Public Health Provide a Net Financial Benefit? ............................................................. 21
   Summary of Current Work in Economic Analysis of Public Health ...................................... 28
   National Agenda and Funding for Public Health ...................................................................... 32
   Barriers to Economic Analysis in Public Health ...................................................................... 35
   Policy Implications of Economic Analysis .............................................................................. 42
   Economic Evaluation Models and Frameworks ....................................................................... 45
Table of Contents—Continued

CHAPTER

Results First ................................................................................................................. 49
Ritzwoller Model ................................................................................................. 50
Economic Assessment Tool (EAT) ................................................................. 51
Practical Cost Benefit Analysis (PCBA) .................................................... 51
Logic Models ...................................................................................................... 52
Economic Methods and Measures ............................................................... 52
Partnership for Success .................................................................................... 56
Chapter Summary ............................................................................................. 58

III. METHODS .......................................................................................................... 61

Research Design ................................................................................................. 61
Study Participants ............................................................................................... 68
Measurement Instruments .................................................................................. 68
Procedures ........................................................................................................... 71
Case Study ........................................................................................................... 73
Analysis Plans ...................................................................................................... 74
Methodologic Limitations .................................................................................. 75
Chapter Summary ............................................................................................. 77

IV. RESULTS ........................................................................................................... 78

Research Questions ............................................................................................. 78
Analysis .................................................................................................................. 79
Table of Contents—Continued

CHAPTER

Quantitative Data ........................................................................................................ 79
Qualitative Data ........................................................................................................... 90
Case Study .................................................................................................................. 104
Chapter Summary ..................................................................................................... 112

V. DISCUSSION ........................................................................................................ 115

Chapter Overview ..................................................................................................... 115
Summary of Design and Results .............................................................................. 117
Discussion of Results ............................................................................................... 119
Conclusions and Implications .................................................................................. 124
Study Limitations ..................................................................................................... 127
Recommendations for Future Research ................................................................. 129

REFERENCES ........................................................................................................... 130

APPENDICES

A. Interview Protocol and Script ............................................................................. 139
B. Human Subjects Institutional Review Board Letter ............................................ 143
LIST OF TABLES

1. Investment in Population and Community-Based Prevention, Education and Outreach Programs and Relevant Provisions of the Affordable Care Act as Passed................................................................. 4

2. The Ten Essential Services of Public Health.................................................. 20

3. Health Behaviors and Projected Health Outcomes........................................ 30

4. Framework for Economic Evaluation.............................................................. 48

5. Economic Evaluation Options for Public Health Systems Intervention............ 54

6. Funding Sources for the Center for Community Health FY06–FY11............ 80

7. UR Clinical and Translational Science Institute Funding for Community Engagement.......................................................................................................................... 86

8. Operating Expenses for the Center for Community Health, FY06–FY12....... 87

9. Center for Community Health Employee Changes, FY06–FY11 ................. 88

10. FY12 Center for Community Health Funds Supporting Community Agencies......................................................................................................................... 90

11. Programs and Services at the Center for Community Health...................... 92

12. Intervention Patients for Blood Pressure Advocacy Program
(as of June 7, 2013)............................................................................................. 105

13. Results After 10-Month Blood Pressure Advocacy Program Intervention ...... 107

14. Changes in Attributable Cost of Health Care Facility-Associated C. Difficile 2011-12................................................................................................................................. 111
LIST OF FIGURES

1. The Public Health System Source: The Future of the Public’s Health .......... 6
2. Distribution of Cost-Effectiveness Ratios for Preventive Measures and Treatments for Existing Conditions .......................................................... 22
3. The Primary Determinants of Health ................................................................ 25
4. Logic Model for URMC Investment in Center for Community Health .......... 65
5. Funding for the Center for Community Health, FY06–FY12 ....................... 81
6. University of Rochester Investment as a Percent of Total Funds for the Center for Community Health .......................................................... 82
7. Summary of Center for Community Health Extramural Awards................ 83
8. Indirect Cost Recovery to UR from Center for Community Health Awards .... 85
9. Center for Community Health Employees, FY06–FY12 ............................. 89
10. Center for Community Health Contributions to the 10 Essential Public Health Services .................................................................................. 103
CHAPTER I
INTRODUCTION

Statement of the Problem

The rising costs of health care and the decreasing amount of financial resources provides both an opportunity and a challenge to the field of public health. The opportunity: limited resources for health have prompted the exploration of community-based prevention as a potential cost-saving alternative to expensive medical testing, hospital stays, surgery, and long-term treatment for chronic disease. The challenge: the public health system, experts in prevention, must adjust its capacities to meet changing demands, including innovative strategies to prevent chronic disease as well as systems and evaluation mechanisms that assure fiscal accountability.

As the United States continues to debate the most effective solution for faster economic recovery, one point is clear: The increasing cost of health care must be contained. Spending on hospital visits, medications, and other health care has been steady for the last few years at about 17.9% of GDP (Gross Domestic Product). Health spending accounts for $1.2 trillion or 19% of the fiscal year 2013 federal spending budget of $6.3 trillion (www.usgovernmentspending.com). In order to bend the cost curve in health care, any strategy to reduce the federal deficit must include a plan to reduce spending on health care.
Most spending in health supports health care delivery, with physician/clinical services accounting for 20% and hospital care accounting for 31% of national health expenditures (Goodell & Ginsburg, 2008). Much less health spending is dedicated to preventing illness, which, if effective, could decrease the cumulative medical costs associated with treating chronic and later-stage disease. Although national data on public health spending are imperfect and often difficult to discover, estimates consistently indicate that less than 5% of national health spending is devoted to public health activities (Mays & Smith 2011). In 2008, estimates put national public health spending at approximately 3% of the $2.4 trillion ($2.7 trillion in 2011) national health expenditures, or $240 per capita (Leider, Sellers, Shah, Pearsol, & Jarris, 2012). Although there are some resources from private foundations and local government to support specific public health prevention strategies, overall funding streams are scarce.

Although medical treatment often provides the latest technology, testing, and pharmaceuticals to address even the most unique of circumstances, this is relevant only to those who are sick and who are able to access medical care. Health care reform, insurance plans, and safety net clinics have been established to improve health care access and even preventive screening to monitor movement from a state of healthiness to needed intervention. Much less effort has been expended in assuring that people remain in a healthy state and this is the role of public health. The 1988 Institute of Medicine (IOM) report “The Future of Public Health” defined public health as “fulfilling society’s interest in assuring conditions in which people can be healthy.” The public health system is concerned with addressing the social determinants of health, which means building an
environment for health, and this is the earliest form of primary prevention. Public health has the greatest opportunity to improve health outcomes and realize significant health efficiency and effectiveness by concentrating efforts in early prevention, often accomplished through policy change and cross-disciplinary partnerships. However, public health leaders are often ill-equipped to advocate for resources and policies and often lack the skills to make the economic case to decision makers that public health is cost-effective.

Policymakers need to be equipped with better information from the public health sector in order to make sound investments and to optimize health outcomes. Cross-disciplinary comparisons of interventions, for example, clinical medicine interventions versus community-based interventions, would also be helpful; however, there are methodological barriers, such as differences in standard measures of outcomes and different timeframes needed to realize success. Policymakers need relative cost-effectiveness studies of different approaches across different sectors, including the impact of non-healthcare interventions (Kindig et al., 2003).

With the passage of the Patient Protection and Affordable Care Act (ACA) Public Law 111-148 in March 2010, President Barack Obama focused health reform on access and prevention in an unprecedented fashion. Several provisions of the ACA target the public health infrastructure and accountability, as summarized in Table 1.
### Table 1

**Investment in Population and Community-Based Prevention, Education and Outreach Programs and Relevant Provisions of the Affordable Care Act as Passed**

<table>
<thead>
<tr>
<th>Section</th>
<th>Provision</th>
</tr>
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<tbody>
<tr>
<td>Sec. 4002</td>
<td>Establishes a “Prevention and Public Health Investment Fund” to provide for expanded and sustained national investment in prevention and public health programs that builds up from $500 million in FY 2010 to $2 Billion in FY2015 and each fiscal year thereafter.</td>
</tr>
<tr>
<td>Sec. 4001</td>
<td>Creates an interagency council to establish a national prevention and health promotion strategy.</td>
</tr>
<tr>
<td>Sec. 4201</td>
<td>Creates “Community Transformation Grants” (CTG) to state and local governmental agencies and community based organizations for the implementation, evaluation and dissemination of proven evidence-based community preventive health activities to reduce chronic disease rates, address health disparities and develop stronger evidence-base of effective prevention.</td>
</tr>
<tr>
<td>Sec. 5313</td>
<td>Authorizes the Secretary to award grants to States, public health departments, clinics, hospitals, FQHCs and other nonprofits to promote positive health behaviors and outcomes in medically underserved areas through the use of community health workers.</td>
</tr>
<tr>
<td>Sec. 4003</td>
<td>Directs CDC Director to convene an independent “Community Preventive Services Task Force” to review the scientific evidence related to the effectiveness, appropriateness, and cost-effectiveness of community preventive interventions and recommendations, to be published in the “Guide to Community Preventive Services”.</td>
</tr>
<tr>
<td>Sec. 4301</td>
<td>Directs HHS/CDC to fund research in the area of public health services and systems that examines evidence-based practices relating to prevention, with a particular focus on high priority areas identified in the National Prevention Strategy or Healthy People 2020 and including comparing community based public health interventions in terms of effectiveness and cost.</td>
</tr>
</tbody>
</table>

**Affordable Care Act Overview: Selected Provisions** (American Public Health Association 2012)

Public health departments are being asked to do more than ever before, and to demonstrate that they can do so efficiently and effectively. Many local health departments are staffed with employees trained for traditional health department work—
focused on infectious disease, screenings, and health fairs, for example. They may not be equipped for the new public health agenda, which includes conducting evidence-based interventions, exploring policy and environmental solutions, completing robust evaluations, and assessing economic value of any program, service, or system change. This requires not only resourcefulness and partnership, but new skills in economic and financial analysis only recently applied to public health. The focus of public health has shifted from infectious disease control to chronic disease prevention, from proximal risk factors for disease to more distal risk factors and intervention (Scutchfield & Howard, 2011). These changes require health departments to consider new and unexpected partnerships and to build new capacity-strengthening public health systems.

An Institute of Medicine (IOM) report in 2003, “The Future of the Public’s Health in the 21st Century,” identified strategies to engage the governmental public health departments with other partners in the community. The call to partnership necessitates governmental public health entities becoming more accountable for what they do and more open to functioning through collaborations and partnerships (Turnock & Barnes, 2007).

The 2003 IOM report laid the groundwork for current public health system change. Figure 1 illustrates the focus on partnership to increase capacity, emphasizing that it is not just the public health system’s responsibility to ensure the conditions of the community’s health.
The IOM report focused on several areas of action and change for the improvement of population health,\(^1\) including:

- adopting a focus on multiple determinants of health,
- strengthening the public health infrastructure,
- building partnerships,
- developing systems of accountability,
- emphasizing evidence, and
- improving communication.

---

\(^1\) Population health is the focus of public health efforts. It refers to “the health of a population as measured by health status indicators and as influenced by social, economic and physical environments, personal health practices, individual capacity and coping skills, human biology, early childhood development and health services” (Federal, Provincial, and Territorial Advisory Committee on Population Health, 1999).
The role of public health is changing, and many public health functions might be better served through partner organizations such as universities or academic medical centers that conduct essential health-related research. Public health agencies that have strong agency partnerships, such as those with universities, hospitals, or community groups, are associated with a higher likelihood of monitoring health status, diagnosing and investigating health problems, enforcing regulations, and conducting research (Scutchfield, Knight, Kelly, Bhandari, & Vasilescu, 2004). In this time of economic hardship and tremendous system change, it is becoming increasingly important for organizations, including those in public health, to “prove their worth,” to be able to demonstrate value in any improvement strategy. Often to this point, health agencies have discussed impact in terms of health outcome and mortality/morbidity measures. However, it is critical that these impacts are also expressed in a way that shows cost-efficiency and economic benefit, especially for promising, evidence-based public health interventions. Evidence-based interventions are those that have strong or sufficient scientific outcomes that demonstrate they are effective.

Prevention, partnership, and accountability are reoccurring themes throughout the Affordable Care Act. Prevention and partnership are familiar, but accountability is relatively new to public health organizations. Only through scientifically demonstrating to decision makers and policy leaders that public health is a “good investment” will the public health system hope to gain continued allocated resources for system infrastructure and capacity. Unfortunately, public health practitioners and researchers are not typically taught this type of analysis. Typical public health professionals are health educators,
nurses, epidemiologists, environmental health specialists, and physicians who may not have encountered economic analysis or public health finance in their training or experience.

When the economics of public health are understood, sound financial investments can be evaluated and presented as an advocacy tool for decision makers. A clear and recent example of this is the Mahoning Health District, an academic health department affiliated with Northeast Ohio Medical University, which functions as a local health department. Facing dire economic outlook and fear of closure, the health officer partnered with public health systems researchers to examine financial deficits and their underlying causes. The agency used the information to implement strategies based on sound financial decisions that led to the turnaround of the agency finances. Within a few years, the department was able to show a positive financial position and remain open. (Honoré, Stefanak, & Dessens, 2012).

**Significance of the Research**

Very little is known about the financial and economic characteristics of public health systems and even less is known about how investments in public health impact service delivery and health outcomes. The current evidence on efficiency and cost-effectiveness issues in public health practice focuses on specific health promotion and disease prevention interventions, which are often clinically based. Very little evidence exists regarding the public health delivery system as a whole (Mays et al., 2009). Mays et al. suggest that new research is needed to develop methods for analyzing efficiency in public health practice and within public health systems.
The 2013 campaign for National Public Health Week was “Public Health is ROI: Save Lives, Save Money” (American Public Health Association [APHA], 2013). The literature for the National Public Health Week references several examples of how public health offers return on investment (ROI) by saving lives and by saving money (Dilley, Harris, Boysun, & Reid, 2012; Gase et al., 2011; Magnus et al., 2012; Ormond, Spillman, Waidmann, Caswell, & Tereshchenko, 2011). Return on investment is an economic performance measure used to evaluate the efficiency of an investment. To calculate ROI, the financial benefit (return) of an investment (less the cost) is divided by the cost of the investment; the result is expressed as a percentage or a ratio. Although public health does save lives, this is not an indication of ROI in the traditional sense, but rather an indication of the effectiveness of public health. In addition, the examples given in the APHA material for saving money are all examples of mathematical modeling and simulations to estimate cost savings for several specific interventions. Although this is valuable information and methodologically appropriate, the research literature is lacking practical evaluations and measures of return on investments in public health practices. In addition, there are not many, if any, observational examples in the literature of investment in public health organizations as a whole and the specific benefits associated with the resulting system change and infrastructure support. Very few examples exist in public health systems research literature. Mays and Smith (2011) have contributed to this small body of literature with their recent study demonstrating that increases in public health spending (total annual spending of the local public health agency, divided by the total population residing within the jurisdiction) can be statistically associated with decreases
in preventable death. The APHA selection of ROI as the theme of 2013’s National Public Health Week and the examples given in the promotional material demonstrate the admirable intent to encourage economic evaluation in public health but also demonstrate the confusion surrounding these methods of analysis.

Public Health Systems and Services Research (PHSSR) is the “field of study that examines the organization, financing, and delivery of public health services within communities and the impact of those services on public health” (Mays, Halverson, & Scutchfield, 2004; Scutchfield & Patrick, 2007). Similar to Health Services Research and following from its development, PHSSR concentrates on the delivery and financing of public health service delivery, not clinical or medical care. The public health systems research community in 2011-2012 met with practitioners, policy makers, educators and other stakeholders to develop a research agenda. The Robert Wood Johnson Foundation (RWJF) and the Centers for Disease Control and Prevention (CDC) led the initiative to update the research agenda for Public Health Systems and Services Research with assistance from the National Coordinating Center for PHSSR and Altarum Institute.

The four topic areas for the research agenda are public health workforce, public health systems structure and performance, public health financing and economics, and public health information and technology (Scutchfield, Pérez, Monroe, & Howard, 2012). Several intriguing research questions emerged for public health financing and economics in the categories of fiscal analysis, financing mechanisms and costs, performance, and outcomes (Consortium, 2012).
This dissertation work will begin to address some of these concerns by contributing to the literature answering questions from the PHSSR National Research Agenda for public health financing and economics, specifically:

- What measures provide the most valid and reliable indicators of the financial performance of public health agencies?
- How do investments in public health strategies influence the need for downstream spending on medical care and/or social services?

Carande-Kulis, Getzen, and Thacker (2007) added to the discussion regarding the research agenda for public health economics by confirming that there is a need to broaden the scope beyond intervention-level analysis to the type of issues that are addressed and the methods applied when examining public health systems and policies. This commentary reiterates that analytical tools have been applied for estimating the economic impact of diseases and injuries, and addressing the cost-effectiveness, and cost-benefit of interventions, especially clinical, to prevent disease and promote health. However, very little study has been done on the economics of public health functions such as monitoring health status, diagnosing and investigating community health problems, informing people about health issues, and developing policies that support community health efforts to modify unhealthy behaviors (Carande-Kulis et al., 2007).

There are many potential barriers to economic analysis in public health systems research. First, effective interventions often involve policy change, surveillance, partnerships, and other system changes whose long-term outcomes are difficult to quantify. Second, many public health practitioners who implement interventions are not
researchers and often lack expertise in designing logic models, defining measureable objectives, and conducting appropriate economic analysis. Third, lack of consistent data tracking and lack of prospective case-control research/evaluation design in most public health interventions makes pre-post evaluation, including economic analysis, difficult. In addition, many outcomes in public health are abstract constructs such as a “healthy community” that are difficult to operationalize. There is no agreed-upon measure that defines improvement in community health. These limitations, evaluation methods, and effective study frameworks will be discussed in this dissertation work.

**Purpose of the Study**

The purpose of this study is to explore how economic analysis and financial thinking can be applied to public health in an understandable and replicable way to create meaningful evidence to inform policy change. This dissertation research first explores economic methods, system frameworks, and barriers to financial and economic analysis while providing references to tools and resources helpful to other public health systems researchers and practitioners. The primary focus of the dissertation concentrates on a real-world example of an economic evaluation analyzing a public health system investment and the change in value resulting from the change. This analysis focuses on a public health system partner, and measures the value return on investment in the context of a new adaptable framework conducive to public health practitioners. This example represents neither a macro-level analysis nor an intervention-level analysis, but rather an intermediate, organizational system perspective.
The University of Rochester has partnered with the Monroe County Department of Public Health (MCDPH) to develop the Center for Community Health (CCH), an academic center within the University of Rochester Medical Center (URMC). I measured the value of the University’s investment in public health by quantifying the costs and benefits of the CCH, which includes both start-up and maintenance costs, and both short-term and long-term outcomes including significant expansion of the public health workforce, and millions of dollars in grants and contracts for public health initiatives. I demonstrate how the CCH has increased the capacity of the public health system in Rochester and use an example through a case study of how this capacity can lead to measurable health outcomes that increase value.

The health department (MCDPH) has collaborated with the University of Rochester Medical Center for decades, and this relationship culminated in the establishment of the CCH. The CCH provides a delivery model whereby public health employees, administrators, and researchers are hired and supported by the University of Rochester to fulfill essential public health services. This model is unique in its formalization of the partnership between local public health and academia in a long-term organizational structure that strives to increase the infrastructure capacity for community health improvement.

Created in 1997, the Center for Rochester’s Health was formed through a memorandum of understanding between the MCDPH and the URMC to address key issues that emerged from the community health assessment and planning process called HealthAction. This was the first iteration of the CCH. Staff was hired by the URMC, but
they worked at the MCDPH contributing to the public health workforce. A steering committee, comprised of leadership from both URMC and MCDPH governed the work of the Center. Several interventions were initiated through the Center including health professional education activities, the Racial and Ethnic Adult Disparities in Immunization Initiative (READII) Rochester, and the Finger Lakes Office of Surveillance and Epidemiology (FLOSE). Work continued until 2004 when URMC officially made community health its fourth core mission. Then in 2006, the Center for Community Health was established from the Center for Rochester’s Health to complete the work of the fourth core mission and staff was moved to URMC. In 2008 the CCH was relocated in city-based facility to enhance its awareness and accessibility, especially among at-risk populations. CCH continues to do public health work and collaborates often with the MCDPH. The CCH mission is to join forces with the community to eliminate health inequalities and improve health through research, education, and service. This is accomplished through several programs and initiatives focused on chronic disease prevention including cancer services, diabetes prevention programs, and counseling. In addition, CCH has health policy and environmental initiatives, as well as research and surveillance efforts.

The CCH was developed through an initial investment from the University of Rochester in public health. UR leadership is interested in knowing if their investment yielded a return and what benefits have been generated from the investment. A framework was developed to add context to this analysis and then effectiveness and cost-efficiency calculations were done to assess the return on the UR investment over time. In
addition to adding to public health systems research literature, the results of this evaluation will be immediately translated to decision makers as URMC leadership contemplates future funding for the CCH.

**Research Question**

In addition to the questions presented in the PHSSR research agenda, the main research question for this dissertation work asks if investing in public health system capacity provides value, and whether that value change can be quantified in economic terms. More specifically:

Does the University of Rochester’s investment in the development and maintenance of the Center for Community Health, a partnership extension of the local public health system, provide a value benefit either financially or in the health of the community?

This question is answered by exploring the system results of the investment that the University of Rochester has made in the establishment and maintenance of the Center for Community Health. Financial gains, process outcomes, and long-term impacts on the community’s health are studied.

**Definition of Terms**

Economics is the study of decisions about the use of goods and services in an environment of limited resources. Economics can be applied to health (health economics) and is used frequently at the Centers for Disease Control and Prevention (CDC) and for public health decision making (Messonnier, 2006). The CDC maintains a
web page on public health economics and tools to encourage economic analysis in public health (www.cdc.gov/stltpublichealth/pheconomics/index.html). Economic evaluation is the comparison of two or more alternative courses of action in terms of both their costs and consequences (Drummond, Sculpher, Torrance, O’Brien, & Stoddart, 2005). There are several types of economic evaluations or methods, and they differ primarily in how benefits are measured. Three of the most common evaluations are cost-benefit analysis (compares money in with money out), return-on-investment or ROI (a type of cost-benefit analysis), cost-effectiveness analysis (compares money in with the desired health effect out), and cost-utility analysis (compares money in with quality-adjusted life years or QALY). For economic analysis in health it is important to remember that measuring the value and quality of life is not objective. Ethical considerations and what constitutes a “valuable life” further complicate health economic evaluation.

Economics was introduced to public health research to make transparent and fair decisions on the basis of the best tools and data possible. Cost-benefit and cost-effectiveness analysis of vaccines are considered by the Advisory Committee on Immunization Practices (ACIP) when it makes recommendations, and the U.S. Prevention Services Task Force and the Task Force on Community Preventive Services both include economic information in their recommendations when available (Messonniér, 2006). Although several methods of economic evaluation including cost effectiveness analysis, cost utility analysis, or cost-benefit analysis and return on investment (ROI) have been used in social sciences and health research, fewer examples are found in public health.
Value is a difficult term to define. Merriam-Webster (n.d.) defines value as the relative worth, utility, or importance of something. Something of value is something that is worthwhile and assessing value is deciding whether or not an activity is worthwhile. The value of an intervention depends on one’s perspective and the beliefs and priorities of the person who is assessing value. Good value can be defined as providing substantial health benefit per dollar spent net of any savings, without necessarily saving money (Maciosek, Coffield, Flottemesch, Edwards, & Solberg, 2010).

Chapter Summary

The need for decision makers to understand and appreciate analysis that demonstrates the value of public health is critical to the profession’s sustainability, especially when funding is tight and decisions must be justified. Economic evaluation and the ability to translate economic analysis into practice and advocacy can help policy makers and practitioners make efficient use of valuable resources.

Public health practitioners would benefit from economic frameworks and methodologies that are easy to understand and adaptable to unique and unusual circumstances and system changes. This dissertation will explore model frameworks and economic methods, and demonstrate their use by assessing the value change resulting from an investment in public health. A case study will be presented to demonstrate how one specific intervention can contribute to the value added from a public health system investment. In summary, public health system changes such as the development of public health-academic partnerships are not obvious frameworks for cost-benefit analysis. My research will explore methods for successful application of economic analysis, and
will give examples of how already established economic methods can be used without elaborate expertise and with minimal resources to quantify value in public health investment.
CHAPTER II

LITERATURE REVIEW

The Value of Public Health

Public health is clearly a leader in community-based prevention strategy and implementation. The classic definition of public health is from C.E.A. Winslow, one of the leading figures in the history of public health. In a 1920 retirement speech, Winslow describes public health as

the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing services for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health.

(Winslow, 1920)

Focus on early prevention and community engagement is evident even in this formative stage of the discipline.

The 1988 Institute of Medicine (IOM) report “The Future of Public Health” summarizes this early definition of public health in shorter form as “fulfilling society’s interest in assuring conditions in which people can be healthy.” The IOM report defined public health’s core functions in three broad categories: assessment of public health, policy development, and assurance that public health services are available. These categories are further defined as the 10 Essential Public Health Services, listed in Table 2.
Table 2

*The Ten Essential Services of Public Health*

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Policy</th>
<th>Assurance</th>
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<tbody>
<tr>
<td>1. Monitor health status to identify and solve community health problems</td>
<td>4. Mobilize community partnerships and action to identify and solve health problems</td>
<td>7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable</td>
</tr>
<tr>
<td>2. Diagnose and investigate health problems and health hazards in the community</td>
<td>5. Develop policies and plans that support individual and community health efforts</td>
<td>8. Assure competent public and personal health care workforce</td>
</tr>
<tr>
<td>3. Inform, education and empower people about health issues</td>
<td>6. Enforce laws and regulations that protect health and ensure safety</td>
<td>9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. Research for new insights and innovative solutions to health problems</td>
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</table>

Public health departments have varying degrees of success accomplishing the essential services and many survey tools have been developed to gauge the performance of health departments based on the essential services including the National Public Health Performance Standards surveys. Very few studies utilize other methods of assessing performance (Erwin, 2008). Public health focus has shifted over the years; for example, policy development and research have not traditionally been at the forefront of activities for public health workers but are the focus of the latest IOM report on public health.
Even though policy development is one of the major functional categories of public health, only a few researchers have examined the relationship between law and public health system performance (Burris, Mays, Scutchfield, & Ibrahim, 2012). Increased integration of policy development and informing decision makers has become an important factor in public health system functioning and community health outcomes. In addition, Healthy People 2020 encourages the use of public health law research and public health systems research to help understand improvements in community health outcomes (Office of Disease Prevention and Health Promotion and U.S. Department of Health and Human Services, 2011).

Does Public Health Provide a Net Financial Benefit?

Is focusing more resources on public health an effective strategy to reduce health care costs? Public health is focused on primary prevention which prioritizes upstream, protective interventions that ensure people stay healthy for as long as possible and reduce excess demand on an overextended health care delivery system (Milstein, Homer, Briss, Burton, & Pechacek, 2011). There is very little research literature examining the cost-effectiveness of typical public health interventions such as building a healthy environment, enacting health-promoting policy, or community-based programs. Although public health systems research lacks economic analysis, many prevention strategies that are typically found in medical settings have been studied for cost-effectiveness and cost-efficiency. Health systems research seems to be ahead of public health systems research in studying economic impact, perhaps due to the limited scope of
clinically based interventions and the increased ability to measure time and financial resources spent on clinical interventions as opposed to community-based work.

Evidence on cost has been collected since the 1970s when cost-effectiveness analysis was first applied to health and medicine (Russell, 2009). Clinical primary and secondary prevention measures and treatment measures show similar distributions for cost-effectiveness (cost per healthy year) when Russell examined the literature. Figure 2 summarizes 279 cost-effectiveness ratios for preventive interventions and 1,221 ratios for treatments from cost-effectiveness ratio studies published between 2000 and 2005, regardless of effected disease. At each level, treatment and prevention show similar cost effectiveness.

Figure 2. Distribution of Cost-Effectiveness Ratios for Preventive Measures and Treatments for Existing Conditions (Russell, 2009)
However, the prevention measures considered in Figure 2 are limited to clinical interventions, typically screening and counseling measures, and often secondary or tertiary prevention. Although this type of work is done in public health, usually with sexually transmitted disease and HIV, often public health is concentrated on more upstream primary prevention strategies with greater potential for cost savings in preventing chronic conditions. Vaccination against pneumococcal pneumonia is a cost-saving example and reduces medical spending for adults ages 50-64 with congestive heart failure, chronic lung disease, diabetes, and other chronic conditions (Russell, 2009). Carefully considering the setting of the intervention, target populations, frequency of intervention, the prevention program’s effectiveness in reducing chronic disease, and component costs can increase the likelihood that a prevention intervention is cost-effective.

Although the evidence is confusing and depends on several characteristics of the prevention intervention, a strong consensus has emerged that a core set of evidence-based clinical preventive services offer high economic value. The National Commission on Prevention Priorities (NCPP) examined 25 preventive services and found 10 that were clearly cost-effective (cost less than $14,000 per QALY) (Woolf et al., 2009). This core set of preventive services offers high economic value, but only a small subset—childhood vaccines, aspirin prophylaxis, and smoking cessation—yield actual cost savings. Preventive care that decreases costs is cost-saving. In contrast, if the benefits are sufficiently large compared to the costs, the intervention is “cost-effective” even if it does not save money. Most preventive care is not cost-saving, but much of it is cost-effective,
providing significant benefit in quality-adjusted life years. An intervention can be expensive; however, it can provide several additional healthy disease-free years and therefore be categorized as cost-effective, even if the intervention does not save any money overall.

Although prevention measures are not often cost-saving, the research has been done primarily in clinical settings and often on more secondary prevention such as screening and smoking cessation counseling. However, the work of public health is focused on community and often on interventions much further “upstream.” Public health’s role of “assuring the conditions in which people can stay healthy” is a clear call to address the social determinants of health, and this very early prevention strategy is, theoretically, the most cost-saving approach to health care. Healthy People 2020 strives for the elimination of preventable death and illness, but states that this will occur only by examining root causes and societal determinants (Office of Disease Prevention and Health Promotion, 2011).

What determines if a person will be healthy? Health outcomes are determined by many factors, as illustrated in Dahlgren and Whitehead’s (1991) historic model of determinants of health (Figure 3). Health is determined by genetic factors such as age, sex, and race and non-health determinants such as income, education, and environment. Each of these determinants affects health; however, the broadest, most far-reaching effects can be accomplished by impacting the socioeconomic, cultural, and environmental conditions.
To what extent each of these determinants impacts health outcomes has been the focus of substantial research. In an often cited article, McGinnis and Foege (1993) were among the first to measure the relative contributions of various determinants to early death of individuals in the United States. They found that genetic predisposition accounts for 30% of premature deaths, whereas health care accounted for an additional 10%. According to the authors, the remaining 60% of proportional contributions to premature death was due to the “social determinants of health,” specifically 40% to behavioral patterns, 15% to social circumstances, and 5% to environmental exposure.

In 2004, Mokdad, Marks, Stroup, and Gerberding confirmed McGinnis and Foege’s estimates using identical study design that involved using a MEDLINE search of
the literature for relative risk and prevalence measures combined with estimates of cause of death from mortality data reported to the Centers for Disease Control and Prevention.

An enormous body of literature supports the view that differences in health are determined as much by social circumstances that underlie them as by the biologic process that mediate them. McGinnis and Foege (1993) summarized the role of health behaviors as a leading cause of death and labeled them the “actual causes of death.” Later updated by Mokdad et al. (2004), these studies concluded that approximately half of all deaths in the U.S. could be attributed to factors such as smoking, physical inactivity, poor diet, and alcohol use (Mokdad & Remington, 2010). Improving the health of individuals is bidirectionally linked to improving the health of communities where they live, work, and play.

Public health has considerable capacity to reduce health care spending by reducing or eliminating the leading causes of disease, death, and disability with cost-efficient, population-based interventions, and linking clinical care to community prevention (Rein & Ogden, 2012). Public health, according to Rein and Ogden, can help decrease costs by centering efforts on primary prevention and gives examples of childhood immunization as one cost-saving measure. Chronic disease, which is largely preventable, causes 7 of 10 deaths in the United States and consumes more than 70% of the nation’s health spending. Recent time-series studies estimate that nationally as much as 50% of the gains in life expectancy in the U.S. since 1950 are attributable to the public health focus on diet, tobacco exposure, and other community interventions (Mays & Smith, 2011).
In a macroscopic analysis of the U.S. health care system, Milstein and his team (2011) estimated the relative and combined health and economic impacts of three intervention strategies mentioned in the Affordable Care Act of 2010: coverage, care, and protection. Specifically, each strategy was examined by analyzing their likely consequences over a 25-year period. The three approaches were (1) Coverage: expand health insurance; (2) Care: deliver better preventive and chronic care; and (3) Protection: establish healthier behavioral and environmental conditions. The impact of approach 3 is more gradual, but is the only approach that lowered both the number of premature deaths and reduced costs, while alleviating demand on already limited primary care delivery system. In addition, Milstein showed that the interventions worked synergistically. The baseline simulation showed that when the protection intervention was added to coverage and care, 90% more lives would be saved and costs would be reduced by 30% in year 10.

In summary, cost-efficiency and cost-effectiveness studies are prevalent in clinical prevention interventions, but much less research has been conducted on the early prevention strategies typical of public health systems. There are many reasons for this, including the amount of time often needed for behavior change, the lack of randomized controlled trials in public health, and the difficulty in proving causation. Since early interventions addressing social, behavioral, and environmental determinants of health can decrease mortality and morbidity, there is a huge potential for cost savings by investing in public health and its functions.
Summary of Current Work in Economic Analysis of Public Health

Economic evaluation can occur at many levels in public health. Macro-level analysis examines public health investments at a national level and looks at benefits that impact the entire health care system and beyond. For example, Trust for America’s Health (2009) issued a report that states for every $10 investment per person per year in proven community-based disease prevention programs, the country could save more than $16 billion annually within 5 years. This is a return of $5.60 for every $1 spent. These findings are based on a model developed by researchers at the Urban Institute and using evidence-based studies in the literature surrounding physical activity, nutrition, and smoking. Researchers examined interventions that cost less than $10 per person and through meta-analysis of the literature, calculated rates of reduction in diabetes, high blood pressure, heart disease, kidney disease, stroke, cancer, arthritis, and COPD with the interventions. Also from the literature, annual costs associated with each of these diseases were calculated and applied to the rates of disease and to the population numbers to calculate averted costs. Mays and Smith’s (2011) study linking public health spending to declines in preventable deaths is another example of macro-level analysis. They found that mortality rates fell between 1.1% and 6.9% for each 10% increase in public health spending over the course of the 12 years studied.

There is also micro-level analysis that occurs with intervention and programmatic economic evaluation. Several of these studies are listed in the literature and include cost savings related to interventions such as discussing aspirin use with high-risk adults, immunizing children, and tobacco-use screening and cessation programs (Maciosek et al.,
Studies at this level can be found using varied economic methods, time frames, inclusion criteria for costs and benefits, and study designs and, therefore, often yield varying results. Decision makers who try to interpret the evidence are often left confused on the general question of “Does prevention save money?”

There is the added confusion in public health economic analysis that the cost of an intervention might lead to an environmental change or a behavior change that does not lead to a quantifiable outcome until the change yields health impact, which may be years later. For example, many public health interventions focus on developing built environments conducive to active lifestyles, with the hope that people living in that environment will be less likely to be overweight or obese. Studies have quantified the added expenses attributable to obesity. One recent macro-level study estimates that annual medical expenditures are between 6.7% and 10.7% lower in the absence of obesity (Trogdon, Finkelstein, Feagan, & Cohen, 2012); therefore, any successful attempt to lower obesity should have some degree of cost savings over time. Several of these examples can be found in the literature and are summarized in Table 3, leading to the conclusion that public health prevention in general is a good investment.
Table 3

*Health Behaviors and Projected Health Outcomes*

<table>
<thead>
<tr>
<th>Study</th>
<th>Target Behavior</th>
<th>Condition</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brownson (2000)</td>
<td>Physical Activity</td>
<td>Cardiovascular Disease</td>
<td>Of people who had access to walking trails, 38.3% used them. Of these users, 55.2% increased their amount of walking.</td>
</tr>
<tr>
<td>CDC (2005)</td>
<td>Physical Activity, Weight Loss</td>
<td>Diabetes</td>
<td>By losing 5 to 7% of body weight and getting just 2.5 hours of physical activity a week, people with pre-diabetes can cut their risk for developing type 2 diabetes by about 60%.</td>
</tr>
<tr>
<td>Dauchet (2005)</td>
<td>Nutrition</td>
<td>Cerebrovascular Disease</td>
<td>Risk of stroke was decreased by 11% for each additional portion per day of fruit and 3% for each added portion/day of vegetables.</td>
</tr>
<tr>
<td>Felson (1997)</td>
<td>Weight Loss</td>
<td>Arthritis</td>
<td>40% increase in risk per 10 pound weight gain and 60% increase in risk per 5 unit BMI increase.</td>
</tr>
<tr>
<td>HHS (2003)</td>
<td>Nutrition</td>
<td>Cardiovascular Disease, Cholesterol</td>
<td>A 10% decrease in cholesterol levels may result in an estimated 30% reduction in the incidence of coronary heart disease.</td>
</tr>
<tr>
<td>Joshipura, et al. (2001)</td>
<td>Nutrition</td>
<td>Cardiovascular Disease</td>
<td>Each additional serving of fruits and vegetables per day was associated with a 4% lower risk for coronary heart disease.</td>
</tr>
<tr>
<td>McGinnis &amp; Foege (1993)</td>
<td>Nutrition</td>
<td>Cardiovascular Disease</td>
<td>22 to 30% of CHD deaths are due to dietary factors, especially increased consumption of cholesterol and saturated fat and a decreased consumption of fiber.</td>
</tr>
<tr>
<td>Nutrition</td>
<td>Cancer</td>
<td>The proportion of all cancer deaths attributable to diet is 35%.</td>
<td></td>
</tr>
<tr>
<td>Nutrition</td>
<td>Diabetes</td>
<td>45% of diagnosed cases are due to poor diet, inactivity and obesity.</td>
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</tr>
</tbody>
</table>

(Trust for America’s Health, 2009)
Although there are entire registries of cost-effectiveness analysis research for clinical preventive interventions, much less is available for community-based programs, typical in public health. A few large-scale studies are promising. The Trust for America’s Health’s (2009) *Prevention for a Healthier America* studied community programs in July 2008 and concluded that an investment of $10 per person per year in proven community programs to increase physical activity, improve nutrition, and prevent smoking and other tobacco use could save the country more than $16 billion annually within 5 years. This is a return of $5.60 for every $1.00 invested. The Commonwealth Fund estimated that elimination of tobacco use and obesity would lower national health expenditures by $474 billion over 10 years, which is the excess cost of care for people with preventable chronic disease and those without (Woolf et al., 2009). Baicker, Cutler, and Song (2010) found that medical costs declined by about $3.27 for every dollar spent on worksite wellness programs, and that absenteeism costs fell by about $2.73 for every dollar spent. Since 60% of Americans get their health insurance coverage through an employment-based plan, this is an important venue for investments in health.

Researchers debate whether preventive services deliver sufficient savings, but it may be more important to ask whether an intervention offers good value for the dollar, regardless of cost savings. Good “value” can be defined as providing substantial health benefit per dollar spent net of any savings, without necessarily saving money (Maciosek et al., 2010). For example, public health policies that reduce risk behaviors for obesity have value even without cost-efficiency studies. Obesity continues to add to the economic burden on both public and private payers. Per capita medical spending for the
obese is $1,429 higher per year (42%) than for someone normal weight (Finkelstein, Trogdon, Cohen, & Dietz, 2009). Using data from the Medical Expenditure Panel Survey (MEPS), researchers estimate that the annual excess medical care cost of four diseases associated with obesity and smoking (Type 2 Diabetes, hypertension, heart disease, and stroke) is currently $238 billion (Waidmann, Ormond, & Bovbjerg, 2011).

**National Agenda and Funding for Public Health**

Although health care reform has been discussed by policy leaders for many years, the Patient Protection and Affordable Care Act (PL111-149) (ACA) was the first policy to link health care reform to funding for public health and prevention (Waidmann et al., 2011). On March 23, 2010, health care reform became law when President Obama signed the ACA legislation. Many provisions of the ACA directly benefit public health including the new policy development mechanism of the National Prevention Council and a significant source of funding called the Prevention and Public Health Fund (PPHF) (Bovbjerg, Ormond, & Waidmann, 2011). The fund originally promised $15 billion over 10 years to build public health capacity by supporting programs, medical screenings, and research related to public health and prevention. The ACA puts public health in the spotlight by adding new funding, creating new infrastructure, and encouraging innovations especially for addressing chronic conditions at the population level.

The ACA makes a significant statement in support of prevention; however, federal funding for public health initiatives remains vulnerable. In fact, in February 2012, the fund was cut by $6.25 billion over 9 years in order to offset a scheduled cut to
Medicaid physician payments. Some ACA provisions such as the Prevention Fund were protected by multi-year appropriations. However, unlike entitlement funding for clinical care, federal funds for public health programs are annually appropriated even if they were authorized in the ACA, which means advocacy is needed each year to sustain funding (Bovbjerg et al., 2011).

Funding for public health is needed. The National Association of County and City Health Officials (NACCHO, 2012) surveyed local health departments nationwide in early 2012 to measure the impact of the economic recession on local health department budgets, staff, and programs. The survey showed that during 2011, 57% of all local health departments reduced or eliminated services in at least one program area, which is more than any year since the recession began in 2008. In addition, over 5,000 staff positions were eliminated in the last half of 2011. Reductions in funding for public health have resulting in the loss of nearly 50,000 state and local public health jobs over the previous 3-year period (Rein & Ogden, 2012). The ratio of public health workforce to U.S. population has dropped from 220 per 100,000 in 1980 to 158 per 100,000 in 2000, already then far below the projected need (Gebbie & Turnock, 2006). Although the prolonged recession no doubt contributes to this job loss, there appears to be a disconnect between reducing costs through prevention and funding the infrastructure most capable of doing this work.

With limiting resources, public health has to set priorities and refocus its agenda. Should the ACA funds be used to fill shortfalls in core public health programs neglected during the recession, or should public health transform its infrastructure and address new
goals? Prioritizing the public health agenda is necessary to effectively advocate for a clear vision. Research is needed to track the downstream effects of this new unprecedented spending in public health through the ACA (Mays & Smith, 2011). It will be important to study the association between public health spending and population health status, a link already examined by Mays and Smith, who found that after controlling for other factors, mortality rates fell by between 0.5% and 4.3% for each 10% increase in public health spending ($p < 0.05$) over 15 years. Medical care spending per person also fell by 0.8% for each 10% increase in public health spending per capita ($p < 0.05$) (Mays & Smith 2011). Mays and Smith concluded that higher levels of spending may contribute to improved population health if resources are allocated to activities that are effective in reducing health risks, and if these activities are targeted successfully to population groups at risk.

Most health care costs are associated with chronic disease. The prevalence of chronic disease is projected to continue growing, and if not slowed, health care costs associated with these conditions will continue to grow. Cardiovascular disease, cancer, and diabetes now cause 70% of U.S. deaths and account for nearly 75% of health care expenditures. The second IOM report, “Future of the Public’s Health,” in 2003 suggests that slowing the growth of chronic disease will require prevention beyond acute care medicine. The IOM report highlighted the critical importance of the multiple determinants of population health, and the social-ecological framework, in future efforts to improve the population’s health. Doctors and hospitals focus on producing health
care, but what is needed is a focus on health and preventing sickness, which is usually the focus of public health activities (Asch & Volpp, 2012).

The Trust for America’s Health (2009) recent report, *Prevention for a Healthier America*, agrees and states that the country will never be able to contain health care costs until we start focusing on how to prevent people from getting sick in the first place. There is a need to put emphasis on improving the choices we make that affect our risk for preventable disease (Trust for America’s Health, 2009). The U.S. prioritization of health care rather than health is evident in the U.S. poor performance in life expectancy and other major health outcomes compared with other developed countries. The U.S. spends extravagantly on clinical care, but sparingly on population-based prevention that influences health more than medical services (IOM, 2003).

So, although there is a great opportunity with ACA and the Prevention Fund resources, public health systems will need to adapt by concentrating on policy change, early community interventions, and prevention of chronic conditions more than infectious disease. In addition, it is becoming increasingly important for public health practitioners and researchers to feel comfortable conducting and discussing economic analysis.

**Barriers to Economic Analysis in Public Health**

The health benefits of prevention are intuitive, but is there economic proof that community-based preventions save money? Unlike with acute care interventions, it is often difficult to demonstrate economic value in community prevention, even when the health value is obvious (Woolf et al., 2009). Prevention interventions strive for healthy
behaviors which are difficult to change, and once changed take time to translate to health and economic benefit. There is also an inherent economic conflict in prevention. Effective prevention prolongs life, which leads to increased medical care use and therefore costs, even among the healthiest survivors. In addition, promoting access to services and screenings conflicts with promoting efficiency and cost-cutting in the short term since more people will use health services. These increased usage costs should, however, be offset by the difference in the cost of care for people with chronic disease and those without. Prevention also can reduce absenteeism and improve productivity at work and school (Waidmann, Ormond, & Spillman, 2012), factors not quantified in this study, but worthy of mention.

Methods of economic evaluation are well established for clinical intervention; however, there are several methodological challenges when applying these methods to public health interventions. This may account for the relatively few complex interventions delivered at the population level that include economic evaluation. Four key methodological challenges were identified by Weatherly and colleagues (2009) after reviewing several economic evaluation studies from the public health literature:

1. It is difficult to conduct randomized controlled trials in public health; therefore, it is hard to determine causation and attribution of health benefits. Without randomized controlled trials, there are threats to the validity of the reported health effects, most commonly selection bias and measurement error. In addition, there is often not a comparison or control group, and therefore
there might be unrelated pathways that account for observed differences (Miller, Dickerson, Smith, & Ory, 2010).

2. With broad-based system change, costs and benefits extend beyond the health intervention to education, economy, and other disciplines. These are often difficult to quantify.

3. Standard approaches to measuring health benefit, i.e., QALY, may be inadequate for measuring public health effects.

4. Standard economic evaluation methods focus on maximizing health gains on the target intervention group, rather than on equity or distribution of health gains across the population.

There are a number of ways to overcome these challenges and Weatherly calls for pilot studies and more methodological research to apply economic methods to public health interventions.

It is difficult to quantify outcomes in public health. There is a need for a clear definition of public health activity and what are important outcomes of that activity. Public health systems research has a broad focus, and there are no “uniformly stated aims to serve as system wide indicators of quality” (Ingram, Bernet, & Costich, 2012). If there are not clear expected outcomes, it is near impossible to quantify value. What measure shows that a public health system change has been effective? When measuring public health system change, it is helpful to review the essential functions of local public health as outcomes indicators. In the landmark 1988 Institute of Medicine (IOM) original study, “The Future of Public Health,” the core functions are defined in three broad categories:
assessment of public health, policy development, and assurance that public health services are available. These categories are further defined as the 10 Essential Public Health Services. The Essential Services provide a working definition of public health and a guiding framework for the responsibilities of local public health systems, which also provides a framework for the National Public Health Performance Standards (NPHPS) Program that monitors the essential services (http://www.cdc.gov/nphpsp/essentialServices.html).

Quantifying costs is important for all economic methods. Medical intervention costs include costs for screening, counseling, pharmaceutical treatments, follow-up diagnostic tests, hospitalizations, etc. However, there are no clear standards for cost capture analyses procedures in behavior interventions (Ritzwoller, Sukhanova, Gaglia, & Glasgow, 2009). Differences in methodology result in inconsistencies and difficulty in comparing costs of varied interventions. Some tools are being developed to standardize cost capture; most importantly for public health systems research is the Public Health Return on Investment tool being developed Dr. Glen Mays with the help of ASTHO (Association of State and Territorial Health Officers) and the CDC. This standardization of information is critical to decision analysis, especially when deciding on resource allocation.

It is also difficult to quantify the money invested in public health. Public health finance is defined as a “field of study that examines the acquisition, utilization, and management of resources for the delivery of public health functions and the impact of these resources on population health and the public health system” (Honoré & Amy,
Its primary focus is on resources needed and acquired for the delivery of essential public health services and other functions of the system. A better understanding of public health finance has been identified as a core need by leaders in the field of public health systems research. There is a growing need to measure levels and types of spending in local public health and demonstrate value and cost-effectiveness of public health services (Leider et al., 2012). Public health finance literature, especially as it relates to public health systems, needs further review to identify gaps and to prioritize areas of future research.

Although a substantial body of literature exists that examines financial ratios used to assess efficiency of corporations and governments, the literature on financial ratio analysis applied to local public health departments is scarce (Suarez, Lesneski, & Denison, 2011). Research on financial analysis of health departments is necessary to determine the most appropriate ways to assess whether dollars spent on public health services are worthwhile. Public health administrators must produce more health with fewer resources than ever before, so knowledge on how to achieve efficiencies in service delivery is critical. Suarez et al. make several recommendations for how financial analysis research can progress, including developing uniform data formats, teaching financial management to public health students, and training health department staff on financial ratio analysis. Suarez et al. also suggest that more research is needed on the use and effectiveness of financial indicators.

The long time frame needed to assess benefits, both health benefits and financial benefits, presents a problem for economic assessment as well as political influence.
Often public health interventions lead to healthy environments that eventually encourage difficult behavior change. The health consequences resulting in the behavior change may take several years to occur. Cost-benefit analysis places a monetary value on the significant intervention-related outcomes, based on benefits expected to accrue over the life course of participants (Kuklinski, Briney, Hawkins, & Catalano, 2011). Potential savings include all medical costs for avoided treatments or reduced costs for less intensive, earlier stage treatments (Maciosek et al., 2006). Substantial cost offsets associated with less use of health care resources is usually long term, greater than 5 years; however, most cost-benefit analyses are done in a much shorter time frame (Ritzwoller et al., 2009).

There is an inherent difficulty in measuring cost-efficiency with public health; public health prolongs life, and it cost more to live longer (Woolf et al., 2009). In essence, prevention leads to increased use of medical services over time. However, preventing people from getting sick definitely has value in terms that economic evaluation cannot easily capture. What matters more is value, the health benefit per dollar invested, and this is measured in cost-effectiveness analysis. Good value can be defined as providing substantial health benefit per dollar spent, without necessarily saving money. Woolf explains that although an intervention might NOT be cost-effective, the resultant behavior change might be cost-effective. For example, an exercise intervention might not be cost-effective; however, there is substantial value and cost savings with decreased obesity that occurs secondary to increases in exercise (Woolf et al., 2009).
Public health economic analysis provides another unique challenge: Metrics developed must be feasible and understandable for already overworked public health staff to use routinely. Research often uses academic terms and calculations that local health department staff does not understand (Neumann, Jacobson, & Palmer, 2008). In addition, public health economic researchers might seek to publish in journals not typically read by public health managers and directors. Academic researchers evaluating the economics of public health investments should increase focus on the needs of public health professionals so they are better able to measure the value of their own services (Neumann et al., 2008). Public health services do often provide a positive return on investment especially long-term, but practitioners often do not know how to discuss this effectively with policy makers. Public health practitioners need to have a quick and easy set of replicable economic evaluation tools and a clear, understandable framework to make credible decisions when discussing the merit of existing and potential programs.

Practitioners and public health systems researchers must continue to collaborate to better understand the efficiency and effectiveness of public health activities (Ingram et al., 2012). When research findings are grounded in practice-based questions regarding value, a convincing political case is made for better targeted funding. Local public health departments may achieve more community impact if they use financial ratio analysis to monitor performance, increase capacity, and achieve their mission and vision which would improve the health of the population in that community (Suarez et al., 2011).
Policy Implications of Economic Analysis

Cost-effectiveness analysis is a powerful analytic tool for assessing the value and efficiency of health care intervention. Although there are limited examples in the literature of cost-effectiveness analysis applied to public health systems change, especially in the United States, academics and policy analysts are increasingly requesting these studies to inform health policy decisions (Bryan, Sofaer, Siegelberg, & Gold, 2009). It is important to keep in mind that cost-effectiveness of a service might vary across regions and different organizational arrangements, and the resultant health outcomes often aren’t realized for years. Benefits, like costs, are often difficult to estimate, and often economic tools are not usable, and the data systems are not uniform or easy to understand.

Public policy makers are very interested in funding cost-effective health programs. Cost savings and cost-effectiveness are important to policy makers because chronic disease, which has become the dominant source of mortality and cost in the U.S., is driven by risk factors that are largely preventable (Goodell, Cohen, & Neumann, 2009). The U.S. Preventive Services Task Force (USPSTF) and the Community Preventive Services Task Force both have established an evidence-based approach to decision and policy making by rating intervention on effectiveness based on systematic reviews (Chattopadhyay & Carande-Kulis, 2004). The USPSTF does not evaluate cost-effectiveness studies of preventive services in developing its recommendations, and only includes economic evaluation for informative purposes. If an intervention is found to be effective after review, any economic information is included in the recommendation
based on any cost studies conducted in the literature used for the reviewed. Such review has been done on the cost effectiveness of screening asymptomatic adults for abdominal aortic aneurysms and exercise tolerance testing for coronary heart disease (http://www.uspreventiveservicestaskforce.org/3rduspstf/chd/chdsum1.htm). The Community Preventive Services Task Force makes recommendations for interventions based on systematic reviews of the literature also. Once a recommendation is made, a review is conducted to assess the quality of any relevant economic evaluations and to summarize those findings along with the recommendations in the Community Guide (www.thecommunityguide.org). There is a systematic method for this review; however, there is a lack of standardized methods and reporting of economic data in the already limited literature (Carande-Kulis et al., 2000). Policy makers are taking an interest in this information about economic returns because of increasing budget constraints and public concern about fiscal accountability. This will become even more of a demand as taxpayer money is being used for Prevention Fund activities.

Policy makers need clear metrics to determine whether an intervention improves community health and whether that intervention is worth the investment. Public health services must demonstrate and communicate measureable contributions to the population’s health so decision makers can have ample information when allocating resources on the basis of effective activities (Jacobson & Neumann, 2009). Unfortunately, not only are financial ratios and economic analyses rare in public health systems research, but better data are needed to measure the health of communities. Although it is not perfect, practitioners should try to use economic analysis to inform the
decision makers as best as possible, and to provide the information before a funding or policy decision needs to be made. Stating that the effect will occur and be measured at some point in the future is just not sufficient in this time of economic hardship. Given the discussion of barriers, it is understandable that public health is seen as a relatively easy target for funding cuts. Some common reasons public health is routinely unfunded are summarized by Bovbjerg et al. (2011):

- The benefit of public health is a future benefit rather than immediate.
- Public health interventions benefit the population at large rather than individuals.
- The causal pathway from public health to better health is not clear.
- Public health initiatives require change that is not always popular.

There are growing opportunities to secure public health funding; however, public health practitioners will need to build support and advocacy through value measures. Practitioners often refer to public health as a “great investment” but are hard-pressed to substantiate that statement with economic or financial analysis. Public health as an investment strategy is being tested through non-traditional interventions. New creative funding opportunities such as social impact bonds have been initiated in the UK and in cities such as Boston and New York. Social impact bonds are performance-based investments where the government partners with service providers and investors to fund creative prevention and early intervention services that improve social outcomes. Investors will require information on value, effectiveness, and return on investment prior to committing resources. In addition, bond payment is based on performance; therefore,
robust evaluation of outcomes as well as financial impact is critical (Callanan & Law, 2012).

Public health practitioners must start thinking like investors, making reasonable judgments about performance and cost, even when precise return on investments cannot be calculated (Bovbjerg et al., 2011). Simply learning to talk more like an economist is a strategy for improving public health.

**Economic Evaluation Models and Frameworks**

Scientific studies of value in public health are scarce, but even less is found in the literature examining systems or infrastructure that give context to the economic methods used to analyze value. A public health systems intervention framework is needed to define the inputs and outputs necessary for economic analysis, as well as to show meaning in the economic results. However, before examining models, it is important to define value. Jack J. Phillips (2008) gives an updated definition of value and states that value must:

- be balanced, with qualitative and quantitative data;
- contain financial and non-financial perspectives;
- reflect strategic and tactical issues;
- satisfy all key stakeholders;
- be consistent in collection and analysis.
A framework for assessing value is a structure for gathering and organizing information that makes it easier for practitioners, researchers, and policy makers alike to decide whether an intervention or system change is worthwhile.

When a framework is illustrating the valuation of community-based prevention intervention, it is important to include impacts on all members of the community and measurements should cover the domains of health, community well-being, and community process. An Integrated Framework for Assessing the Value of Community-Based Prevention, developed by the Institute of Medicine, is the most recent comprehensive text on valuation for community-based work. The IOM report (2012) proposes four indicators to measure the value of community-based prevention: changes in health, changes in community well-being, changes in community process, and changes in resources used. Although there are many measures to quantify changes in health and resources, changes in community well-being and community process are much harder to measure. Elements of community well-being include wealth and income, education, employment, crime, social support, etc., and can include physical as well as social characteristics. The County Health Rankings (www.countyhealthrankings.org) begins to measure this in a systematic way but struggles with methodological issues. Community processes include leadership development, civic engagement, decision making, and history and are much more difficult to quantify.

An economic assessment of value can have a prospective (such as the cost estimates produced by the Congressional Budget Office) or retrospective design. The chosen frameworks should keep this perspective in mind. Most program evaluations are
concurrent or retrospective assessments of value. In addition to the timing perspective, the IOM Committee on Valuing Community-Based, Non-Clinical Prevention Programs (the Committee), responsible for the IOM report, concluded that a framework should include the following elements:

- A decision making context—who are the decision makers and what are they trying to decide?
- A list of valued outcomes—what do the decision makers care about? And how do we measure each of those outcomes?
- A list of admissible sources of evidence—what information does the decision maker use to build the model of causation linking the intervention to the outcomes?
- A method for weighting and summarizing—how is information on all the valued outcomes made understandable to the decision maker?

The Committee identified eight existing frameworks that have been used to assess the value of community-based prevention (IOM, 2012). Some of those frameworks that go beyond simple economic analysis include the PRECEDE-PROCEED model, the Re-AIM framework, and Health Impact Assessment. The frameworks presented in the IOM report are summarized here for this dissertation in Table 4.
Table 4

*Framework for Economic Evaluation*

<table>
<thead>
<tr>
<th>Framework</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit-Cost Analysis</td>
<td>Compares all costs to all benefits in a dollar amount. Benefits represent all perspectives, but not all benefits are easily converted to financial value.</td>
</tr>
<tr>
<td>Cost-Effectiveness Analysis</td>
<td>Similar to Cost-Benefit analysis but health is the valued outcome. Answers how much it costs to produce a health outcome. This method is difficult for measuring community improvements.</td>
</tr>
<tr>
<td>Congressional Budget Score</td>
<td>Analyzes proposed legislation to provide budget and economic information for Congress. Focus is on changes to the federal deficit. Does not emphasize value of health improvements from community-based prevention.</td>
</tr>
<tr>
<td>PRECEDE-PROCEED</td>
<td>Framework for decision making in the planning and evaluation of health promotion and disease-prevention programs. Predisposing, Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation – Policy, Regulatory and Organizational Constructs in Educational and Ecological Development. &gt;1,000 published applications. Dependent on local conditions and the input of community. No assessment of resources.</td>
</tr>
<tr>
<td>Re-AIM</td>
<td>Reach, Effectiveness, Adoption, Implementation, and Maintenance Framework. Used in community health promotion field to assess whether a specific intervention is likely to have a positive health impact. Resource use and population health are outcomes. <a href="http://www.RE-AIM.org">http://www.RE-AIM.org</a></td>
</tr>
<tr>
<td>Health Impact Assessment</td>
<td>Health Impact Assessment involves a 6 step process including screening, scoping, assessment, recommendations, reporting, and monitoring and evaluation and is applied to policy changes being proposed outside the realm of health. The idea is to measure the health impact of a policy in another discipline and report those findings to policy makers to help inform decision making. Economic analysis could be a part of the analysis; however the focus is on health impacts.</td>
</tr>
<tr>
<td>Community Preventive Services Task Force Guidelines</td>
<td>CSPTF is an independent, nonfederal, group appointed by the CDC. Prioritizes topics and evaluated the effectiveness of interventions. Don’t often analyze cost effectiveness information unless the effective study includes substantial evidence in this area.</td>
</tr>
<tr>
<td>Canadian Health Services Research Foundation Model</td>
<td>Also called the Lomas model, provides a framework for combining evidence of different types. Doesn’t specify a list of valued outcomes, but lists different types of evidence used by decision makers. More descriptive model than decision aid.</td>
</tr>
</tbody>
</table>

(IOM, 2012)
Although each of these models has advantages, none by itself provides a comprehensive framework for public health system evaluation. In addition, cost-benefit and cost-effectiveness analysis are often considered economic methods, not frameworks. A few other models are discussed in the literature but were not included in the IOM report on assessing value.

**Results First**

In the state of Washington, legislators and agencies use a research model developed by the Results First team to help achieve better results with lower costs. The model has been applied to create significant improvements in crime and incarceration rates with cost savings (PEW Center on the States, 2012). The Results First cost-benefit analysis model includes seven steps:

1. Identify effective programs from the literature for a given problem.
2. Predict the impacts of policy options being considered around the problem.
3. Calculate the potential return on investment of policy options and assess the investment risks, based on all available research studies.
4. Rank the projected benefits, costs and risks of all programs.
5. Eliminate ineffective programs to simplify options for the policy makers.
6. Assess the combined benefits and costs if options were combined.
7. Communicate with policy makers so they understand the assessment.
This model relies heavily on research in the literature for effectiveness studies and cost-benefit analysis of interventions. Unfortunately, the literature on cost analysis in community-based public health interventions is limited.

A similar seven-step framework was developed in Australia specific for public health programs (Population Health Division, 2012). This model depends less on the literature but requires a significant amount of estimating both mortality and morbidity outcomes as well as costs and benefits of the public health program. In addition, this framework has been developed to assess the value of a program, and is less applicable to public health system change.

**Ritzwoller Model**

Ritzwoller describes a five-step process for practical cost assessment techniques that are primarily applicable to behavioral interventions (Ritzwoller et al., 2009). In summary, the five-steps are:

1. Determine the perspective of the analysis.
2. Identify required components if the intervention were to be duplicated.
3. Capture the cost of those replicable components.
4. Analyze data to calculate a cost per intervention or per participant.
5. Conduct sensitivity analysis to address uncertainty in the adoption of intervention.

Although comprehensive, this framework is again geared toward specific interventions and does not aid in the organization of data for system change. In addition, the
framework does not address long-term behavior change or the cost savings of health outcomes.

**Economic Assessment Tool (EAT)**

The Economic Assessment Tool has been designed to understand the economic value of nursing services. This model sets up a return on investment analysis for nursing innovations and services (Ryrie & Anderson, 2011). EAT was built on the discipline of improvement and is based on four stages: mapping and planning, costing, calculating, and reporting. In the first phase, analysts develop process maps and a plan for data collection including cost measures. In the costing phase, monetary values are assigned to all inputs and outcomes associated with the innovation being studied. Data on effectiveness that cannot be quantified are also collected. Phase three is designed to calculate the return on investment dividends by comparing all costs with benefits. Importantly, phase four is included so that results are reported to decision makers.

**Practical Cost Benefit Analysis (PCBA)**

Recognizing the inherent shortcomings of most models and economic methods as applied to public health interventions, this model was developed to provide simple analysis for public health practitioners who are not entrenched in economic research (Miller et al., 2010). The PCBA functions as a tool of break-even analysis that does not require randomized controlled research design to provide quick and effective economic evaluation. This model requires three steps: (1) conduct a literature review to identify
existing evidence related to the cost studies of similar interventions to estimate benefits associated with avoiding the health issue, (2) develop a cost model to estimate costs and define scope, and (3) determine the magnitude of the health effect required to achieve a favorable cost-benefit ratio.

**Logic Models**

If the model is to be practical and beneficial to public health, it is important to ask practitioners what is important to them in an economic framework. When 46 public health practitioners in four states were asked to describe potential models for measuring the value of public health services, the respondents commented that the most promising model would combine cost accounting methods, community assessment, and an internal consensus-building process for setting priorities (Jacobson & Neumann, 2009). Jacobson and Neumann suggest using logic models as a way to frame value in public health. Logic models link expenditures to outcomes and provide context for the data and analysis. Logic models also provide a clear pathway for decision makers and policy leaders to understand.

**Economic Methods and Measures**

Once a model is developed to add structure and context to the economic analysis, a measurement tool and economic methods should be chosen. Various texts, most notably the CDC’s *Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation* (Haddix, Teutsch, & Corso, 2003), and web-based tutorials exist that explain
in great detail economic methods for analysis (Drummond et al., 2005; Gold, Siegel, Russell, & Weinstein, 1996; Muenning & Khan, 2002). The Centers for Disease Control and Prevention has a webpage dedicated to Public Health Economics and Methods (www.cdc.gov/stltpublichealth/pheconomics/index.html), which focuses on three specific economic evaluations: cost-effectiveness, cost-benefit, and cost-utility analyses. I developed a summary table, Table 5, linking brief definitions, calculations, and resources for these basic methods for this dissertation.

The CDC resource provides several links to valuable tools and reference material, including topics beyond the scope of this research, for example, economic evaluation of public health laws and their enforcement, and decision and transmission modeling (CDC 2013).

Public Health Uniform National Data System (PHUND$) is a web-based financial data collection and analysis tool that has been developed and maintained by the National Association of County and City Health Officials (NACCHO). This system is designed to collect local public health agency financial data in a standardized, common format and then create analysis markers for public health practitioners, such as ratio and trend analysis (Honoré, 2012). PHUND$ provides a way for health departments to track their financial trends in a standardized way, which allows for comparative analysis between agencies (benchmarking) and measures of program sustainability (http://www.publichealthfinance.org/research-and-analysis/2292).
Table 5

**Economic Evaluation Options for Public Health Systems Intervention**

<table>
<thead>
<tr>
<th>Method</th>
<th>Definition</th>
<th>Calculation</th>
<th>Interpretation</th>
<th>Resources</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost-Benefit Analysis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net cost-benefit</td>
<td>total overall benefit after costs are accounted for</td>
<td>B-C where B = incremental benefit of a program and C = incremental costs</td>
<td>Positive number indicates benefit, Higher number is greater value</td>
<td>CDC offers tools to help with cost estimates. The Chronic Disease Cost</td>
<td>Must be able to quantify health benefits if those are to be included;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(money-money)</td>
<td></td>
<td>Calculator is a downloadable tool to estimate costs of 6 chronic diseases.</td>
<td>program approach might be difficult to apply to system change</td>
</tr>
<tr>
<td>Cost-benefit ratio</td>
<td>Type of standardized cost benefit analysis</td>
<td>B/C where B = incremental benefit of a program and C = incremental costs</td>
<td>Higher ratio is greater value, any number &gt;1.0 has a net benefit</td>
<td>Economic Impact Analysis Tool developed by HRSA/Office of Rural Health</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ratio)</td>
<td></td>
<td>Policy can be found on the Rural Assistance Center website <a href="http://www.raconline.org/">http://www.raconline.org/</a></td>
<td></td>
</tr>
<tr>
<td>Return on Investment (ROI)</td>
<td>measure to evaluate the efficiency of an investment</td>
<td>[(B-C)/C] x 100% where B = incremental benefit of a program and C = incremental costs (% or ratio)</td>
<td>Positive ROI indicates benefit, the higher the number, the higher the benefit</td>
<td>Public Health Return on Investment Tool, currently in development being beta tested; Center for Health Care Strategies, Inc. RIO evidence base and forecasting calculator <a href="http://www.chcs.org">www.chcs.org</a></td>
<td>Consistent measurement of costs and benefits across PHSR interventions is critical for comparison and research</td>
</tr>
<tr>
<td><strong>Cost-Effectiveness Analysis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost-effectiveness ratio</td>
<td>net cost per unit of health gained, measures interventions in terms of effectiveness</td>
<td>C/HB where C = net costs and HB = incremental health benefit (money/health benefit)</td>
<td>The lower the ratio the better the value of the intervention</td>
<td>Cost effectiveness analysis registry website; Guide to Analyzing the Cost-Effectiveness of Community Public Health Prevention Approaches <a href="http://aspe.hhs.gov/health/reports/06/cphpa/">http://aspe.hhs.gov/health/reports/06/cphpa/</a></td>
<td>health benefit can be number of people cured, # of asymptomatic days, reduction in glucose, etc.</td>
</tr>
<tr>
<td>Incremental cost-</td>
<td>(ICER) compares differences between the costs and health outcomes of two interventions; used to compare options</td>
<td>C2-C1/HB2-HB1 where C1 and C2 are the net costs of two mutually exclusive intervention, and HB1 and HB2 are the health benefits of those same mutually exclusive interventions (money/health benefit)</td>
<td>The result demonstrates the additional cost per unit of health gained with intervention 2.</td>
<td>Prevention Effectiveness: a guide to decision analysis and economic evaluation. 2nd ed. Haddix, Teutsch, Corso, eds. New York, NY: Oxford :2003</td>
<td></td>
</tr>
<tr>
<td>effectiveness ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost-utility analysis</td>
<td>type of cost-effectiveness analysis where health benefits are measured in years of healthy life lived</td>
<td>C/HB where C = incremental costs and HB = quality adjusted life years (QALY) (money/QALY)</td>
<td>lower ratios are better values; typically values of $50K or $100K per QALY are considered &quot;good value&quot; in health but this is subjective</td>
<td>A bibliometric review of cost-effectiveness analyses in the economic and medical literature (Medical Decision Making, Vol. 30, Issue 3, May 2010, pp 320-327)</td>
<td>Comparative effectiveness approach</td>
</tr>
</tbody>
</table>

**Table Notes:**
- **Cost-Benefit Analysis:**
  - **Cost:** Where B = incremental benefit of a program and C = incremental costs (money-money)
  - **Interpretation:** Positive number indicates benefit, Higher number is greater value
  - **Resources:** CDC offers tools to help with cost estimates. The Chronic Disease Cost Calculator is a downloadable tool to estimate costs of 6 chronic diseases. [http://www.cdc.gov/chronicdisease/resources/calculator/index.htm](http://www.cdc.gov/chronicdisease/resources/calculator/index.htm)
  - **Comments:** Must be able to quantify health benefits if those are to be included; program approach might be difficult to apply to system change

- **Cost-Effectiveness Analysis:**
  - **Cost-effectiveness ratio:** Where C = net costs and HB = incremental health benefit (money/health benefit)
  - **Interpretation:** The lower the ratio the better the value of the intervention
  - **Resources:** Cost effectiveness analysis registry website; Guide to Analyzing the Cost-Effectiveness of Community Public Health Prevention Approaches [http://aspe.hhs.gov/health/reports/06/cphpa/](http://aspe.hhs.gov/health/reports/06/cphpa/)
  - **Comments:** Health benefit can be number of people cured, # of asymptomatic days, reduction in glucose, etc.

- **Incremental cost-effectiveness ratio (ICER):**
  - **Comparison:** The result demonstrates the additional cost per unit of health gained with intervention 2.

- **Cost-utility analysis:**
  - **Comparison:** Lower ratios are better values; typically values of $50K or $100K per QALY are considered "good value" in health but this is subjective

- **Comments:** Comparative effectiveness approach
Mortality and life expectancy are two basic measures of population health often used to measure “health benefit” in cost-effectiveness analysis. Shorter term indicators include measurements of self-perceived health and functional status often captured in population health surveys such as the Behavioral Risk Factor Survey, the National Health Interview Survey, or the National Health and Nutrition Examination Survey, and many others (Mokdad & Remington, 2010). The CDC “Healthy Days Measures” have also been suggested by Parrish as being the most viable option for health-related quality of life measures (Parrish, 2010). The standard 4-item set of Healthy Days core questions (CDC HRQOL–4) has been used since 1993 in various surveys and is validated. It would be almost impossible to include all health benefits of an intervention that may include long-term related social and environmental benefits.

The U.S. Public Health Service Panel on Cost-Effectiveness in Health and Medicine has recommended the use of quality-adjusted life-years (QALYs) as the best way to estimate outcomes in a cost-effectiveness analysis. Cost-utility analysis is the method that uses QALYs as the measure for health benefits. QALYs take into account both length of life and quality of life in one measure. Using this measure allows a comparison of the dollar cost per health benefit of different interventions to be analyzed (Bryan et al., 2009). QALYs are not easy to determine, nor are they intuitive. The National Institute for Health and Clinical Excellence (NICE) defines the QALY as a “measure of a person’s length of life (survival or life expectancy) weighted by a valuation of their health-related quality of life” (www.nice.org.uk) (C. Phillips, 2009). Quality of life valuation is called health utilities, and the EQ-5D is widely used as the instrument for measurement. With QALYs, a year of perfect health is worth 1 and a year of less than
perfect health is valued from 0 to 1. A small number of QALY tables of disease specific QALY weights have been published and all but the most severe and least severe conditions fall in the range of .7 to .9 for chronic conditions (Maciosek et al., 2001).

**Partnership for Success**

The local public health department stands at the center of the public health infrastructure which represents the available capacity to carry out these services (Baker & Koplan, 2002). Since the public health workforce represents the major component of the public health infrastructure, it is essential to study workforce composition and competency to determine the best system for implementation. The public health system consists of many diverse organizations and partnerships. The IOM committee recommends that public health departments work with other providers and agencies to develop adequate capacity. Partnership is an effective strategy to increase capacity and maximize efficiency and effectiveness in acquiring and using resources (Suarez et al., 2011). In fact, public health partnerships were found to be significantly related to public health system performance using the NPHPS Instrument (Scutchfield et al., 2004). Agency partnerships with universities were positively associated with performance on essential services 1, 2, 6, and 10. The core function of assessment supports and catalyzes the other two functions of policy and assurance and is often beyond the scope of the local public health department. Health in all policies requires a multidisciplinary approach, which necessitates collaboration (Koh, 2011).
Community partners aid in the public health mission by expanding funding for public health from federal, state, and private sources. Partners in New Hampshire provided more funds than state and federal funds dispersed by the state to the public health department, and about half of partner spending went toward direct public health service (Bernet, 2012).

There is little additional information on collaborative partnerships in public health. Although collaborative partnerships are becoming an increasingly popular strategy, especially in these times of fiscal hardship, there has been limited empirical evidence that exists on their effectiveness in improving community-level outcomes (Roussos & Fawcett, 2000). Noting this research gap, Zahner (2005) studied partnerships with local public health departments in Wisconsin. She found that partnerships with local health departments and one or more other system partners addressed 35 different primary focus areas. The most common focus areas were tobacco prevention, maternal and child health, emergency planning, community assessment and planning, and immunizations. Partnership success, as measured by implementation of partnership plans, was the least evident in “designing local health systems or services.”

As demands on public health increase, while financial resources decrease, partnerships across disciplines are likely to rise. Unique public health system arrangements and delivery models must be evaluated for success, both in health outcomes and economic efficiency. The partnership between the University of Rochester Medical Center (URMC) and the Monroe County Department of Public Health (MCDPH) has grown over the past decade into what is known today as the Center for Community
Health (CCH). Assessing whether the development and maintenance of the CCH is value-adding for the University investment is the topic of this dissertation. The partnership was developed to improve community health by adding capacity to conduct the work of public health; however, overall evaluation of this system development has not yet occurred in a systematic way.

Chapter Summary

Current work in public health economics is sparse but includes some promising results. Trust for America’s Health found that every $1 spent on community-based prevention in physical activity, nutrition, and smoking cessation efforts yields $5.60 in health savings. Medical expenses for those who are obese have been quantified and are much higher than normal weight persons. Mays and Smith (2011) found that mortality rates fell between 1.1% and 6.9% for each 10% increase in public health spending. More research in public health economics is needed, and programs and interventions must begin evaluating their work in terms of cost-effectiveness and return on investments. My dissertation research begins to fill this gap.

The Affordable Care Act has placed national attention on prevention and the public health system. The ACA established a Prevention and Public Health Investment Fund to provide for expanded and sustained national investment in prevention and public health programs that builds up from $500 million in FY 2010 to $2 billion in FY2015 and each fiscal year thereafter. The ACA also directed HHS/CDC to fund research in the area of public health services and systems that examines evidence-based practices relating to
prevention, including comparing community-based public health interventions in terms of effectiveness and cost.

There are many barriers to public health economic analysis, including the time frame often needed to see health effects with primary prevention. Other barriers include the lack of randomized controlled trials in public health systems research, lack of applicability of common economic methods in public health, and lack of expertise among public health practitioners. Quantifying investments and subsequent outcomes in public health is difficult and will require new models, new methods, and creative analysis.

To simplify translation in economic analysis, a framework should be used to add context to economic methods. The Institute of Medicine (2012) provides a summary of many frameworks in their recent report, “An Integrated Framework for Assessing the Value of Community Based Prevention.” In addition to the frameworks described in the IOM report, other models such as Results First, Ritzwoller framework, Economic Assessment Tool, Practical Cost Benefit Analysis, and logic models provide options for public health economic researchers and practitioners.

Public health systems are changing with many partners being added to the central hub of the governmental public health department. Partners from academia, community-based organizations, and health care systems are more frequently linking to the public health system infrastructure. This dissertation presents one such partnership where the University of Rochester has joined the local public health department network by investing in the Center for Community Health. This study will analyze the investment made by the University to the Center for Community Health in terms of value, both in
adding to the public health capacity needed to conduct the essential services and in financial efficiency and effectiveness.

The value of public health is measured in terms of its ability to conduct the 10 Essential Services of assessment, policy, and assurance. To date, public health leaders have measured their value by how well they completed the essential services and their impact on community health. Very little research has been done to assess the financial value of public health, even though this is a growing need of policy leaders and organizational decision makers. As the nation is searching for ways to cut costs, prevention is emerging as a viable solution. Most research has studied clinical prevention methods and screening, which do not usually provide cost savings, although many provide some level of cost-efficiency and cost-effectiveness. Public health provides potential cost savings since the work of public health concentrates on environmental and behavioral changes, including the social determinants of health. Early primary prevention that creates healthy environments will encourage beneficial behaviors—the first steps to keeping people healthy and therefore away from using expensive health services.
CHAPTER III

METHODS

Research Design

This study is a multiple-methods retrospective analysis of the value change associated with the development and growth of the Center for Community Health (CCH), a unique naturally occurring experiment. This is a non-experimental, longitudinal case study of the CCH over a 6-year period. Costs and benefits are analyzed over time, starting with the initial contribution of the University of Rochester to the Center for Community Health in May of 2006 and continuing through June 2012. The financial gains and losses are presented from the perspective of the University of Rochester, who contributed the original costs for start-up of the CCH and continues to support the CCH financially. This work does not determine costs and benefits associated with other indirect effects related to health such as education, productivity, or absenteeism, although obviously contributory to the economic analysis but beyond the scope of this study.

The study focuses on organizational-level changes and measures the costs and benefits associated with the CCH and its initial and ongoing development. To date, most economic research in public health takes either a micro-approach studying specific interventions or specific disease states, or a macro-approach looking at national investments in public health and overall trends in outcomes. Taking a mid-level approach of examining a discrete departmental organization containing multiple
interventions, as is done in this dissertation, contributes to the body of knowledge of value benefit to investments in public health systems. This study collects real observational financial data over time, as opposed to modeling or predictive analysis, to answer the question of whether investments in public health system infrastructure as a whole are cost-beneficial and/or offer a valuable return on the investment.

As discussed, developing a framework to add context to economic methods is important for understanding data collection and ultimately for translation to policy makers and practitioners. The IOM (2012) report, “An Integrated Framework for Assessing the Value of Community Based Prevention,” lists characteristics necessary for an effective framework, and then describes several existing frameworks that were summarized in Chapter II of this dissertation. After reviewing the literature regarding existing frameworks, it seems a more practical model is needed that considers the IOM desirable characteristics and blends existing frameworks. I propose the following Framework for Assessing Value in Public Health System Change:

*Framework for Assessing Value in Public Health System Change*

1. Define the analysis as prospective or retrospective; set a time frame.
2. Define the decision makers who will use the results of the analysis.
3. List the outcomes of value to the decision makers—financial and/or health.
4. Develop a logic model or system map that ties the system change or investment to the valued results, including intermediate steps.
5. Define measures for outcomes.
6. Collect data for each measure and assign monetary values to health outcomes where possible.

7. Select appropriate economic method for analysis and calculate value.

8. Write the story for decision makers using the outcomes of value.

I apply this framework to the current study of the Center for Community Health and the continuing investment made by the University of Rochester. Using the framework, this analysis is a retrospective analysis of the Center for Community Health (CCH) and spans the time from May 2006 through June 2012, based on the University’s July–June fiscal year. The decision makers for this analysis are the leaders of the University of Rochester Medical Center (URMC), and therefore the analysis is from the perspective of the University, and whether the CCH is a value-added endeavor, worthy of significant and continuous annual funding. The URMC has committed to community health as its 4th mission and initiated and supported the CCH to contribute to this mission; therefore, measure of community health improvement is a most valued outcome (Step 3).

However, decision makers need to be fiscally accountable and must be informed on economic measures in order to make sound future funding decisions. URMC invests substantially in the CCH and the URMC is interested in the return on that investment, both in adding value to community health and in financial return. Therefore, a secondary outcome measure of importance is the financial gains of the CCH, including the indirect costs recovered by URMC via CCH. Financial solvency is critically important to maintain the CCH, which will add to community health infrastructure, sustain the CCH health care workforce and services, and ultimately assist in improving the health of our
Assessment of public health infrastructure and service delivery is an important and prioritized outcome, and is measured by using the Essential Services as a guide.

A logic model that systematically represents the outcomes of the URMC investment and assigns measures to each outcome is depicted in Figure 4. A logic model links structure, processes, outputs, and outcomes. Health outcomes of interest can and will change depending on the intervention or the concerns of the investor. For example, there are several service areas that have emerged from the CCH, including cancer services and infectious disease surveillance, and several programs including diabetes prevention and health education, and each service area or program has specific desired health outcomes. Taken collectively, each programmatic change resulting and an outcome of interest contributes to the overall health of the community and could be detectable in an overall measure of the community’s health such as the local Behavioral Risk Factor Survey, called the Monroe County Adult Health Survey, or in morbidity or mortality measures for the county.

As defined in the Institute of Medicine (2003) report, the ultimate health impact for public health is to protect and promote health and well-being, and a strong national and local governmental public health infrastructure is necessary to accomplish that goal. Therefore, the logic model contains the intermediary step of building public health capacity as measured by the 10 Essential Services, a well-recognized measure of public health infrastructure and function. Measuring public health system performance—the extent to which the system achieves its mission—requires the ability to measure each of
the components of the system and their relationships with each other. The logic model presented in Figure 4 is based on the conceptual framework of the public health system developed by Handler, Issel, and Turnock (2001), which also includes the macro context of the social, economic, and political environment in which the public health system exists.

*Indirect Cost Recovery: As grant dollars are secured for UR through CCH efforts, a percent of the grant award is allotted to URMC to cover the costs of doing business such as utilities, personnel, equipment, etc. This money, in essence, partially offsets the URMC investment in CCH.

*Figure 4. Logic Model for URMC Investment in Center for Community Health*

It is important to note that although building community health capacity should logically lead to improved community health, this has not been demonstrated in the literature; the assumption that capacity building leads to actual improvements in health is not substantiated with scientific evidence. A recent study by Ingram, Scutchfield,
Charnigo, and Riddell (2012) examined the relationship between public health system performance in providing the core public health functions of assessment, assurance and policy development, and community health outcomes. After studying local public health systems covering 444 counties in 23 states, the authors found that health system performance as measured by success in the 10 Essential Public Health Services was associated with three of the six outcome measures—percentage of mothers receiving no prenatal care in the first trimester, coronary heart disease, and pertussis rate—but were not associated with the other three health outcomes—percentage of low birth weight babies, syphilis rate, and colon cancer rates. Moreover, the associations were not always in the predicted direction. These recent results add to two older articles examining the same relationship. Schenck, Miller, and Richards (1995) found that high performance in health departments, as measured by a survey of 26 indicators based on the core functions of public health, was often associated with poor health status, which seems counterintuitive; however, they examined primarily birth indicators as the health outcomes, which is only a small part of public health functions. Kanarek, Stanley, and Bialek (2006) found relationships between performance and four of the nine health status measures they examined using the Community Health Status Indicators (CHSI). Although these results are promising, the researchers did not report on the magnitude or directionality of the associations they observed.

There are several reasons why it is difficult to study the relationship between public health capacity and community health outcomes. Two of the most significant barriers are the time lag from prevention to development of chronic disease and the lack
of agreed-upon set of “public health outcomes” (Joly et al., 2007). Current improvements or lack thereof in community health status may be the result of public health decisions made years ago. Recent national accreditation may speed up the development of community-level system outcomes that can be expected of a well-functioning health department. Several options exist, including Healthy People 2020.

Although the association between public health capacity and community health outcomes is still being examined, the Essential Services offer a good framework for identifying, analyzing, and evaluating public health activities. Since their development and release from the Institute of Medicine in 1994, the 10 Essential Public Health Services has gained broad acceptance as evidenced by their use in national initiatives such as the Healthy People 2010 infrastructure chapter and in the National Public Health Performance Standards Program (NPHPSP) instruments, endorsed by the CDC, the American Public Health Association, the National Association of County and City Health Officers (NACCHO), and many others (Corso, Wiesner, Halverson, & Brown, 2000). It is reasonable to assume that the extent to which a system achieves its mission depends on that system’s performance. The mission of public health systems is to improve community health, and the system’s performance is best measured through the 10 Essential Public Health Services; therefore, improvement in performance of the essential services might reasonably lead to improved community health in the future.

In this dissertation research, the logic model conceptualizes the process of URMC investment to community health impact. However, we cannot presume that the investment in CCH would be the cause for any improvement in community health as
measured by the Monroe County Adult Health Survey or any other broad measure of population health without a more robust research study design. Instead, I measured the financial implications of the investment by URMC to CCH as well as the community health capacity change as a result of this investment, as measured by the 10 Essential Public Health Services. I then examined one program that resulted from the development of the CCH as a case study example of how health can be impacted by infrastructure investment. Data and methods will be discussed in the next sections.

**Study Participants**

Since this is a secondary data analysis, the actual population of study participants is quite small. Interviews were conducted with key informants at the Center for Community Health, which includes managers and or directors that oversee the service activities at the Center. In addition, managers and directors who have been with the CCH since its inception were interviewed informally for historical accuracy. An interview guide has been developed and is discussed below. Human Subjects Institutional Review Board (HSIRB) approval was sought from Western Michigan University; however, this study was found to be exempt from HSIRB approval.

**Measurement Instruments**

Both quantitative and qualitative data were collected on all aspects of CCH depicted in the logic model. Qualitative data were collected through in-depth, open-ended key informant interviews to gather historical information about the start of the
CCH and its development. Interviews were conducted with the CCH Director, Financial Officer, Community Engagement Director, and Communications Director, all four of whom were on staff at the initiation of the CCH. In addition, open-ended interviews were conducted with 14 service leaders at the CCH to gather information about the ways in which CCH services carry out the 10 Essential Services. The interview materials are given in Appendix A. The script includes the following questions:

1. What services or programs do you provide that might be considered part of public health system delivery?

2. After reviewing the 10 Essential Services (listed), where do you think your programs or services fit? Name as many as you think are appropriate, and it may be that your services do not match any of the public health 10 Essential Services.

3. In your opinion, does your service or program area add financial value to the University of Rochester? Please explain.

Quantitative data were collected primarily from the finance function of the CCH and were collected from 2006 through fiscal year 2012. Economic data were gathered in the following categories:

- Revenue: What money is coming into the CCH to cover costs? Revenue falls into two primary categories, the annual investment money from UR, and extramural money from grants; there is no revenue from programs at CCH. Each category was tracked over time.
• Indirect Cost Recovery: How has the CCH extramural funding in grants contributed to URMC indirect cost recovery via CCH? As grant dollars are secured for UR through CCH efforts, a percentage of the award is allotted to UR to cover the costs of doing business, such as lights, accounting personnel, etc. Indirect cost recovery was tracked over time.

• Expenses: Where has the money been spent? Expenses fall primarily into personnel expenses—wage and fringe—and rent. There are other expenses primarily from program and service costs related to materials, travel, etc. Expenses by category were tracked over time.

The 10 Essential Service for Public Health was used as a measurement tool for community health capacity assessment, an intermediate step to health impacts. Services that are delivered through the Center for Community Health were matched to essential services that they provide, and any uncertainties were discussed with the program manager. There are 14 program and/or service areas that were studied and outputs or process measures were categorized by essential service. At the end of the analysis a complete picture of how the Center for Community health currently contributes to the assessment, policy, and assurance of the public’s health is summarized. For example, a few clear examples of how the 10 Essential Services are fulfilled through work within the CCH are described below:

• #1. Monitoring health status: The development of the CCH has supported the growth of the Communicable Diseases Surveillance and Prevention program, which includes emerging infections and health care associated infections
prevention. By developing the infrastructure to monitor public health communicable diseases, we have been able to standardize protocols, target interventions, and impact health—in this example by decreasing infections in hospitals as closely tracked by the emerging infections director and the CDC.

- **#4. Community partnerships:** How many partnerships were in place at the CCH inception? What partnerships and partnership networks exist currently and at each year in between? Partnerships include clinical practices, community-based organizations, academic centers, research networks, etc.

- **#8. Competent workforce:** One key function of the CCH being housed in an academic medical center is to contribute to the education of students from all disciplines. Faculty within the CCH educate medical students, nursing students, public health students, and undergraduates, among others, on the principles and practice of community health.

**Procedures**

To analyze value changes over time since the initial investment of URMC, financial information was collected from the finance office at CCH. Meetings with the accountant and finance director took place to explain the study and to request information. Data were included for income from 2006-2012 categorized by source, expenses for the same time period by category, indirect cost collected per year, and number of full time equivalents in personnel over time.
Descriptions of programs and services performed by the faculty and staff at CCH were reviewed and categorized into the most appropriate 10 Essential Services. After initial categorization, I met with each service/program area director to discuss my thoughts and acquire feedback, which was incorporated as appropriate.

For each of the many program areas or services provided at the CCH, one could track all possible benefits both in short-term health outcomes and in community-wide health impacts; to do so would be quite expansive and resource intensive, and beyond the scope of this dissertation. The primary services and programs provided by the CCH are listed below:

- Healthy Living Program
- Diabetes Prevention Program
- Community Transformation Grant – H.E.A.R.T.
- Blood Pressure Advocacy Program
- Communicable Diseases Surveillance and Prevention
- Teen Success and Empowerment Program
- Healthy Hero
- Cancer Services
- Rochester Walks
- Healthy Living Program
- Community Health Policy
- Community Health Education
- Got Health! Health Promotion and Education
- Community Engagement

One service area was assessed as a case study for a more in-depth analysis of health impact and cost-effectiveness, with the understanding that if all service areas were assessed to impact, CCH leadership could create a picture of the total health impact and economic effect of the URMC investment. In addition, service areas could be compared for cost-effectiveness, if all assessment was done in a standardized fashion. An entire analysis of all 14 services is beyond the scope of this dissertation.

**Case Study**

One very recently developed program at the CCH would not have been possible to implement at the local health department due to the need for quick hire of employees, collaboration with clinical settings, and expedited contract negotiations with local business. This program, the Blood Pressure Advocacy Program (BPAP), was assessed for health impact. BPAP has a current evaluation process in place, which is tracking results that will be gathered for this study, and effects of blood pressure control have been researched in the literature, lending this program to an anticipated straightforward assessment of cost-effectiveness. This is a grant-funded program that uses community health advocates to address social and behavioral determinants of health in clinic patients with uncontrolled diagnosed high blood pressure. Data were collected for this analysis as well, building on the data collected for the general assessment of the CCH. The total number of clients in the intervention was analyzed, as well as the number of clients who
have their blood pressure in control at the completion of their intervention. The literature was studied to assess the added cost associated with uncontrolled high blood pressure, and the projected care costs of stroke and heart attack, both common consequences of uncontrolled high blood pressure that are averted if the BPAP program achieves client control. Discussions with the BPAP Director and with the CCH Director and Financial Officer assured accurate information.

**Analysis Plans**

Once the quantitative and qualitative data were collected, economic analysis was performed in order to answer the research question:

Does the University of Rochester’s investment in the development and maintenance of the Center for Community Health, a partnership extension of the local public health system, provide a value benefit either financially or in the health of the community?

First, revenue and costs to the CCH, as well as URMC indirect costs collected, were graphed over time to provide a visual representation of financial change based on investments. Other calculations were made for each year, and tracked over time. These include:

- Ratio of (indirect cost collected/UR support) × 100%
- Ratio of (UR support/total budget) × 100%
- Cost effectiveness ratio of workforce = UR support/# CCH employees
- Overall Return on Investment (net benefit of investment/cost × 100%) for the creation and maintenance of the CCH and the BPAP program

In addition, infrastructure changes were summarized for year one, FY2006, of the CCH and FY2012 for comparison. Community health impacts that were discovered through the review of services were listed, and cost-effectiveness of the BPAP program was assessed.

The final step of the framework is to summarize the analysis in terms of the decision maker. The study is to provide information to the URMC leadership regarding the value change resulting from the URMC investments. This report includes both quantitative statements including the results of the analysis, and qualitative discussions regarding how the investment in the CCH has impacted the ability to provide the 10 Essential Services, building the capacity to improve community health, a pillar of the URMC mission. In addition, a case study analysis of concrete health outcomes and the associated return on investment was included in the report, remembering that the BPAP program is only one of a dozen programs with quantifiable health outcomes.

**Methodologic Limitations**

There are several methodological limitations to this study. This is not a randomized-control trial but rather a retrospective observational study of one system’s experiences that can be applied to other systems as appropriate. Being retrospective and observational, reliability of the historical data is only as strong as the key informants who
are interviewed. In addition, in using a newly developed framework for assessment, there may be some information inadvertently omitted.

When assessing each CCH program for its contributions to the 10 Essential Public Health Services, the data are dependent on the manager’s or supervisor’s knowledge of the services provided and honesty in reporting only those services provided. This information is subject to social desirability bias, which may lead informants to overstate compliance. This was minimalized by having the researcher also categorize the services for comparison and discussion with the managers.

There is a substantial limitation in the inability to accurately measure community health impact caused by the URMC investment in the development and growth of the CCH. Causation is extremely difficult to demonstrate in the best of circumstances, and given the added complications of time lag with prevention efforts and inconsistency in appropriate health outcomes, is not possible in this study. I measured improvement in community health capacity through the essential services; however, evidence is insufficient to prove that public health capacity is associated with improved community health outcomes.

Since this is an economic analysis, there are added limitations with the financial data. Information is collected in very general categories, and some financial information collection or categorization procedures may have changed over the 6-year time frame of this study. In addition, there are many financial returns that are beyond the scope of this study, such as those related to improved social circumstance, or improved productivity of clients impacted by the CCH. In addition, in-kind contributions are often given to the
CCH in the form of volunteers or student work. Since this information has not been accurately tracked across the 6-year time span, I did not quantify in-kind contributions. However, where such contributions are known and are substantial, in-kind contributions were noted in narrative form.

**Chapter Summary**

Economic analysis is rare in public health systems research, especially at the system level and with actual data. A framework is presented to guide the analysis for this work as well as for the growing population of future practitioners and researchers interested in this work. A multiple-methods retrospective analysis of the value change associated with the development and maintenance of the Center for Community Health (CCH), a unique naturally occurring experiment, was conducted. This is a non-experimental, longitudinal case study of the CCH over a 6-year period. Economic methods were used to measure value returned on the investment that URMC continues to make in the CCH. Results were summarized and disseminated to decision makers at URMC to inform future funding decisions.
CHAPTER IV
RESULTS

Research Questions

The research question for this dissertation work asks if investing in public health system capacity provides value, and whether that value change be quantified in economic terms. More specifically:

Does the University of Rochester’s investment in the development and maintenance of the Center for Community Health, a partnership extension of the local public health system, provide a value benefit either financially or in the health of the community?

This work will add to the evidence-based related to questions from the Public Health Services and Systems Research (PHSSR) National Research Agenda for public health financing and economics, specifically, testing measures to provide valid and reliable indicators of the financial performance of public health organizations, and studying investments in public health and their influence on the need for downstream spending on medical care and/or social services.

A multiple-methods retrospective analysis of the value change associated with the development and growth of the Center for Community Health (CCH) was conducted. This longitudinal case study of the CCH involved costs and benefits as well as growth in community health capacity over a 6-year period starting with the initial contribution of
the University of Rochester to the Center for Community Health in May of 2006 and continuing through June 2012.

**Analysis**

Both quantitative and qualitative data were collected and analyzed as described in Chapter III: Methods, and in accordance with the Framework for Assessing Value in Public Health System Change, Step 6: Collect data for each measure and assign monetary values to health outcomes where possible, and Step 7: Pick appropriate economic methods for analysis and calculate value.

**Quantitative Data**

After acquiring approval from the CCH director and financial officer to collect and analyze financial data for the purposes of this study, information was requested from the CCH accountant and current finance director. Information on revenue by source, indirect costs collected by URMC, expenses by general categories, and funds provided through contracts or agreements to community organizations was requested for FY06 through FY11 (Fiscal Year is July 1 – June 30). In addition, the number of full-time equivalents in personnel over the same time frame was requested.

**Revenue.** Revenue to the CCH comes from two sources: supportive funds for infrastructure given by the URMC each year since the CCH inception in 2006, and extramural awards including grants, contracts, and other funding arrangements from external sources. Information about revenue for each year from FY2006 (July 1, 2005 –
June 30, 2006) to FY2013 (July 1, 2012 – June 30, 2013) was collected from the finance director. Extramural award funding information was collected from the URMC accounting website, accessed by the finance director, while URMC internal funding information was collected from historical accounting records within the CCH (see Table 6).

Table 6

*Funding Sources for the Center for Community Health FY06–FY11*

<table>
<thead>
<tr>
<th>Source</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
</tr>
</thead>
<tbody>
<tr>
<td>UR Support</td>
<td>$79,800</td>
<td>$822,450</td>
<td>$825,600</td>
<td>$846,800</td>
<td>$808,800</td>
<td>$864,800</td>
<td>$887,450</td>
</tr>
<tr>
<td>Total Awards</td>
<td>$12,943</td>
<td>$360,937</td>
<td>$1,748,383</td>
<td>$2,410,128</td>
<td>$3,125,257</td>
<td>$3,598,153</td>
<td>$4,577,375</td>
</tr>
<tr>
<td><strong>Total Funding</strong></td>
<td>$92,743</td>
<td>$1,183,387</td>
<td>$2,573,983</td>
<td>$3,256,928</td>
<td>$3,934,057</td>
<td>$4,462,953</td>
<td>$5,464,825</td>
</tr>
</tbody>
</table>

Support from the University of Rochester has remained steady throughout the history of the CCH, although the first year’s funding was lower. This was most likely due to transition funding strategies, from the CCH preceding organization called the Center for Rochester’s Health to the current structure, in addition to the FY06 including only the months from May 2006 when the CCH opened to the end of the fiscal year (June 30, 2006). Although UR support has remained constant, extramural funding has increased each year. Graphic representation is given in Figure 5.
Figure 5. Funding for the Center for Community Health, FY06–FY12

The return on investment (ROI) analysis is a form of cost-benefit analysis that measures the cost of an intervention compared to the expected financial return of the intervention. The cost to the University of Rochester is its annual investment in the CCH each year. One return on that investment is the extramural funding that the CCH (a Center within UR) has been able to acquire based on that investment. The extramural awards have been expended as “costs” and have not been returned to the UR other than the indirect cost recovery to UR through CCH from the awards. In addition, the extramural awards are intended to result in break-even funding, and not to yield a profit; therefore, financial gain on the UR investment will not be quantitatively achieved until the economic benefit of prevention of disease is quantified. However, extramural funds contribute to the UR return on investment since the “costs” have been used to contribute...
to the mission of improving the community’s health, as was the intent of the investment and as described in the qualitative section. For the first complete year of the CCH, the ROI was 44%, meaning for the UR investment, the CCH was able to acquire 44% in extramural funding. By the last complete year of the CCH, the ROI was 516%; for the UR investment made in FY2012 ($887,450), the CCH was able to gain 516% of that investment, an additional $4,577,375.

Another way to calculate this return is to look at the investment as a percentage of the entire funding for the CCH, represented in Figure 6.

![Figure 6](image)

**Figure 6.** University of Rochester Investment as a Percent of Total Funds for the Center for Community Health

The ratio of UR support/total budget × 100% is the investment as a percentage of total funds. This ratio decreases each year since the inception of the CCH. The closer this ratio is to zero, the less dependent the CCH is on UR support resources.
Extramural funding, external to the UR, comes from several sources including federal agencies, most often the Centers for Disease Control and Prevention (CDC) and the National Institutes of Health (NIH), state agencies such as the New York State Department of Health, and locally, including the Greater Rochester Health Foundation as well as funding from other hospital systems and organizations. Extramural awards were retrieved from the UR funding database. Awards were listed in the database by budget period, which varied for each grant and often crossed more than one fiscal year. Each grant was examined and funding divided into the fiscal year that most accurately reflected the distribution. For example if an award budget period was listed as 01/01/2010 – 12/31/2010, half of the funding was categorized as FY2010 funding, and half was categorized as FY2011 funding. Distribution of extramural funding is shown in Figure 7.

**Figure 7.** Summary of Center for Community Health Extramural Awards
Figure 7 shows that the distribution from funding sources has changed since the inception of the Center for Community Health. Federal funding has increased significantly over the years and for FY12 accounts for 53% of extramural funding. City/County funding decreased for FY12 and this is due to the transfer of the School Based Influenza Vaccine program from the CCH to the Monroe County Department of Public Health. This program contributed $346,920 in FY11 and ended for FY2012.

Extramural funding is particularly important to the University of Rochester because often when funding is awarded, indirect costs can often be allocated and the indirect funds go to the University, not to the CCH. Indirect costs are used for institutional expenses that are incurred for multiple or shared projects and activities and therefore cannot be specifically identified with relative ease and with a high degree of accuracy to one particular grant-funded project or account. Typical indirect costs include:

- Depreciation, maintenance, and utilities for University buildings and equipment;
- Administrative effort of clerical, faculty, and other professional personnel;
- Expenses for offices which serve the entire University, such as the President’s Office, Human Resources, Purchasing, and Finance;
- Central operations such as facilities management, telecommunications, sponsored projects administration, and libraries.

Not all grants will allow for indirect cost recovery. A summary of the indirect funds to the University from grants and awards to the CCH is shown in Figure 8.
Indirect cost recovery grew substantially in the first five fiscal years then decreased in FY12, again due to the elimination of the School Based Influenza Vaccine program in FY12. The goal over time is for indirect cost recovery to exceed the UR support funds and the UR sets a goal of support funds being one third of the indirect funds collected.

In addition to the funding streams mentioned above, the CCH is responsible for managing funds assigned to other Centers and Departments. The most substantial example of this is the Clinical and Translational Science Institute (CTSI), which is the institute within URMC that houses the NIH Clinical and Translational Science Award (CTSA). URMC was one of the initial 12 academic institutions awarded in the initial year of funding, in June 2012. The CTSA institutions work to transform the environment to increase the speed and success of clinical and translational research. Translation of research requires strong relationships with community—the academic community,
Communication channels with the community are built through the Community Engagement function, which is administered through the Center for Community Health. The CCH receives funding to complete the Community Engagement function, which improves research by basing study questions on true community needs, and improves public health by translating research to implementable best practices. The CCH adds value to the URMC by serving in the Community Engagement Function. The CCH is responsible for annual NIH CTSI funding as seen in Table 7. This funding has remained stable for the six years that the CTSI has been operational and contributes to the public health capacity building and employee growth of the CCH.

Table 7

<table>
<thead>
<tr>
<th>CTSI – Community Engagement</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$289,631</td>
<td>$370,410</td>
<td>$351,891</td>
<td>$368,781</td>
<td>$317,872</td>
<td>$338,824</td>
</tr>
</tbody>
</table>

**Expenses.** Expenses for the CCH are only tracked collectively for the core or operating budget, which is supported by the funds from the University of Rochester, and not for the extramural funding. Expenses for the years since the CCH’s inception are given in Table 8.
### Table 8

**Operating Expenses for the Center for Community Health, FY06–FY12**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>$42,356</td>
<td>$437,397</td>
<td>$553,888</td>
<td>$565,191</td>
<td>$400,400</td>
<td>$521,962</td>
<td>$504,321</td>
</tr>
<tr>
<td>Benefits</td>
<td>$16,358</td>
<td>$104,194</td>
<td>$136,368</td>
<td>$146,280</td>
<td>$98,890</td>
<td>$136,772</td>
<td>$153,605</td>
</tr>
<tr>
<td>Travel &amp; Conference</td>
<td>$1,800</td>
<td>$21,015</td>
<td>$25,055</td>
<td>$33,690</td>
<td>$21,298</td>
<td>$29,690</td>
<td>$48,470</td>
</tr>
<tr>
<td>Supplies</td>
<td>$2,000</td>
<td>$11,099</td>
<td>$7,863</td>
<td>$12,528</td>
<td>$57,484</td>
<td>$29,024</td>
<td>$42,660</td>
</tr>
<tr>
<td>Lease/Rentals</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$88,369</td>
<td>$79,266</td>
<td>$122,259</td>
<td>$49,157</td>
</tr>
<tr>
<td>Communications</td>
<td>$1,210</td>
<td>$7,350</td>
<td>$10,834</td>
<td>$15,332</td>
<td>$24,806</td>
<td>$18,996</td>
<td>$30,973</td>
</tr>
<tr>
<td>Printing</td>
<td>$158</td>
<td>$3,992</td>
<td>$4,041</td>
<td>$5,193</td>
<td>$15,538</td>
<td>$9,665</td>
<td>$11,202</td>
</tr>
<tr>
<td>Utilities</td>
<td>$1,000</td>
<td>$2,105</td>
<td>$1,432</td>
<td>$17,369</td>
<td>$4,936</td>
<td>$11,463</td>
<td>$9,684</td>
</tr>
<tr>
<td>Capital Equipment</td>
<td>$2,046</td>
<td>$1,354</td>
<td>$14,356</td>
<td>$4,416</td>
<td>$2,122</td>
<td>-</td>
<td>$12,416</td>
</tr>
<tr>
<td>Professional Services</td>
<td>-</td>
<td>$8,981</td>
<td>$398</td>
<td>$12,473</td>
<td>$80</td>
<td>$1,110</td>
<td>$1,280</td>
</tr>
<tr>
<td>Misc. Expenses</td>
<td>$2,000</td>
<td>$4,290</td>
<td>$4,555</td>
<td>$9,812</td>
<td>$18,558</td>
<td>$7,391</td>
<td>$8,028</td>
</tr>
<tr>
<td>Expense Credits</td>
<td>-</td>
<td>$53,574</td>
<td>$62,696</td>
<td>$83,817</td>
<td>$(85,324)</td>
<td>$(39,896)</td>
<td>$(23,451)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$68,928</td>
<td>$655,351</td>
<td>$821,486</td>
<td>$825,329</td>
<td>$807,195</td>
<td>$848,436</td>
<td>$848,345</td>
</tr>
</tbody>
</table>
Of note is the Lease/Rentals category. The CCH decided in 2009 to move from the URMC building to a location within the community. The current location of the CCH is within a historical building on the original CCH campus located in the art district of the city. The building is easy to find and easily accessible to the public with free parking. The CCH is open for public use including the conference rooms, the kitchen area, and the library.

Although the operational funding for wage (salary) and fringe (benefits) has remained relatively constant in the operating budget, the staff at CCH has grown over the years through extramural funding. Employee numbers were tracked by reviewing the URMC staff listings from the human resources department over the years. Employees that joined the CCH within the FY were included as “employees entered” and those that were terminated or retired on a date falling within the fiscal year were counted as “employees exited.” Employee counts for each fiscal year are shown in Table 9.

Table 9

<table>
<thead>
<tr>
<th>Center for Community Health Employee Changes, FY06–FY11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Number of Employees Entered</td>
</tr>
<tr>
<td>Number of Employees Exited</td>
</tr>
<tr>
<td>Total Number of Employees</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total #FTE* that Entered</td>
</tr>
<tr>
<td>Total #FTE that Exited</td>
</tr>
<tr>
<td>Total #FTEs</td>
</tr>
</tbody>
</table>

*FTE = Full-Time Equivalent
The number of employees and number of full-time equivalents (FTE) have followed a positive trajectory since the CCH opened in FY06 with the exception of FY11, which shows a decrease in both employees and full-time equivalents. The discrepancy between the number of employees and the number of FTEs lies in the fact that some employees are part-time employees, and others are hired as TAR or “Time as Recorded.” TAR employees work less than 0.25 FTE and their hours vary each pay period. Often fellows or students are included in this category. The growing number of employees and FTEs are shown graphically in Figure 9.

![Center for Community Health Faculty/Staff](image)

**Figure 9.** Center for Community Health Employees, FY06–FY12

The CCH workforce has increased over the years, despite the relatively level funding from UR. The CCH has been able to increase the number of people working in community health primarily by adding staff through intramural funding.

Through the UR support funding, the CCH has been able to grow financially by acquiring extramural funding. Much of the extramural funding is given back to the
community to build the capacity of the entire public health system. Funding to community organizations has grown over the years; however, these data have not been tracked since the CCH start. The most recent fiscal year was examined for contracts with community agencies, and the funds shown in Table 10 were contracted to community agencies.

Table 10

*FY12 Center for Community Health Funds Supporting Community Agencies*

<table>
<thead>
<tr>
<th>Community Agency</th>
<th>Amount of Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.E.A.R.T. CDC Community Transformation Grant</td>
<td>$320,332</td>
</tr>
<tr>
<td>Diabetes Prevention Program</td>
<td>$68,000</td>
</tr>
<tr>
<td>Livingston/Wyoming Health Partnership</td>
<td>$16,689</td>
</tr>
<tr>
<td>Livingston/Wyoming Health Partnership – Infrastructure</td>
<td>$123,231</td>
</tr>
<tr>
<td>Livingston/Wyoming Health Partnership – COLA</td>
<td>$9,883</td>
</tr>
<tr>
<td>Rochester Walks</td>
<td>$30,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$568,635</strong></td>
</tr>
</tbody>
</table>

**Qualitative Data**

An application to the Human Subjects Institutional Review Board (HSIRB) of Western Michigan University was submitted and assurance was granted this information gathering process was exempt from needing HSIRB approval. Requests for a 15–30
minute interview were emailed to all program managers and directors for the following service areas and programs:

- Healthy Living Program
- Diabetes Prevention Program
- Community Transformation Grant – H.E.A.R.T.
- Blood Pressure Advocacy Program
- Communicable Diseases Surveillance and Prevention
- Teen Success and Empowerment Program
- Healthy Hero
- Cancer Services
- Rochester Walks
- Healthy Living Program
- Community Health Policy
- Community Health Education
- Got Health! Health Promotion and Education
- Community Engagement

Information for each program was gathered from any CCH-approved promotional material, relevant and accurate website descriptions, and manager/director interview to compile brief summary descriptions of each, which are listed in Table 11. Interviews were conducted over a three-day period and each interview was between 15 and 30 minutes long. Notes were taken during the interview that were jointly approved as
written. Both the researcher and the program manager/director reviewed and approved the program description included in Table 11. More extensive descriptions can be found on most of the programs and services listed on the Center for Community Health website: http://www.urmc.rochester.edu/community-health.

Table 11

Programs and Services at the Center for Community Health

<table>
<thead>
<tr>
<th>Program/Service Area</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Blood Pressure Advocacy Program (BPAP)</td>
<td>This is a clinic-based program designed to help adults diagnosed with high blood pressure get their blood pressure under control by making positive and permanent changes in their behavior and lifestyle. The program is part of the community-wide High Blood Pressure Collaborative. The program is delivered by Community Health Advocates who are community members who may not have extensive health training. The advocates are trained to work one-on-one with patients, most of whom are referred by patients’ health care providers. Patients can also request to meet with an advocate on their own. The services are FREE for patients.</td>
</tr>
<tr>
<td>Breast Health Awareness Project (BHAP)</td>
<td>This is an initiative of the Cancer Services Program of Monroe County. Its focus is on educating and encouraging good breast health among women in Monroe County ages forty and over at average or increased risk for breast cancer and ages thirty to thirty-nine at increased risk for breast cancer. BHAP reaches women who have health insurance but have not received a mammogram in two or more years, to encourage them to get breast cancer screenings.</td>
</tr>
<tr>
<td>Cancer Services Program (CSP)</td>
<td>The Cancer Services Program is part of a larger statewide initiative run by the NYS Department of Health’s Cancer Services Program. This initiative is focused on increasing the rates of cancer screenings among priority populations. The program covers the cost of breast, cervical and colorectal cancer screenings for uninsured women age 40 and older and uninsured men age 50 and older. The program is a unique partnership with over 40 community based agencies and 100 health care providers in Monroe County. Case management is also available for those needing additional support and assistance as they go through diagnosis and treatment.</td>
</tr>
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Table 11—Continued

<table>
<thead>
<tr>
<th>Program/Service Area</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Clinical and Translational Science Institute (CTSI)</td>
<td>The University of Rochester Clinical and Translational Science Institute facilitates the application of basic science findings to human health problems, developing clinical solutions, testing efficacy, and implementing interventions at the community level. The transformation of biomedical research requires the development of a true continuum from bench to community. Communication and collaboration among the major sectors of the health community—the academic community, the practice community, and the public health community—are essential to improve the community's health and overall quality of life. The CCH serves as the Community Engagement function of the CTSI and houses the Practice Based Research Network.</td>
</tr>
<tr>
<td>Communicable Diseases Surveillance and Prevention</td>
<td>This service area is part of a national effort to provide population-based communicable disease data for surveillance of disease patterns, evaluation of vaccine programs and to identify populations at risk for severe infection and those in need of screening and preventive care. The service area is a collaborative with the CDC in the 10-state Emerging Infection Program and in collaboration with the NYS Dept of Health. This service area also coordinates two citywide collaborative efforts working to reduce hospital acquired infections.</td>
</tr>
<tr>
<td>Community Engagement</td>
<td>The CTSI Community Engagement function, by facilitating communication and genuine partnerships among investigators, health care providers, and community members fosters community partnership. The Community Engagement function contributes to a more active clinical and translational research environment and greater participation by the local community. Community Partnership: Strengthening existing relationships and activating new partnerships between the university, local coalitions and community based organization are the goals of community partnership. With a focus on prevention and the promotion of healthy lifestyles, we are working to change the environments in which people live, work, learn and play. Coalitions: The Community Advisory Council (CAC) was created in 2006 to represent the voice of the community and serve as an advisory group. The CCH serves an important role on the African American Health Coalition and the Latino Health Coalition and many unique community coalitions. Sentinel Network: UR is part of this group of 5 CTSA sites that survey concerns and needs of underrepresented populations to give them a voice in research. CCH has engaged in this discovery for several years to improve bidirectional communication of community residents and investigators and to link people to needed medical and social services.</td>
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<tr>
<td>Program/Service Area</td>
<td>Description</td>
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<tr>
<td>Community Health Education</td>
<td>The Center supports community health learning through many activities including mentoring students from undergrad through residency, planning and producing Public Health Grand Rounds, supporting faculty who are engaged in community health research and experiential learning. The CCH teaching medical students community health and directs each student through a one month community improvement project. Public Health Grand Rounds facilitate the exchange of best practices through year-round presentations from community and academic public health professionals.</td>
</tr>
<tr>
<td>Community Health Policy</td>
<td>The CCH informs policy decisions, both internal and external to the University of Rochester, through community assessment, research and intervention evaluation, to prevent disease, promote an optimal quality of life for all, and protect the health of the community. We participate in many policy coalitions in Rochester including PlayBest and HealthiKids that advocate for policies that encourage healthy behaviors, as well as the Health Impact Assessment Learning Collaborative that explores health in all policies. We facilitate the community benefits reporting of health needs assessment and improvement planning for hospital systems in Monroe County and evaluate promising new programs for policy improvement. Past initiatives have included passing an innovative lead law and promoting adult immunization.</td>
</tr>
<tr>
<td>Community Transformation Grant – H.E.A.R.T</td>
<td>In partnership with the Monroe County Department of Public Health, and numerous community partners, the CCH was awarded a five-year, $3.6 million grant by the CDC to fund H.E.A.R.T. (Health Engagement and Action for Rochester’s Transformation), an initiative to improve the health of area residents through policy and environmental changes. Focus areas for health improvement include active transportation, baby-friendly initiatives related to breastfeeding, school health and wellness, workplace wellness, and crime prevention through environmental design. Initiatives will also be launched to advance diabetes prevention, self-sustaining food hubs, management of high blood pressure, and smoke-free policies.</td>
</tr>
<tr>
<td>Program/Service Area</td>
<td>Description</td>
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<tr>
<td>Diabetes Prevention Program (DPP)</td>
<td>Diabetes Prevention Program (DPP) helps people who have been diagnosed with pre-diabetes. The DPP is a lifestyle change program funded through the Greater Rochester Health Foundation, which is offered on an individual basis or in small sessions. In this 22-week program, participants learn about what contributes to and gets in the way of behavior change. The program teaches clients how to eat healthy at home and in restaurants, become active as a way of life, reduce stress, and stay motivated. The Diabetes Prevention Program has been scientifically validated for its ability to help people lose weight. Current research is being conducted to help determine the best way to provide the Diabetes Prevention Program intervention at a reasonable cost. Through our research, we hope to identify an effective way to delay diabetes, helping to extend people’s lives, reduce medical costs, and improve quality of life.</td>
</tr>
<tr>
<td>Got Health!</td>
<td>The Center sponsors free health talks called “Got Health?” to help community members get and stay healthy. The talks cover basic health information and are delivered in easy-to-understand language, with plenty of time for questions and answers. They take place in community settings, such as places of worship, recreation centers, and libraries.</td>
</tr>
<tr>
<td>Healthy Hero Outreach Program (HHOP)</td>
<td>The Healthy Hero Outreach Project supports the Greater Rochester Health Foundation 5-2-1-0 campaign to prevent childhood obesity. The program offers hands-on activity sessions to give families ideas for building healthy eating and active play into their routines in easy, affordable, fun ways. A team of outreach volunteers provides interactive presentations that focus on the popular “5-2-1-0 Be A Healthy Hero” campaign, specifically targeting diverse populations living in the City of Rochester and selected suburbs where the incidence of childhood obesity is the highest in Monroe County. The HHOP’s primary focus is to use fun, skill-building activity sessions that include affordable recipes, safe cooking practices, and easy low- or no-cost active play ideas to teach parents and families how to make healthy changes at home.</td>
</tr>
<tr>
<td>Program/Service Area</td>
<td>Description</td>
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<tr>
<td>Healthy Living Center (HLC)</td>
<td>Located within the Center for Community Health, the Healthy Living Center helps patients make healthy changes in their life to lose or maintain weight, improve diet and nutrition, lower blood pressure, lower cholesterol, reduce stress, or stop smoking. Counseling relies on Self-Determination Theory—a theory of motivation. It specifically defines the motives that fuel people’s behavior and it also defines how the social environment can support or undermine people’s motivation. Treatment is provided through individual counseling and/or group support. The Healthy Living Research Center is the research arm of the Healthy Living Center. Translational research is conducted to understand the motivational and psychological mechanisms that drive health behavior change.</td>
</tr>
<tr>
<td>Healthy Living Program (HLP)</td>
<td>Healthy Living Program/Vida en Salud: The Healthy Living Program and its Latino counterpart (Vida en Salud) are community-based fitness and health education programs aimed at helping African-American and Latinos adopt healthy lifestyles. The programs emphasize physical activity and healthy eating. They are run in partnership with the YMCA in local churches and community organizations.</td>
</tr>
<tr>
<td>Practice Based Research Network (PBRN)</td>
<td>The Greater Rochester-PBRN (GR-PBRN) was established in 2007 to bring together primary care clinicians and researchers in a collaborative model designed to improve patient care and outcomes. The PBRN offers consultation on conducting practice-based research including linking researchers and community practices, IRB assistance, protocol development, and training for investigators and research staff in building and maintaining practice relationships.</td>
</tr>
<tr>
<td>Rochester Walks</td>
<td>Rochester Walks is a grant funded program to promote walking and physical activity in city neighborhoods. With a grant from the New York State Department of Health, Rochester Walks! is advocating for environmental improvements that promote walking, labeling safe and interesting walking routes, and establishing walking clubs to bring neighbors together for fun and fitness.</td>
</tr>
</tbody>
</table>
Table 11—Continued

<table>
<thead>
<tr>
<th>Program/Service Area</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teen Health and Success</td>
<td>The URMC Teen Health and Success Partnership works with Hillside Work-Scholarship Connection (HW-SC), a nationally recognized youth development program. HW-SC increases graduation rates within the Rochester City School District. The University of Rochester (UR) offers employment opportunities for the young adults who are part of the HW-SC program. This partnership provides opportunities for Rochester's youth to develop hands-on job skills, while at the same time laying the foundation for future employment and career development within health care, research, and academic settings. The partnership provides academic resources, life skills development, and job training including free tutoring, career shadowing, monthly enrichment learning sessions, college preparation, wellness programs and career coaching. Mentoring Males on a Continuum is taking best practices from the Minority Male Education literature and the Black Parenting literature and providing mentorship and education to Rochester’s male teens to promote healthy behaviors and academic success. Be Healthy Be Successful is a health literacy and health care resource connection program for Rochester’s urban youth. Teens attend a health literacy seminar where they are engaged in learning to traverse the health care system. Teens requesting assistance are linked to health insurance, medical, dental and vision services.</td>
</tr>
<tr>
<td>Partnership</td>
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</table>

The 10 Essential Public Health Services were discussed and explained during each manager/director interview and both the researcher and the program manager/director categorized the functions performed in that area with any and all appropriate essential services. Several descriptions were available for the managers/directors to review when clarity of the essential service was needed, including the National Public Health Performance Standards Program Orientation to the Essential Public Health Services (http://www.cdc.gov/nphpsp/documents/EssentialServicesPresentation.pdf). After interviews were completed, all contributions to the 10 Essential Public Health Services were compiled and summarized in Figure 10.
### ASSESSMENT

1. **Monitor health status to identify and solve community health problems.**
   
   a. Communicable Disease Surveillance monitors communicable diseases, hospital acquired infections and emerging infections for Monroe County.
   
   b. CH Policy assists with the Monroe County Adult Health Survey to assess risk behavior and community input on the data through the Health Action process.
   
   c. CH Policy facilitates the Monroe County Community Health Needs Assessment for hospital systems and the health department, for NY and IRS reporting.
   
   d. HEART financially supports the Monroe County Adult Health Survey to monitor behavior risk factors, and supports analysis of the data collected.
   
   e. Healthy Living Center works with School of Nursing at URMC to aggregate and analyze the data from the employee biometric screenings to monitor the health status of the University employees and plan programs based on that assessment.
   
   f. TEEN HSP monitors the progress and success of their students including academic achievements and some health outcomes.

2. **Diagnose and investigate health problems and health hazards in the community.**
   
   a. Communicable Disease Surveillance investigates hospital acquired infections and propose interventions to reduces incidence.
   
   b. Communicable Disease Surveillance Emerging Infections Program reports all data to the CDC for evaluation of vaccine effectiveness and policy recommendations.
   
   c. Community Partnerships, with the AA and Latino health coalitions, have advanced the health agenda and strategic plan based on community health data for these underrepresented populations.
   
   d. Rochester Walks links with community members to evaluate communities for walkability.
   
   e. TEEN HSP investigates prevalent health problems such as teen pregnancy and sexually transmitted diseases and devises interventions that are geared towards the target population.

3. **Inform, educate and empower people about health issues.**
   
   a. The BPAP program works with hypertensive patients to teach them about their blood pressure, as well as causes and prevention of further disease through one-on-one discussion sessions.
   
   b. Breast Health Advocates meet with community groups to discuss the importance of mammograms.
   
   c. Cancer Services raise awareness of risky behaviors and teach the importance of cancer screening through community fairs and events.
   
   d. The Got Health! series provides basic health information to community members through interactive lectures in community settings.
   
   e. The Healthy Living Library is open to the public and provides books, pamphlets, displays and community interface for access to trusted health information.
   
   f. CH Education supports many health lectures to the URMC community and supports the year round Public Health Grand Rounds.
g. Communicable Disease Surveillance reports weekly to Monroe County Department of Health during flu season so that the health department can report to the public and advise on flu outbreaks.

h. HEART teaches healthy lifestyles through diabetes prevention and blood pressure ambassador program and virtual clinician initiative.

i. HEART provides community screening on public health issues such as Weight of the Nation viewings.

j. The Diabetes Prevention Program, either directly or through trained facilitators, educates community members about diabetes prevention.

k. Healthy Hero teaches families healthy eating and exercise to prevent childhood obesity.

l. Healthy Living Program educates the community about healthy lifestyles and teaches about activities and nutrition.

m. TEEN HSP conducts monthly enrichment health education sessions to inform teens on health issues.

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POLICY

4. Mobilize community partnerships and action to identify and solve health problems.

a. The BPAP program partners primary provider clinics with community health workers. CHWs are located in the clinic and address social and behavioral determinants.

b. Cancer Services partners with community agencies and providers.

c. Cancer Services partners with Cancer Mission 2020 to suggest policy and environmental change to prevent cancer, especially lung, breast and colon.

d. Communicable Disease Surveillance has developed a multi-hospital collaborative that has significantly decreased the incidence of central line infections. The collaborative is multidisciplinary involving many hospital workers at all levels. The collaborative is established as a sustainable infrastructure for decreasing infectious disease throughout the county.

e. Communicable Disease Surveillance Emerging Infections Program partners with the Monroe County Dept of Health through a non-funded grant to provide infrastructure support, monitoring and reporting in case of an outbreak.

f. Community partnerships are supported through the Community Advisory Council that links CBOs, faith community, local government, media and school district with the URMC.

g. Community Partnership facilitates the relationships between and within many coalitions and with URMC through years of collaboration and mutual respect.

h. CH Policy collaborates with several community partners to identify policy solutions to health problems such as HealthiKids, PlayBest, LEAD Coalition, Health Impact Assessment, etc.

i. CH Policy mobilizes hospital systems to partner with the health department and FLHSA to develop the Monroe County Community Health Improvement Plan based on data and community input for NY and IRS reporting.

j. HEART leadership team, which represents over 20 community and governmental organizations, works together to transform the community. Community agencies are linking and coordinating services.
k. HEART has been approached by several individual neighborhoods asking to partner on grant opportunities for healthy community improvements.
l. HEART initiatives such as school health index and CEPTED mobilize communities within schools and neighborhoods to address health issues such as safety and poor food selections.
m. The Diabetes Prevention Program coordinates services between six different clinical sites to avoid duplication and maximize usage of services to patients diagnosed with pre-diabetes.
n. Healthy Hero works with partner agencies to implement their program and to meet families in their communities.
o. PBRN promotes partnerships between practitioners, researchers and community members.
p. Rochester Walks building walking clubs among community members to encourage peer support for active lifestyles.
q. TEEN HSP participates in NYSDOH, HWSC and Rochester City School District and other community agencies strategies groups/committees that focus on teen health issues.

5. Develop policies and plans that support individual and community health efforts.

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<tbody>
<tr>
<td>a.</td>
<td>CCH Communications developed “Speaker Guidelines” that are based on CDC guidance that promote health literacy in any public health education engagement.</td>
</tr>
<tr>
<td>b.</td>
<td>Communicable Disease Surveillance helped develop hospital policies to reduce hospital acquired infections.</td>
</tr>
<tr>
<td>c.</td>
<td>Community Advisory Council developed the “Guiding Principles for Community-Based Research” to help researchers base their questions on community needs and a process for community endorsement.</td>
</tr>
<tr>
<td>d.</td>
<td>Community Partnership developed the “Principles for Partnership” that were adopted by several coalitions to keep coalition meetings fair and on task.</td>
</tr>
<tr>
<td>e.</td>
<td>CH Policy was integral in the development and implementation of Lead policy in Monroe County. CH Policy advocated for complete streets policy and healthy corner stores policy in City of Rochester through the HealthiKids coalition.</td>
</tr>
<tr>
<td>f.</td>
<td>HEART smoking-free clean indoor air policy in public outdoor space, college campuses and multi-unit housing was supported and some initiated.</td>
</tr>
<tr>
<td>g.</td>
<td>HEART teams in Rochester City Schools are developing policies based on the School Health Index to improve the physical environment and nutrition.</td>
</tr>
<tr>
<td>h.</td>
<td>HEART active transportation coordinator is developing policies to improve the environment through trails, bike paths and slower traffic improvements.</td>
</tr>
<tr>
<td>i.</td>
<td>HEART worksite wellness index will suggest policy and environmental changes to businesses for adoption based on an internal assessment.</td>
</tr>
<tr>
<td>j.</td>
<td>Rochester Walks is making environmental improvements by and marking walking routes with signage and mile markers.</td>
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6. Enforce laws and regulations that protect health and ensure safety.

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<tbody>
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<td>None.</td>
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## ASSURANCE

### 7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable.

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<tbody>
<tr>
<td>a.</td>
<td>The BPAP program links high risk hypertensive patients to community resources and empowers patients to ask questions of the primary providers.</td>
</tr>
<tr>
<td>b.</td>
<td>Breast Health Awareness program reminds insured women to get mammograms and assists with finding providers and services.</td>
</tr>
<tr>
<td>c.</td>
<td>Cancer Services provides screening to uninsured by removing the cost barriers and facilitating appointments.</td>
</tr>
<tr>
<td>d.</td>
<td>CCH Communications provides information on their websites and brochures to link people to services the CCH provides.</td>
</tr>
<tr>
<td>e.</td>
<td>Sentinel Network links survey respondents to needed health and social services as appropriate.</td>
</tr>
<tr>
<td>f.</td>
<td>HEART through health fairs and community interactions serves as a resource for people who need personal health services and provides links to those services.</td>
</tr>
<tr>
<td>g.</td>
<td>HEART worksite wellness index will link businesses to services provided at URMC for employees who work there.</td>
</tr>
<tr>
<td>h.</td>
<td>Diabetes Prevention Program provides care for patients diagnosed with pre-diabetes to prevent advancement of the disease.</td>
</tr>
<tr>
<td>i.</td>
<td>Healthy Living Center providers see patients who are referred from primary care providers for behavior change therapy that cannot be addressed adequately in the primary providers’ office.</td>
</tr>
<tr>
<td>j.</td>
<td>Healthy Living Center providers link their counseling services with the patient’s primary provider and specialists as needed.</td>
</tr>
<tr>
<td>k.</td>
<td>Healthy Living Center provides behavior change counseling to employees free of charge to remove the cost barrier for patients/employees.</td>
</tr>
<tr>
<td>l.</td>
<td>Healthy Living Program goes into communities to provide exercise and nutrition help to AA and Latino groups.</td>
</tr>
<tr>
<td>m.</td>
<td>TEEN HSP Be Healthy Be Successful Health Literacy and Resource Connection program links teens to health insurance, medical care, dental and vision care.</td>
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### 8. Assure competent public and personal health care workforce.

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<tbody>
<tr>
<td>a.</td>
<td>The BPAP program trains community members (14 to date) on health issues, especially hypertension but also related chronic disease and risky behaviors, and their prevention. Continuous education is provided to the CHWs currently working on the BPAP program.</td>
</tr>
<tr>
<td>b.</td>
<td>The BPAP program developed an 8-session, 24 hour education program for community organizations including assessment tools that can be used to train community health workers.</td>
</tr>
<tr>
<td>c.</td>
<td>Cancer Services informs providers about new screening and prevention guidelines and updates providers as the evidence base changes.</td>
</tr>
<tr>
<td>d.</td>
<td>CH Education trains medical students on community health and the importance of addressing social and behavioral determinants of health and directs the Community Health Improvement Course for experiential learning.</td>
</tr>
</tbody>
</table>
e. CH Education facilitates Public Health Grand Rounds and faculty groups to enhance community health work and professional development of faculty and staff at URMC as well as students and community members.

f. HEART has trained medical students, residents and undergraduates by providing community health experience and education through practical learning.

g. Diabetes Prevention Program trains nurses, dieticians and other providers at clinics to deliver the DPP program and learn diabetes prevention.

h. Healthy Hero uses volunteers who are often students in social work, public health and nursing and teaches health education and effective community engagement.

i. Healthy Living Center provides clinical internship experience to medical students, residents, graduate students and undergraduates of all disciplines who want to learn about motivation theory and health behavior change.

j. Healthy Living Program and Cancer Services provide training and experience for students studying medicine, nursing and public health.

k. PBRN teaches practitioners about research, evidence-based practice and translation.

l. TEEN HSP through the Hillside Work-Scholar Program teaches students who are at risk, and who are often from underrepresented communities, about health careers and offers entry level health jobs to these students.

9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.

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<tbody>
<tr>
<td>a.</td>
<td>The BPAP program is evaluated for effectiveness both for blood pressure control and behavior changes within the patient population.</td>
</tr>
<tr>
<td>b.</td>
<td>Cancer Services evaluates effectiveness of personal health services for their clients.</td>
</tr>
<tr>
<td>c.</td>
<td>Communicable Disease Surveillance evaluates the effectiveness of vaccine programs and reports data to the CDC for national effectiveness of the vaccines, especially the HPV and influenza.</td>
</tr>
<tr>
<td>d.</td>
<td>HEART evaluates the effectiveness of community transformation through an extensive intervention evaluation plan.</td>
</tr>
<tr>
<td>e.</td>
<td>The Diabetes Prevention Program evaluates their programs for effectiveness with a post intervention study for participants.</td>
</tr>
<tr>
<td>f.</td>
<td>The Diabetes Prevention Program evaluates implementation sites for effectiveness and promotional ability and referrals.</td>
</tr>
<tr>
<td>g.</td>
<td>Healthy Hero evaluates their interventions for effectiveness immediately post program and several months after intervention.</td>
</tr>
<tr>
<td>h.</td>
<td>Healthy Living Center tracks employee wellness information for improvements over time. Each intervention is evaluated for effectiveness as well.</td>
</tr>
<tr>
<td>i.</td>
<td>Healthy Living Program studied a comparison with the Diabetes Prevention Program to see what settings are most effective. Family settings were also evaluated.</td>
</tr>
<tr>
<td>j.</td>
<td>TEEN HSP has a robust evaluation system that tracks student success as compared to students not in the Hillside Work-Scholar Program as well as program effectiveness.</td>
</tr>
</tbody>
</table>
10. Research for new insights and innovative solutions to health problems.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>The BPAP program provides an innovative solution to supplementing primary care intervention with high risk hypertensive patients.</td>
</tr>
<tr>
<td>b.</td>
<td>Communicable Disease Surveillance team is doing research on C-diff in long term care centers to assess whether the infection is most often acquired at the center or at the hospital. Also researching antibiotic usage in nursing homes.</td>
</tr>
<tr>
<td>c.</td>
<td>Community Partnership, although not personally conducting research, facilitates collaborative relationships which are essential for research to truly be community based.</td>
</tr>
<tr>
<td>d.</td>
<td>Community Partnership facilitates community members and organizations learning the research evidence base for health issues and interventions through coalition meetings and presentations.</td>
</tr>
<tr>
<td>e.</td>
<td>CH Policy conducts public health systems research to measure the value of investing in public health infrastructure.</td>
</tr>
<tr>
<td>f.</td>
<td>HEART is filling the gap in evidence for Deaf Health interventions and is part of the national return on investment research and evaluation project.</td>
</tr>
<tr>
<td>g.</td>
<td>Diabetes Prevention Program is conducting extensive research to determine the most effective setting for successful implementation.</td>
</tr>
<tr>
<td>h.</td>
<td>Healthy Living Center is researching the use of a ‘virtual clinician’ for diabetes management and also for lowering cholesterol.</td>
</tr>
<tr>
<td>i.</td>
<td>PBRN facilitates research that is clinically based and assures translation and community engagement in research in primary care settings.</td>
</tr>
<tr>
<td>j.</td>
<td>TEEN HSP researches how preventing high school dropout prevents early mortality and chronic morbidity; Health literacy and resource connections are being evaluated for effectiveness of appropriate use of health care resources.</td>
</tr>
</tbody>
</table>

*Figure 10. Center for Community Health Contributions to the 10 Essential Public Health Services*

According to the information provided in the interviews, the Center for Community Health contributes substantially to the 10 Essential Public Health Services. The service most often mentioned by managers/directors is Essential Service #4:

Mobilize community partnerships and action to identify and solve health problems, followed by #7: Link people to needed personal health services and assure the provision of health care, and #3: Inform, educate and empower people about health issues.

Managers/directors did not state that they contributed to Essential Service #6: Enforce laws and regulations, which is to be expected since the CCH does not have any regulatory
authority. Managers/directors stated less contributions to Essential Services #2: Diagnose and investigate health problems, and #1: Monitor health status to identify and solve community health problems.

Essential Services #5: Developing policies and plans, #8: Assuring a competent workforce, #9: Evaluating effectiveness, and #10 Research for new insights, are all well represented, with several managers/directors mentioning programs that service this function.

**Case Study**

*Blood Pressure Advocacy Program (BPAP):* Finger Lakes Regional Economic Development Council awarded a grant for $300,000 to the Finger Lakes Health System Agency (FLHSA) to support the development and hiring of Community Health Advocates (CHA) to address high blood pressure among the high risk population in Monroe County. FLHSA contracted with the CCH in March 2012 to implement the Blood Pressure Advocacy Program (BPAP). Contracts were expedited between the funders and the CCH, as well as Memoranda of Understanding with all four clinic sites for CHA placement. All agreements were negotiated, edited for compliance, and initiated within a 4-month time period. Administrative staff was hired within 6 weeks, and CHAs were hired in July 2012. Clinic care began on August 17th with an overarching goal of improving blood pressure control in patients of neighborhood health centers by assisting clinical staff in addressing the social and behavioral determinants of health.
Data are being collected by the BPAP supervisor and the evaluator in order to assess the effectiveness of the BPAP program. The patient data counts were shared with this researcher in order to evaluate the cost-benefit of the program. A summary of the number of patients available for the intervention is given in Table 12.

Table 12

*Intervention Patients for Blood Pressure Advocacy Program (as of June 7, 2013)*

<table>
<thead>
<tr>
<th>Intervention Patients</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Patients with HBP in data import</td>
<td>6355</td>
</tr>
<tr>
<td>Patients with no visit in last 13 months</td>
<td>294 (5%)</td>
</tr>
<tr>
<td>Patients with BP $\geq$ 140/90</td>
<td>2226 (35%)</td>
</tr>
<tr>
<td>Patients with no BP data available</td>
<td>334 (5%)</td>
</tr>
<tr>
<td>Total patients from import for intervention</td>
<td>2854 (45%)</td>
</tr>
<tr>
<td>Total Patients referred from providers and staff</td>
<td>644</td>
</tr>
<tr>
<td>Number of patients completing first visit with CHA</td>
<td>485</td>
</tr>
<tr>
<td>Number who exited the program in control</td>
<td>55</td>
</tr>
<tr>
<td>Number of “in control” patients who participated</td>
<td>25</td>
</tr>
<tr>
<td>Number who intentionally withdrew from program</td>
<td>12</td>
</tr>
<tr>
<td>Number currently in BPAP program</td>
<td>410</td>
</tr>
</tbody>
</table>

The BPAP program has been operational since August 2012 and a full assessment of progress was conducted in June 2013. In the 10 months that the BPAP program had been seeing patients, all patients at the four intervention clinics that are diagnosed with high blood pressure (HBP) and whose blood pressure (BP) was recorded as being not in
control (systolic \(\geq 140\) mmHg and/or diastolic \(\geq 90\) mmHg) were contacted for inclusion in the program. Of the 1,078 patients contacted, 485 patients (45%) met with a Community Health Advocate (CHA) and completed an intake assessment. Once the assessment is completed, CHAs work with patients to make behavior changes through health coaching using CDC best practices centered on smoking cessation, nutrition, medication adherence, and exercise. As of June 2013, 410 patients (85% of those who completed the assessment) remained in the BPAP program, while 55 (11%) had exited the program with their blood pressure in control. When examining the patients who have visited the CHAs more than one time, there is an average decrease in blood pressure both in the systolic and diastolic measures. There are 232 patients who had out of control blood pressure initially, and who have visited the CHA more than once. To estimate the clinical impact of the BPAP intervention, the changes in blood pressure were measured between the original blood pressure readings and the most recent blood pressure readings for those patients who are diagnosed with HBP and whose BP was not “in control” at the start of the intervention. A paired \(t\) test was conducted in SPSS 19 to measure the change for statistical significance. Table 13 shows that the patients who have visited the CHAs more than once have seen a statistically significant decrease in their blood pressures between their original BP reading and the latest BP reading.
Table 13

Results After 10-Month Blood Pressure Advocacy Program Intervention

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>Latest</th>
<th>Mean Change</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic</td>
<td>150 ± 15</td>
<td>132 ± 15</td>
<td>18 ± 20</td>
<td>Paired ( t(231) = 13.72, p = .000 )</td>
</tr>
<tr>
<td>Diastolic</td>
<td>85 ± 9</td>
<td>78 ± 11</td>
<td>8 ± 12</td>
<td>Paired ( t(231) = 10.21, p = .000 )</td>
</tr>
</tbody>
</table>

In order to calculate a financial benefit associated with this change in BP, I followed the process outlined by Song, Hill, Bennet, Vavasis, and Oriol (2013) for the cost savings study of a similar intervention. First, the reduction in blood pressure was converted into reductions in relative risk for myocardial infarction, stroke, and general cardiovascular disease using the Framingham risk calculators. Next, the change in relative risk was converted to cases of myocardial infarction, stroke, and cardiovascular disease avoided through the BPAP program. Last, attributable costs were assigned to convert risk reduction into savings.

Framingham Risk Calculators were used to calculate patient risk for myocardial infarction (MI) (http://my.clevelandclinic.org/heart/disorders/cad/heart_center_risk_tool.aspx), for stroke, and for general cardiovascular disease risk (http://www.framinghamheartstudy.org/risk/index.html). The average age of the BPAP patients in the CCH intervention was 57.6 years and the population was split male and female, leaning slightly towards female 57%. For the risk calculations, the most conservative answers were chosen, including indicators for no family heart history, no smoking, and yes to taking medications or being treated since the patients were all being
seen in one of the clinics. No indications for a history of any comorbidities were chosen and all parameters were held constant for comparisons, only changing the blood pressure as indicated by our actual results. These indications for risk factors will yield a conservative estimate in the change of risk, which realistically is not reflective of our patient population who most often have elevated cholesterol, smoke, and present with comorbidities. The midpoint of the obese category was used as a conservative estimate of our patient population. The predicted reduction in risk for myocardial infarction within 10 years by decreasing systolic blood pressure from 150 mmHg to 132 mmHg yields a 2% decrease in risk for both males (12%–10%) and females (4%–3%). The reduction in risk for stroke within 10 years was 3% for males and 2% for females. The reduction in risk for “general cardiovascular risk,” including coronary death, MI, coronary insufficiency, angina, stroke, peripheral artery disease or heart failure, decreased 5.4% for males (28.3%–22.9%) and decreased 4.6% for females (15.9%–11.3%).

The sample population that experienced the blood pressure change through the BPAP intervention consisted of 232 patients at the end of 10 months. Using the average decrease in risk between males and females and applying that risk to our patient population, we determine that the decreases in risk for MI equates to 4.64 MI cases, 5.8 cases of stroke, and 11.6 cases of general cardiovascular injury averted.

In order to calculate cost savings, the excess medical care cost per case for the hospital was examined using the O’Sullivan et al. (2011) research, which studied administrative claims data to predict medical care costs of 15 different cardiovascular
events (O’Sullivan et al., 2011). The 36-month post-event attributable costs for nonfatal MI (adjusted to 2013 rates) were calculated to be $87,524 per patient. The 36-month post-event attributable cost for ischemic stroke was $23,881 and for hemorrhagic stroke was $85,490 per patient. The most common category of general cardiovascular injury is angina. Non-surgical angina is estimated to add $42,986 cost per patient for the 36-month post-angina event time frame. For the risk reduction from the decrease in blood pressure achieved by the 232 patients in the BPAP program, total predicted cost savings are $406,111 for MI, $138,510 for ischemic stroke, and $498,638 for angina. These savings assume that the patients maintain their lower blood pressure during the time frame of the risk assessment, which admittedly is a large assumption. The BPAP investment as a whole was $300,000 for the first year, so the cost has been recovered in the risk reduction for just these few acute cardiovascular events. If we examine just the general risk reduction for cardiovascular injury and assume that angina represents a typical cost, the $498,368 can be considered benefits compared to the $300,000 total cost for the program. The cost benefit would result in a $198,368 “profit” that contributes to one program’s offset of the cost of the UR investment in CCH ($887,450 for FY12). As a case study, this is one example of the many services provided at the CCH, all of which have potential to impact health outcomes that result in long-term cost savings.

Besides the BPAP program, several other service areas and programs have measured outcomes that contribute to the value added by the CCH. These outcomes were mentioned in the interviews and are recorded here as additional information to the study.
Community Engagement: The Community Advisory Council (CAC) was established by CCH to advise URMC on community needs. Thirty-one community and academic members comprise the CAC, and 18 community-based organizations, including health and social service agencies, the faith community, local government, the city school district, and media are represented. The CCH serves an important role on the African American Health Coalition and the Latino Health Coalition and at last count had membership in 26 unique community coalitions. The value of community engagement is difficult to quantify. Several researchers at the CCH have written a paper titled “Evaluating Community Engagement in an Academic Medical Center,” which is being reviewed.

Cancer Services: For 2012-13 grant year, the Cancer Services Program in Monroe County (CSP-MC) enrolled more than 1,800 men and women into the program, and screened almost 1,500. More than 5,300 individuals have been screened since April 1, 2009. If screening indicates a suspected cancer, CSP can pay for additional testing. If a client is diagnosed with breast, cervical, colorectal, or prostate cancer and has no insurance to cover treatment, CSP will assist them in applying for coverage through Medicaid or funding treatment is some other way. During the 2012-12 service year, 567 people needed follow-up services of some kind. A total of 36 cancerous or precancerous conditions were found in this year alone.

Communicable Disease Surveillance and Prevention: The C-diff prevention collaborative program calculated estimated cost savings on a quarterly basis related to hospital-onset C. difficile infections for the four major hospitals in the Rochester area.
This was done by assigning an excess cost of $14,000–$34,000 to each C. diff case (based on hospital billing information) and looking at the change in cases over time. The excess cost is based on an unpublished administrative study at two of the four hospitals where the cost of patients with (cases) and without C. diff (controls) were compared after matching the case and control patients by DRG group. Overall cost savings are given in Table 14. The communicable disease surveillance and prevention central line associated bloodstream infections collaborative saved the hospitals an estimated $560,000–$1,360,000 for one year just in prevention efforts for hospital acquired c-diff.

Table 14

*Changes in Attributable Cost of Health Care Facility-Associated C. Difficile 2011-12*

<table>
<thead>
<tr>
<th>Facility</th>
<th>Number of Cases</th>
<th>Change in # of Cases 2011-12</th>
<th>Estimated change attributable cost 2011-12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Hospital A</td>
<td>194</td>
<td>143</td>
<td>−51</td>
</tr>
<tr>
<td>Hospital B</td>
<td>212</td>
<td>240</td>
<td>+28</td>
</tr>
<tr>
<td>Hospital C</td>
<td>85</td>
<td>75</td>
<td>−10</td>
</tr>
<tr>
<td>Hospital D</td>
<td>90</td>
<td>83</td>
<td>−7</td>
</tr>
<tr>
<td>Total</td>
<td>581</td>
<td>541</td>
<td>−40</td>
</tr>
</tbody>
</table>

A similar intervention was conducted looking at all hospital central line infections outside of the intensive care units. Central Line Associated Bloodstream Infections (CLABSI) pose a significant risk to patients in hospitals. This was a 5-year funded
research project from the New York State Department of Health. In the first year of the project, 175 CLABSI were observed, and in 2012, the fifth year of the intervention, only 38 CLABSIs were observed. A cost study was conducted to assess and estimate the attributable excess cost of CLABSI and that research yielded $45,560 per infection, which is a bit higher than the excess cost in the literature of $7,288–$29,156 per infection (Scott, 2009). The potential number of CLABSI, if no intervention had taken place, could have reached 525 over 3 years (the post-intervention period). Hospitals in the collaborative experienced a total of 224 infections over that 3-year period. Using these numbers, 301 fewer CLABSI than predicted actually occurred, yielding a conservative estimated overall cost savings between $2,193,688–$8,775,956 using Scott’s estimate or as much as $13,713,560 when applying our cost estimate.

**Chapter Summary**

A multiple-methods retrospective analysis of the value change associated with the development and growth of the Center for Community Health (CCH) was conducted. This longitudinal case study of the CCH involved costs and benefits as well as growth in community health capacity over a 6-year period starting with the initial contribution of University of Rochester to the Center for Community Health in May 2006 and continuing through June 2012.

Research was conducted to ascertain if investing in public health system capacity provides value and whether that value change can be quantified in economic terms. More specifically, the research examined whether the University of Rochester’s
investment in the development and growth of the Center for Community Health, a partnership extension of the local public health system, provided a value benefit either financially or in the health of the community.

Financial value was calculated after collecting and analyzing several sources of financial data from the CCH and from the UR accounting systems. The total CCH budget has grown each year since its inception. UR infrastructure support has been constant at around $850,000 annually; however, extramural awards have steadily increased from $12,943 in the first year to $4,577,375 in FY12, which represents a 516% return on the UR investment. CCH was able to increase the indirect costs recovered that support UR administrative and utility expenses each year, somewhat offsetting the UR investment.

The extremely large return on investment is not paid back to UR in financial returns, since the function of the CCH is not to turn a profit, but rather to improve the community’s health. The return on investment is delivered in increased capacity to improve community health. Increasing numbers of staff and faculty have been hired through the CCH since its inception to increase the county public health workforce. According to the information provided in the interviews, the Center for Community Health contributes substantially to the 10 Essential Public Health Services. The service most often mentioned by managers/directors is Essential Service #4: Mobilize community partnerships and action to identify and solve health problems, followed by #7: Link people to needed personal health services and assure the provision of health care, and #3: Inform, educate, and empower people about health issues. Essential
Services #5: Developing policies and plans, #8: Assuring a competent workforce, #9: Evaluating effectiveness, and #10: Research for new insights, are all well represented, with several managers/directors mentioning programs that service this function.

To more concretely demonstrate improved community health, a case study of the Blood Pressure Advocacy Program was examined. The CCH had the infrastructure and capacity to win the BPAP funding award, and during the first year of its start-up and implementation, Community Health Advocates were able to lower the blood pressure significantly on 232 high-risk patients diagnosed with hypertension. The program achieved estimated savings of $544,621 from the decreased risk of MI and stroke in the patient population.
CHAPTER V
DISCUSSION

Chapter Overview

Demonstrating value for investment in public health system capacity building is critical to inform funding and policy decisions. This project describes a process for quantifying value using economic/financial techniques and provides an example of assessing return on investment. The public health system, including governmental public health as well as system partners, plays an important role in health care in the United States. The value of prevention and community health has grown with the discussion of health care reform and the passage of the Affordable Care Act. Health care costs are growing and early primary prevention initiatives, especially those delivered in the community setting, have potential to provide cost savings. Practitioners and researchers must be prepared to show value for investments made in public health infrastructure.

Funding is tight and financial decisions must be justified with objective data discussed within a logical and relevant context. Economic evaluation and the ability to translate economic analysis into practice and advocacy can help policy makers and practitioners make efficient use of valuable resources. Frameworks are needed to assist public health practitioners translate their message, understand economic analysis, and showcase their added value to policy makers.
The public health system must adjust its capacities to meet changing demands, including altered strategies to prevent chronic disease as well as fiscal accountability. Often this is best served when public health systems expand their partnerships to effectively address some essential services. Partnership and sustainability demand accountability, both in health outcomes and cost benefit. To date, little research has been done on the economics of public health systems and services, especially at the local level.

The Monroe County Department of Public Health (MCDPH) has partnered with the University of Rochester (UR) to develop the Center for Community Health (CCH), an academic medical center within the University of Rochester (UR), and the subject of this research. The UR invests substantially and annually to the development and growth of the CCH to fulfill a pillar of its mission of improving community health. This dissertation work studies financial data and explores the work of the CCH to answer the research question: Does the University of Rochester’s investment in the development and maintenance of the Center for Community Health, a partnership extension of the local public health system, provide a value benefit either financially or in the health of the community? This is a question that all funders ask of their partner agencies, and one that public health practitioners should be well prepared to answer. This research provides a replicable model for public health organizations to duplicate when assessing the value of their agencies.
Summary of Design and Results

A multiple-methods retrospective analysis of the value added with the development and maintenance of the Center for Community Health (CCH), a unique naturally occurring experiment, was conducted. This is a non-experimental, longitudinal study of costs and benefits as well as growth in community health capacity over a 6-year period starting with the initial contribution of University of Rochester to the Center for Community Health in May 2006 and continuing through June 2012. Financial records of the CCH were analyzed to produce a time series picture of the use of the UR investment. Interviews were conducted of managers and directors within the CCH to capture gains in public health capacity. A case study was also conducted to evaluate health outcomes and the associated cost savings of one particular program within the CCH.

The results of the analysis show that the total CCH budget has grown each year since its inception. UR infrastructure investment has been constant at around $850,000 annually; however, extramural awards have steadily increased from $12,943 in the first year to $4,577,375 in FY12, which represents a 516% return on the UR investment. In addition, CCH was able to increase the indirect funds that support UR administrative and utility costs each year, somewhat offsetting the annual UR investment. Indirect cost recovery totaled 55% of the UR investment for FY12.

The large return on investment is not paid back to UR in financial returns, since the function of the CCH is not to turn a profit, but rather to improve the community’s health. The return on investment is delivered in increased capacity to improve
community health. This increased capacity is evident in many ways, including the increase in staff and faculty hired through the CCH over the years. The CCH workforce increased from 13 employees (12.6 FTEs) in FY06 to 63 employees (46.7 FTEs) in FY12. The increased faculty and staff have been able to build public health capacity by fulfilling the 10 Essential Public Health Services. According to the information provided in the interviews, the Center for Community Health contributes substantially to the 10 Essential Public Health Services. The service most often mentioned by managers/directors as a function of their work is Essential Service #4: Mobilize community partnerships and action to identify and solve health problems, followed by #7: Link people to needed personal health services and assure the provision of health care, and #3: Inform, educate and empower people about health issues. Also, #5: Developing policies and plans, #8: Assuring a competent workforce, #9: Evaluating effectiveness, and #10: Research for new insights, are all well represented with several managers/directors mentioning programs that service this function.

The research demonstrates that CCH has been able to turn the UR investment into substantially increased funds that are being used to improve the public health functionality. To more concretely demonstrate improved community health, a case study of the Blood Pressure Advocacy Program (BPAP) was examined. During the first year of the BPAP’s start-up and implementation, Community Health Advocates (CHAs) were able to lower the blood pressure significantly on 232 high-risk patients diagnosed with hypertension. The program achieved estimated savings of $544,621 from the decreased risk of myocardial infarctions and stroke in the patient population enrolled in BPAP.
Other CCH programs and services have demonstrated cost savings through their interventions. For example, the CLABSI program saved the area hospitals between $2,193,688 and $8,775,956 over their 3-year intervention, and the communicable disease surveillance and prevention central line associated bloodstream infections collaborative saved the hospitals an estimated $560,000 – $1,360,000 for one year, just in prevention efforts for hospital acquired c-difficile. Many other service areas and programs are very successful in improving community health; however, their outcomes have not been converted to monetary measures. A true picture of the entire value added by the UR initial and growth investments in the CCH can only be fully realized by economically analyzing all health outcomes.

**Discussion of Results**

It is clear from this research that the Center for Community Health adds value to the University of Rochester and that there is a valuable return on the investment that UR makes in the CCH annually. It is also clear that the value added can be quantified, as demonstrated in the results section.

Value can certainly be assessed through financial gains; however, the CCH goal is not to produce a financial profit. Most grant funding and private awards require that funds be used to complete the work plan of the award contract so that all funds are used to do the work, in this case, of community health. However, this is not to say that cost savings and realized returns are not important, just that the savings are often absorbed in increased intervention or service delivery so that funding is “break-even.” Therefore
value cannot be measured in improved profits, but rather in the additional work that those profits can fund.

The UR has steadily supported CCH with an annual investment that is used for infrastructure support (as shown in the operating budget, Table 6.) However, through that support, CCH has been able to apply for and win several extramural awards, resulting in a 5-fold budget increase since the CCH’s inception. Not only has funding increased substantially, but funding sources have changed and larger, federal, longer-term grant funding has increased. Extramural funding supports the work that the CCH is able to accomplish and the more funding received, the more community health work can be achieved. Federal funding is also important for dissemination of findings and networking with experts nationwide. UR infrastructure support has allowed the CCH to build strong internal systems for community partnership as well as health monitoring and tracking that makes the Center a desirable recipient for extramural funding.

Increasing extramural funding has resulting in increased indirect cost recovery to the University, although not all extramural funding allows for indirect cost allocation. The CCH is cognizant of the allowable indirect costs payable when applying for extramural funding; however, the potential to improve community health always takes priority over indirect funding allotment.

In addition to the grants given directly to the CCH, there is value that is difficult to quantify in the additional funding to the UR, and to the community partners, that is made possible by the existence of the Center. For example, the Clinical and Translational Science Award was given to the UR and the CCH has the responsibility of the
Community Engagement function. The CCH was well established and capable to serve this function when UR applied for the very substantial CTSI award. In addition, Finger Lakes Health System Agency recently was awarded the largest Centers for Medicare and Medicaid Innovations (CMMI) award in the nation. The Director of the CCH was instrumental in assisting with the system design that was articulated in the grant application, and advocated for community health partnership in the clinical design model.

The increased overall budget of the CCH has been used to increase community health work through increases in staff and increases in the service delivery. The URMC has as part of its mission and strategic plan to “improve the health of the community.”

The mission of public health is to promote physical and mental health while preventing disease, injury, and disability. The 10 Essential Public Health Services were introduced to measure how well the health department is designed to reach the mission; presumably, the better an organization performs the essential services, the more likely they are to improve health and prevent disease. The same principles were applies to the CCH as a public health partner. The 10 Essential Public Health Services are carried out across the 14 key programs and services of the CCH. The essential services cover three core functions defined in the 1988 IOM report: (1) Assessment or monitoring the health status of a community; (2) Policy development, implementation, and advocacy; and (3) Assuring the community has access to competent and effective community health. Through interviews with each of the program managers or directors at the CCH, the research demonstrated a broad body of work that covers all three core functions. The CCH did not have any activity that contributes to enforcing laws and regulations that
protect health and ensure safety; however, that is to be expected since as a partner organization in an academic institution, we have no legal authority to do so. The CCH did, however, contribute substantially in areas that are traditionally not done by local public health, including developing policies and plans, evaluating effectiveness of personal and population-based health services, and conducting research for new insights and innovative solutions to health problems. As public health systems grow and new partners are added, it will be important to match partners that have great capacity to complete essential services beyond the scope of a particular governmental health department. Research is a key example: research might be more easily and efficiently conducted in an academic medical center than in a practice-based public health department.

Another important essential function that is conducted by many service areas within the CCH is mobilizing community partnerships and action to identify and solve health problems. The CCH was established in part to be the link between the UR and the community; therefore, it is of value that we have such substantial contributions to this essential service. In addition to the many activities listed during the interviews, the Director of Community Engagement is tracking community encounters and partners. Thirty-one community and academic members comprise the Community Advisory Council which is led by the CCH, and 18 community-based organizations, including health and social service agencies, the faith community, local government, the city school district, and media are represented. In addition, the CCH had membership in 26 unique community coalitions. Beyond participating in community groups, the CCH has been
able to support our community partners financially and has contributed $568,635 in contracts and agreements with community-based organizations.

Although this research has shown substantial value returned on the investment of the UR through financial growth as well as community health capacity, it is difficult to demonstrate improved community health resulting from the UR investment. There is not a clear singular measure for improved community health, and that measure changes depending on the service area. Examining all the service areas within the CCH for community health improvement is beyond the scope of this dissertation; however, a case study example was presented. The Blood Pressure Advocacy Program (BPAP) is a recent initiative that was funded through the state economic growth initiative, via subcontract with the Finger Lakes Health Services Agency. The CCH was selected for this funding contract because of its ability to get the program started quickly, to initiate and complete contracts in a timely manner, to develop and implement a training program based on established curriculum and national guidelines, and to translate evidence-based practices into a clinical setting within a matter of months. Were it not for the establishment and growth of the CCH, UR would not have been a candidate to receive this funding award of $300,000 to oversee the program. Within the first year of the program, the CCH BPAP program has actively worked with over 400 patients referred by providers or through phone solicitation. Among all the clinic patients with high blood pressure that is not controlled, four community health workers are actively counseling 232 patients. These patients have seen substantial health outcomes, including an overall decrease in blood pressure from 150/85 to 132/78, a statistically significant difference
(paired \( t(231) = 13.72, p = -.000 \)). Converting that change in blood pressure to long-term cost savings, this change is estimated to result in 4.64 less myocardial infarctions (MIs) and 5.8 less cases of stroke. Overall, we can expect 11.6 cases of general cardiovascular injury averted, resulting in substantial decreases in cost in medical care—$544,621 in costs savings for the 3-year period following MI and stroke cases averted. This savings benefit is offset by the $300,000 cost needed to run the program for one year, with remaining balance of $244,621 in savings. Theoretically, that savings can be matched against the UR contribution for FY12 of $887,450.

Each service area within the CCH has both potential and realized health outcomes that can be quantified and converted to net savings or net cost. The BPAP program alone, along with the indirect cost recovery ($487,535), comes close to covering the UR contributions for FY12.

Conclusions and Implications

This research shows that the UR annual investment yields substantial value in the financial return of over 500% for FY12, which was used to increase the public health capacity in our community and to improve health outcomes. The true and complete measure of community health improvement is difficult to quantify; however, that does not diminish the value that has been quantified.

A Framework for Assessing Value in Public Health Systems was presented in this dissertation and may be used by practitioners to summarize value and to disseminate the findings to decision makers, including funders. Step 8 in the framework is to “write the
story for the decision makers using the outcome of value.” The results should be presented in a succinct and understandable manner to persons who might not be familiar with public health or prevention concepts. The sample summary for the evaluation of the Center for Community Health, as presented to the University of Rochester, would read as follows.

A retrospective analysis of the Center for Community Health was conducted to study the value added through the annual contributions of the University of Rochester from the CCH inception in May 2006 through the last complete fiscal year that ended June 30, 2012. The University is interested in supporting a fiscally responsible Center that was established to contribute to the mission of improving the community’s health. The University’s contribution leads to improved health outcomes in the following way:

1. Investments from the University have remained steady through the six years since the Center was established. The CCH has been able to grow that money by applying for extramural funding which has increased every year. The UR investment as a percent of the annual budget is decreasing each year and the indirect funds collected for UR have increased.

2. The CCH has been able to use the increasing extramural funding to build community health capacity by expanding our health workforce from 13 to 63 individuals, increasing the services and programs we are able to provide, growing and financially supporting our partnership organizations ($568,635
given to community agencies through contracts in FY12) and evaluating and researching our successes. The CCH has contributed significantly to the 10 Essential Public Health Services, including:

- Monitoring the health status of Monroe County through our communicable disease surveillance, the Monroe County Adult Health Survey and the evaluation of the employee biometric screenings.

- Informing, educating, and empowering people about health issues through conducting community health forums, teaching through one-on-one interventions in Healthy Hero, Blood Pressure Advocacy Program, Teen Health and Success Partnership, and the Diabetes Prevention Program.

- Mobilizing community partnerships through many initiatives including the Practice Based Research Network, the Community Advisory Council, the African American Health Coalition, and membership in 26 unique community coalitions.

- Developing policies that support community health efforts including supporting clean indoor air initiatives, environmental improvements including the Rochester Corner Store Policy, Complete Streets Legislation, and the H.E.A.R.T. initiative funded through the CDC.

- Research for innovative solutions exploring the Diabetes Prevention Program, and implementation strategies, as well as the Healthy Living Center studying virtual clinicians and self-motivational theory for behavior change.

3. Increased community health capacity has led to improved community health and health impacts. As an example, the Blood Pressure Advocacy Program was able to significantly decrease the blood pressure of 232 high risk hypertensive individuals who are engaged in routine counseling sessions with Community Health Advocates at community clinics. This decrease in blood pressure equates to over $500,000 in savings from preventing 4.6 heart attacks and 5.8 strokes in this patient population alone.

Sustained operational funding has yielded a return on investment for the UR not only in financial gains but more significantly in the ability to do more work to improve the health of the community.

Public health practitioners and systems researchers must begin to study the financial and economic implications of their work. A strong business case for an
intervention or infrastructure support is a powerful advocacy tool for resource allocation decision makers.

**Study Limitations**

There are several limitations to this research. This is not a randomized-control trial but rather a retrospective observational study of one system’s experiences that can be applied to other systems as appropriate. Being retrospective and observations, reliability of the historical data is only as strong as the key informants who are interviewed. Likewise, when assessing each CCH program for its contributions to the 10 Essential Public Health Services, the data are dependent on the manager’s or supervisor’s knowledge of the services provided and honesty in reporting only those services provided. Ideally, a second data source could be constructed by interviewing community partners and/or community members. Managers’ categorization of services among the 10 Essential Services is subject to social desirability bias, which may lead informants to overstate compliance. This will be minimized by having the researcher also categorize the services for comparison and discussion with the managers.

This is an observational study and, therefore, no control group is included for comparison. Unfortunately, we cannot ascertain what the CCH financial progression would have been without the UR investment, nor can we compare the growth of the CCH after its inception in May 2006, to the growth prior to the inception since these financial data are not as accurate.
There is a substantial limitation in the inability to accurately measure community health impact caused by the URMC investment in the development and growth of the CCH. Causation is extremely difficult to demonstrate in the best of circumstances, and given the added complications of time lag with prevention efforts and inconsistency in appropriate health outcomes, is not possible in this study.

Since this is an economic analysis, there are added limitations with the financial data. Information has been collected and categorized over the past 6-year time frame and the CCH has experienced unusual turn-over in financial department staff. Consequently, some financial information collection or categorization procedures may have changed over time, leading to inconsistencies. When possible, this researcher discussed any discrepancies with the CCH director and/or the CCH Chief Operating Officer, both of whom have been with the CCH since its inception. In addition, there are many financial returns that are beyond the scope of this study, such as those related to improved social circumstance, or improved productivity of clients impacted by the CCH. In addition, in-kind contributions are often given to the CCH in the form of volunteers or student work. Since this information has not been accurately tracked across the 6-year time span, in-kind contributions were not quantified.

Also unique to financial data collection is the difference in fiscal years among granters and the CCH. Most extramural awards have budget years that are not consistent with the CCH fiscal year; assignment of funds to a given fiscal year is somewhat subjective as the funds were split by date and not specifically tracked. Grants awarded in
October of 2010, for example, would be listed in the UR financial system as being administered in FY10, however, would be counted in the CCH FY 2011.

**Recommendations for Future Research**

Standardized outcome measures are needed in the study of public health. A consistent recognized outcome of improved community health would enable accurate comparisons between agencies. Understandably, this is a daunting task as community health encompasses so many diverse parameters. However, measuring the association between improved community health capacity through the 10 Essential Public Health Services and improved community health outcomes should be researched.

Although this research contributed to the literature addressing the Public Health Services and Systems Research Agenda, specifically

- What measures provide the most valid and reliable indicators of the financial performance of public health agencies?

- How do investments in public health strategies influence the need for downstream spending on medical care and/or social services?

Much more work is needed in financial and economic analysis of systems research. It is difficult to apply economic measures of success to public health endeavors primarily because public health sees value not in financial gains but in the health of the community. The “financial success” is in improved community health, which to date has been very difficult to measure. However, the fact that there are many uncertainties should not stop public health practitioners and researchers from quantify the value in the work they do.
REFERENCES


Consortium from Altarum Institute, CDC, RWJF and the National Coordinating Center for Public Health Services and Systems Research. (2012). A national research agenda for public health services and systems. *American Journal of Preventive Medicine, 42*(5S1), S72-S78.


Appendix A

Interview Protocol and Script
Recruitment Email Letter

**Initial Email:**

To program managers and service directors at CCH: As most of you know, I am working on my dissertation to finish my PhD in Interdisciplinary Health Sciences at Western Michigan University. My study is titled “Quantifying Value in Public Health: Using Economic Methods to Analyze System Change”. I am studying whether or not the University of Rochester’s investment in the Center for Community Health has added value either in financial gains or in contributing to the 10 Essential Services of Public Health Systems. I will be reviewing each of your areas and programs to determine which, if any, of the 10 Essential Services your work contributes to. In order to confirm that my interpretation is consistent with your thinking, I would very much like to interview each of you as key informants. The interview should take one session of between 15-30 minutes of your time. You can decide to stop the interview at any time you wish. Although I know each of you, no personal identifying information will be collected or published in my research.

If you are willing to discuss your service area with me, please reply to this email at your earliest convenience to set up our interview time. If you are not interested, please reply to this email to let me know that. Thank you so much for your consideration.

**Follow up Email:**

Sorry to bother you, but I am following up on the email I sent earlier requesting your participation in a brief key informant interview about your service area, and how your work fits with the 10 Essential Services of Public Health Systems (see previous email, below). Please respond to let me know if you are interested in participating or not. If interested, I would like to set up a brief interview time as soon as possible. Thank you.
You are invited to participate in a research project entitled “Quantifying Value in Public Health: Using Economic Methods to Analyze System Change”, designed to analyze whether the University of Rochester’s investment in the development and maintenance of the Center for Community Health, a partnership extension of the local public health system, provides value either financially or in the health of the community. The key informant interview is designed to assess how services and programs in the Center for Community Health fit with the 10 Essential Services of a Public Health System. This study is being conducted by faculty member Dr. Kieran Fogarty and student investigator Theresa Green and from the Interdisciplinary Health Sciences Program at Western Michigan University.

This interview is comprised of 3 open ended questions and will take approximately 15-30 minutes to complete. Your replies will be recorded by written notes taken during the interview process which can be reviewed by you at any time. You will be identified as the “Manager/Director of key service area or program”. You may choose to not answer any question. Signing below and answering the questions indicates your consent for use of the answers you supply. Participation in this interview is voluntary and if you choose to not participate, simply state that you wish to stop the interview at any time. Your responsibilities at the Center will not be affected in any way by whether or not you complete the interview. If you have any questions regarding this study, you may contact Dr. Kieran Fogarty (269-387-8447), the Human Subjects Institutional Review Board (269-387-8293) or the vice president for research (269-387-8298). A final report regarding the project will be available from Theresa Green upon request.

This consent form has been approved for use for one year by the Human Subjects Institutional Review Board as indicated by the stamped date and signature of the board chair in the upper right corner. You should not participate in this project if the stamped date is more than one year old.

Name

Date
Interview Script

Thank you for agreeing to participate in this interview.

1. What services or programs do you provide that might be considered part of public health system delivery

2. After reviewing the 10 Essential Services listed below, where do you think your programs or services fit? Name as many as you think are appropriate, and it may be that your services do not match any of the public health 10 Essential Services.

<table>
<thead>
<tr>
<th>Assessment</th>
<th></th>
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<tbody>
<tr>
<td>1. Monitor health status to identify and solve community health problems</td>
<td></td>
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<tr>
<td>2. Diagnose and investigate health problems and health hazards in the community.</td>
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<tr>
<td>3. Inform, education and empower people about health issues</td>
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</tbody>
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<table>
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<tr>
<th>Policy</th>
<th></th>
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<tbody>
<tr>
<td>4. Mobilize community partnerships and action to identify and solve health problems.</td>
<td></td>
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<tr>
<td>5. Develop policies and plans that support individual and community health efforts.</td>
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</tr>
<tr>
<td>6. Enforce laws and regulations that protect health and ensure safety.</td>
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<tr>
<th>Assurance</th>
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<tr>
<td>7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable</td>
<td></td>
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<tr>
<td>8. Assure competent public and personal health care workforce</td>
<td></td>
</tr>
<tr>
<td>9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.</td>
<td></td>
</tr>
<tr>
<td>10. Research for new insights and innovative solutions to health problems.</td>
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</table>

3. In your opinion, does your service or program area add financial value to the University of Rochester? Please explain.

Thank you.
Appendix B

Human Subjects Institutional Review Board
Letter of Approval
Date: May 14, 2013

To: Kieran Fogarty, Principal Investigator
Theresa Green, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: Approval not needed for HSIRB Project Number

This letter will serve as confirmation that your project “Quantifying Value in Public Health: Using Economic Methods to Analyze System Change” has been reviewed by the Human Subjects Institutional Review Board (HSIRB). Based on that review, the HSIRB has determined that approval is not required for you to conduct this project because you are analyzing a program and not collecting personal identifiable (private) information about individuals.

Thank you for your concerns about protecting the rights and welfare of human subjects.

A copy of your protocol and a copy of this letter will be maintained in the HSIRB files.