

2020

## Use of Managerial Epidemiology by Healthcare Leaders in Ambulatory Settings

Chantelle Schenning  
*Walden University*

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# Walden University

College of Health Sciences

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Chantelle Schenning

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Walden University  
2020

Abstract

Use of Managerial Epidemiology by Healthcare Leaders in Ambulatory Settings

by

Chantelle Schenning, MHA

MA, University of Maryland University College, 2015

BA, Notre Dame of Maryland University, 2012

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Health Services

Walden University

August 2020

## Abstract

Despite many health reforms, the United States continues to struggle with limited healthcare access, exponential healthcare costs, and poor quality of care. Overcoming these challenges requires healthcare leaders' effective navigation of industry transformation towards population health and a shift in patient volume to ambulatory healthcare settings. Research has demonstrated that the use of managerial epidemiology, an application of epidemiology tools and principles to management decision-making within healthcare organizations, can better serve the health of the population and could improve the triple aim of inadequate access, high costs, and poor quality. However, the adoption of this practice is weak and its utilization by current healthcare leaders has not yet been studied. Diffusion of innovation theory framed this qualitative study to understand the perspectives of ambulatory healthcare leaders on using managerial epidemiology within their leadership approach as well as understand the spread of this practice and associated barriers. Twelve healthcare leaders participated in semistructured interviews. Findings from open-axial coding of the interview data indicated managerial epidemiology is critical and validated the importance of managerial epidemiology for impacting the triple aim, population health, and overall system performance. Additionally, this study provided steps to accelerate the adoption and highlighted the use of managerial epidemiology during a pandemic, which has worldwide implications for improving health and performance of healthcare globally therefore promoting social change.

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## Dedication

Dedications are personal and meant to emphasize who the researcher is dedicating their work or state of being to as a way of honoring them. Like most things in my life, this dedication will be unconventional. Instead of honoring individuals in this dedication, I dedicate this dissertation to groups of people who are the world-shakers, social change enthusiasts, and healthcare warriors. Thank you for being curious and your efforts towards impacting the healthcare of our greater population. It is a never-ending pursuit, but it starts with each and every one of us. I hope this study and my future work will help support you in our collective endeavor for a better healthcare system.

## Acknowledgments

First and foremost, thank you to my dissertation chair, Dr. Aagard and committee member, Dr. Duncan for being on this journey with me! I appreciate your guidance, expertise, and support (emotional and educational) along the way. I am grateful for your refinements and polishing touches, but most importantly, I am grateful for your thought-provoking questions that always delivered a more thoughtful, finished product. You made this journey as smooth as possible and less lonely. I am forever grateful for you and inspired by you!

To the participants of this study, thank you for your time and thoughts during our interviews. I thoroughly enjoyed talking with each of you and exploring your perspectives. Truly, I believe the findings of this study can impact our healthcare system and our population's health. None of this could be accomplished without you. I am forever grateful. Thank you for your altruistic hearts and unrelenting leadership for your patients.

To my parents and family, thank you for empowering me since I was a young girl by "letting me be the boss or captain of the boat". Truly, I grew up believing I could be and do anything. I never once thought improving the leadership of healthcare across our nation was too far-fetched. Thank you for your love and support along this journey!

To Phil, thank you for your encouragement during the homestretch of my dissertation. Your support and love have meant more than I could ever say. Thanks for opening your home and heart to me while quarantining and "disserting" or is it desserting? And importantly, thanks for being the love of my life.

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## Chapter 1: Introduction to the Study

### Introduction

The United States continues to struggle with limited healthcare access, high costs, and suboptimal quality of care. Although there is a proven practice called *managerial epidemiology* that could help, most academic institutions are not educating healthcare leaders on this concept (Caron & Hooker, 2015). In addition, the adoption of this practice is weak and there is a lack of published literature on the topic (Fleming, 2015).

Meanwhile, healthcare leaders are challenged with the triple aim of access, cost, and quality (Love & Ayadi, 2015; Storkholm, Mazzocato, Savage, & Savage, 2017).

Particularly, ambulatory healthcare leaders could benefit from using a population-based leadership approach with managerial epidemiology as patient volume is shifting toward the ambulatory healthcare settings (Love & Ayadi, 2015; Storkholm et al., 2017). The intent of this study was to gain an understanding of ambulatory healthcare leaders' perspectives on the use of managerial epidemiology. The findings of this study may provide insight to changing healthcare leadership approaches to improve the health of populations and enhance the performance of healthcare organizations.

In Chapter 1, I provide a description of the background of this study and state the problem this study will address, the research questions to be explored, and the framework guiding the research. In addition, I provide definitions of key concepts, an overview of the scope, and the limitations. At the end of Chapter 1, the significance of this study is shared before transitioning into the literature review in Chapter 2.

## **Background of Study**

Compared to other countries, the United States has struggled with access, cost, and quality of healthcare for its population (Osborn, Squires, Doty, Sarnak, & Schneider, 2016). This national healthcare challenge requires a change to healthcare leadership approaches. Combining epidemiology with healthcare management may improve the health of populations and help solve the nation's challenges of excessive costs, limited access, and inadequate quality in healthcare (Ibrahim, 1983; Scutchfield & Keck, 2009). This combination of epidemiology and healthcare management is called managerial epidemiology (Fleming, 2015; Rohrer, 2013). This practice is not commonly known or researched. As this practice is emerging, approximately 20% of healthcare leaders are retiring (Grimm, Watanabe-Galloway, Britigan, & Schmaker, 2015). Although new leaders are entering the workforce, most academic programs do not offer a curriculum including managerial epidemiology (Caron & Hooker, 2011). Therefore, emerging leaders are not adequately trained for the significant changes needed for our healthcare industry (Caron & Hooker, 2011). Healthcare managers are constantly challenged by the triple aim of cost, access, and quality, but it will be more important than ever for ambulatory healthcare leaders to use managerial epidemiology as the healthcare approach towards preventative medicine shifts the patient volume to ambulatory healthcare settings (Love & Ayadi, 2015; Storkholm et al., 2017).

## **Problem Statement**

Despite healthcare reform attempts such as those led by Presidents Roosevelt, Clinton, and Obama, the same challenges of poor quality, limited access to services, and

high costs continue to plague the nation and create a complex environment for healthcare leaders to generate improvements (Osborn, et al., 2016; Storkholm et al., 2017).

Decisions informed through patient population data could contribute to improvements in the nation's health and economy by reducing costs, increasing access to, and reducing the use of services while improving quality of care (Fleming, 2013). Fleming (2013) and Rohrer (2013) have promoted a blend of healthcare administration and epidemiology called managerial epidemiology. Using managerial epidemiology, healthcare leaders could make decisions to better serve the health needs of their patient population (Fleming, 2015). Caron and Hooker (2011) indicated that healthcare leadership education and training is not consistently adequate for the changes the healthcare industry has faced, such as the noted shift in public health from infectious to population health, and the increased triple threat of access, cost, and quality. This is attributed to a gap in education programs providing education in managerial epidemiology topics (Caron & Hooker, 2011). Although there is a managerial epidemiology textbook developed by Fleming (2015) with case studies to help health services leaders adopt the practice, as well as supplemental resources for teaching, few health services undergraduate and graduate education programs offer managerial epidemiology courses or concepts and adoption of the practice is still weak (Caron & Hooker, 2011; Rohrer, Angstman, & Pecina, 2013).

Despite this acknowledgment that managerial epidemiology is a promising practice for healthcare leaders and that education for healthcare leaders is inconsistent, the engagement and perspectives of ambulatory leaders for using the practice to navigate



the ongoing national healthcare challenges is unclear. After almost 40 years, only a small number of researchers make up the managerial epidemiology research community. These researchers indicate that the practice will help healthcare leaders improve population health and reduce the burden of access, cost, and quality (Caron & Hooker, 2015; Fleming, 2015). However, there is a lack of published literature on leaders' understanding of and use of managerial epidemiology in ambulatory healthcare settings. Rohrer, Angstman, and Pecina (2013) emphasized the need for further development of managerial epidemiology and encouraged healthcare leaders to consider using it. With the evident benefits of the concept of managerial epidemiology and recognition of the weak adoption, it is surprising that leaders' perspectives of managerial epidemiology are presently unstudied as to identifying recommendations for increased use of the practice. The health of our nation may become reliant on healthcare leaders understanding and utilizing the practice of managerial epidemiology. Therefore, the perspectives of ambulatory leaders on the use of and diffusion of managerial epidemiology should be studied to address this gap.

### **Purpose of Study**

The purpose of this traditional qualitative study is to understand perspectives on the use of and diffusion of managerial epidemiology among healthcare leaders with experience in ambulatory healthcare settings. Collection and analysis of interview data can stimulate a greater understanding of the current experiences ambulatory leaders have in using managerial epidemiology to guide their practice, such as development and implementation of staffing models, new services, or modes of health service delivery.

This data may provide insight into how managerial epidemiology can be used to lead an effective, efficient healthcare organization, as well as improve the health of the patient population the organization serves.

### **Research Questions**

The following research questions guided this study:

Research Question 1: What are the perspectives and experiences of ambulatory healthcare leaders on the use of managerial epidemiology for decision-making?

Subquestion 1: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *relative advantage* of the use of managerial epidemiology?

Subquestion 2: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *compatibility* of the use of managerial epidemiology?

Subquestion 3: What are the leaders' perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *complexity* of the use of managerial epidemiology?

Subquestion 4: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *trialability* of the use of managerial epidemiology?

Research Question 2: What are the perspectives and experiences of ambulatory healthcare leaders regarding communicating the use of managerial epidemiology through the healthcare system?

## Framework

The framework for this research study is diffusion of innovation (DoI) theory (Rogers, 2003). DoI theory, developed by Rogers in 1962, considers four elements for diffusion of an innovation: the innovation itself, communication, time, and social system (Rogers, 2003). Additionally, the main attributes of influencing an innovation from the DoI theory (i.e., relative advantage, compatibility, complexity, trialability, and observability; Rogers, 2003) were explored through this study of managerial epidemiology. These attributes are defined as follows:

- Relative advantage describes whether the innovation, such as managerial epidemiology, is viewed as being beneficial (Rogers, 2003). This can be explored by determining whether the healthcare leaders in ambulatory healthcare settings perceive the practice of managerial epidemiology to be a benefit to their decision-making or a hindrance.
- Compatibility refers to whether the innovation fits well with the current norms to understand the speed and needs of the adoption (Rogers, 2003). Through the compatibility lens, I explored how managerial epidemiology links with current norms and practices especially as it related to managers' decision-making and improvement processes.
- Rogers (2003) described the attribute of complexity as being used to assess the perceived difficulty of the innovation. In this study, I assessed perceptions of the difficulty of applying the concept of managerial epidemiology in leadership practices as well.

- Trialability is used to understand whether the innovation can be used as a trial or experiment prior to adoption (Rogers, 2003). I explored the leaders' willingness and ability to try the use of the managerial epidemiology practice to understand this element of diffusion.
- Lastly, observability refers to the measure of how much the innovation can be viewed by the adopters to understand the results and benefits of the innovation to help with adoption (Rogers, 2003). Exploring the leaders' perspectives helped glean whether the practice can be observed before full adoption and how this might be done to increase diffusion of managerial epidemiology.

In this research, the DoI theory related to the adoption of managerial epidemiology as being poor, despite past attempts and the perceived benefit of the practice. Using DoI theory allowed me to explore the diffusion of managerial epidemiology. I was able to ask specific questions to assess the leaders' perceptions of the four elements as they relate to managerial epidemiology including, the innovation itself, communication, time, and social system, as well as the five aforementioned attributes that influence adoption of the innovation. Drawing from the DoI theory, studying the leaders' perceptions helped to form a better understanding of diffusion of managerial epidemiology. Although the DoI theory has been used in the past for the healthcare industry, it had not been used as a framework within the managerial epidemiology literature (Huye et al., 2017).

### **Nature of Study**

The nature of this research was traditional qualitative research using interviewing as the method of data collection (Ravitch & Carl, 2016). I conducted this qualitative research to gather leaders' perspectives on managerial epidemiology. The method for data collection was in-person or virtual interviews with ambulatory leaders. The interviews were recorded and manually transcribed. A thorough coding with preset codes and emerging codes, categorizing, and theming was conducted to generate the overarching themes related to the managerial epidemiology.

### **Definitions**

*Ambulatory healthcare setting:* A healthcare setting which could include community health centers, urgent care centers, outpatient clinics, physician offices, specialty clinics or centers, radiology centers, and dental clinics (Centers for Disease Control and Prevention, 2016).

*Compatibility:* A component of the DoI theory that measures of the alignment of the innovation with the existing norms of the adopters and the social system (Rogers, 2003).

*Complexity:* A component of the DoI theory that describes the degree of how difficult it is to utilize and understand the innovation (Rogers, 2003).

*Managerial epidemiology:* The application of epidemiology principles and tools to decision-making within and the management of healthcare organizations (Caron, Hooker, & Ulrich-Schad, 2013; Fleming, 2015).

*Observability:* An element of the DoI theory that describes the visibility of innovation results (Rogers, 2003).

*Population health:* Overall health outcomes of a group including the spread of outcomes and determinants of health within the group of individuals (Kindig & Stoddart, 2003).

*Relative advantage:* An element of the DoI theory that describes how the innovation is perceived as being better than the idea (Rogers, 2003).

*Trialability:* An element of the DoI theory that measures how experimental the innovation might be (Rogers, 2003).

### **Assumptions**

Prior to the start of this study, a few assumptions were recognized. One assumption encompassed the engagement of healthcare leaders in ambulatory healthcare settings. I assumed the participants would not have much time to spare for the interview. I also assumed there may be bias from the participants towards their own experiences and managerial practices. I also assumed that participants would respond as honestly as possible. However, there is no way to know in qualitative research whether the participant is providing honest answers or telling you what they think you want to hear.

### **Scope and Delimitations**

The scope of this study includes the perspectives and experiences of healthcare leaders in ambulatory healthcare settings regarding the use of managerial epidemiology. There is little literature published on managerial epidemiology, and I found nothing exploring its use by healthcare leaders in ambulatory healthcare settings. Healthcare

leaders and organizations can use the perspectives from this study to change leadership approaches that may drive organizational performance and improve access, enhance quality, and reduce costs of care.

For delimitations, I chose to include only healthcare leaders in ambulatory healthcare settings rather than any healthcare leader. This delimitation was chosen due to the shift of patient volume toward the ambulatory healthcare settings. Further delimitations of the participant pool include the criterion of at least 1 year of experience in the ambulatory healthcare settings. This delimitation is important to ensure that the participants have adequate experience to provide a perspective on the topic in the ambulatory healthcare setting. Another delimitation is the conceptual framework of DoI. I considered using phenomenology or grounded theory. However, both were not suitable for this research on managerial epidemiology. The concept itself of managerial epidemiology was already developed; therefore, grounded theory was not appropriate. The use of phenomenology was also inappropriate as there are likely few lived experiences with managerial epidemiology to provide meaningful data. The concept of managerial epidemiology exists, yet there is little experience with the practice, so the use of DoI as a conceptual framework provides the most appropriate underpinning to address the research question.

### **Limitations**

There are a few limitations of this qualitative study to consider. One readily apparent limitation is the use of video or telephone conferencing for some interviews instead of conducting an in-person interview. Although technology allows for connection

with participants near and far and reduces costs for the study, technology can limit the researcher's ability to build rapport and experience nonverbal communication (Ravitch & Carl, 2016). Another limitation of this study is the request for participants to become familiar with the concept definitions presented in this study and provide their perspectives. If participants are given robust time (i.e., months) to develop perspectives on these defined concepts prior to interviewing, their perspectives might be more well-rounded and developed. Lastly, there is a limitation with generalizing this study. This study was conducted with healthcare leaders in ambulatory healthcare settings only; therefore, transferring the findings to other healthcare leaders would need to be critically evaluated.

### **Significance**

The aim of this study was to understand the perspectives of healthcare leaders in ambulatory healthcare settings regarding the use of managerial epidemiology. Managerial epidemiology is a concept that may improve population health and organizational performance by reducing costs, improving access, and enhancing quality of care. Healthcare leaders are struggling to define the meaning of population health and significant variation of the concept across many organizations is noted (Skinner, Franz, Taylor, Shaw, & Kelleher, 2018). Yet, population health is the key to improving our nation's healthcare system (Fos, Fine, & Zuniga, 2018). With academic institutions not equipping current and future leaders with applicable population health leadership approaches and skills, this study is positioned to provide insight for changing the approach of healthcare leaders across the nation to impact the health of the greater



population and to improve the performance of healthcare organizations. Additionally, this study can contribute to literature in support of managerial epidemiology to be included in academia for future healthcare leaders.

### **Summary**

The challenges of limited access, high costs, and suboptimal quality of care continue to plague the United States (Osborn et al., 2016; Storkholm et al., 2017). Using a population-based leadership approach and practicing managerial epidemiology can help leaders navigate these challenges more effectively (Caron & Hooker, 2015; Fleming, 2015). In this study, I explored the perspectives of healthcare leaders in ambulatory healthcare settings on using managerial epidemiology to provide recommendations for changing the approach of healthcare leaders across the nation, thereby improving the health of the greater population and improving the effectiveness of our healthcare system. In Chapter 2, I will review literature that supports key concepts and highlights the gap in existing literature to be explored in this study. In Chapter 3, the research design will be presented in detail.

## Chapter 2: Literature Review

### Introduction

Although the practice of managerial epidemiology can help health systems become more effective in improving the access, cost, and quality of healthcare services for greater patient populations, it is not widely applied by managers (Fleming, 2015). Despite its benefits, managerial epidemiology is not taught within many healthcare administration programs (Caron & Hooker, 2011). Rooted in the theoretical framework of DoI, this qualitative research was conducted to gather the perspectives of healthcare leaders on the use of managerial epidemiology in ambulatory healthcare settings. Using EBSCO database, the primary search for the literature review included keywords such as *managerial epidemiology, diffusion of innovations, ambulatory leader, ambulatory manager, outpatient leader, and outpatient manager*.

### Theoretical Framework

The theoretical framework for this study, DoI theory, was developed by Rogers in 1962 (Rogers, 2003). Rogers (2003) defined an innovation as something new that is being adopted. Although DoI is often used for new technology, an innovation can also be a practice such as managerial epidemiology. Diffusion is the way the innovation is spread with communication to individuals (Rogers, 2003). DoI consists of five attributes: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). Focus on these attributes can lead to the innovation being adopted more quickly (Rogers, 2003).

Relative advantage of an innovation describes how the innovation is perceived as being better than what already exists (Rogers, 2003). The relative advantage and rate of adoption are correlated. If the potential adopter perceives the innovation as favorable, the rate of adoption will be more rapid (Rogers, 2003). The relative advantage for the same innovation can be different depending on the individual. For example, a study found that nurses' relative advantage for collaborative team models was higher than the relative advantage of the primary care doctors' relative advantage for the same collaborative team models (Vedel et al., 2013). There are few articles on relative advantage related to healthcare leadership.

Compatibility is a measure of the alignment of the innovation with the existing norms of the adopters and the social system (Rogers, 2003). Compatibility also compares the innovation with the needs and previous experience of the adopters and system (Rogers, 2003). If the innovation is not compatible, the adoption rate will be slower (Rogers, 2003). Interestingly, the values, norms, and past experiences for healthcare are changing while the innovation of managerial epidemiology is emerging. Like relative advantage, there is little literature on compatibility related to healthcare leadership. Many of the compatibility articles related to healthcare were focused on the diffusion of new care design models such as embedding community workers into healthcare systems (Zulu, Michelo, Hurtig, Kinsman, & Michelo, 2015).

Complexity refers to the perception of how difficult it is to utilize and understand the innovation (Rogers, 2003). The complexity of the innovation is a factor in the rate of adoption. If the innovation is more difficult, the adoption will be much slower than that

of an innovation that is more easily understood (Rogers, 2003). Research exists on medical innovations, healthcare technology, and interventions such as healthy dieting interventions (Huye et al., 2017).

Trialability is the measure of how experimental the innovation might be (Rogers, 2003). If the adopters are able to try the innovation, the rate of adoption will be accelerated (Rogers, 2003). The ability to test the innovation reduces uncertainty, which contributes to an increased rate of adoption (Rogers, 2003). Research shows trialability as beneficial for patients adopting electronic personal medical record (Emani et al., 2012).

Observability refers to the visibility of innovation results (Rogers, 2003). If the adopters are able to see results of the innovation more readily, the likelihood of adoption increases (Rogers, 2003). Similar to trialability, research shows observability as a benefit for adoption of personal health records (Emani et al., 2012). There is also literature on observability for preventative measures and interventions such as smoking cessation (Windsor et al., 2013).

Rogers (2003) described diffusion as a communication type that transfers information about the innovation through a communication channel. The communication channels can be used for sharing messages to groups of people through mass media such as the internet or newspapers, whereas interpersonal communication channels are for two or a few people to exchange messages (Rogers, 2003). Rogers also defined types of diffusion as *heterophily* or *homophily*, which describes the comparison of the individuals involved in the communication. For example, homophily is the measure of similar

qualities between the individuals engaged in communication (Rogers, 2003). In contrast, heterophily is the measure of the differences between the individuals involved in the communication, which exist for most diffusion problems (Rogers, 2003). There is research on heterophily and homophily related to diffusion between fashion stylists and customers (Saiki, 2015). In healthcare literature, there is research found on homophily communication strategies for HIV prevention (Dearing, 1996). However, literature was not found on homophily or heterophily related to healthcare leadership (Dearing, 1996).

A key element to the diffusion process is time. According to Rogers (2003), there are three focuses of time for diffusion. Time is related to the innovation-decision process, the degree to which a person embraces innovation, and the volume of individuals in the system (Rogers, 2013). The innovation-decision process consists of five steps, including knowledge, persuasion, decision, implementation, and confirmation (Rogers, 2003). The first step, knowledge, refers to when the innovation is first discovered (Rogers, 2003). Next, persuasion is when the innovation is determined to be favorable or unfavorable (Rogers, 2003). The decision step is when actions are taken for accepting or rejecting the innovation (Rogers, 2003). Once the decision is made, implementation is when the individuals are using the innovation (Rogers, 2003). Lastly, confirmation is validation or reassurance of the decision for implementing the innovation (Rogers, 2003). Rogers (2003) also indicated the possibility for the innovation decision to be retracted based on the last step of confirmation. The time for each step and the time for completing the entire process can vary.

The time for completing the innovation process as well as the time it takes for volume of individuals to adopt the innovation depends on the individuals' degree of embracing innovation (Rogers, 2003). Rogers (2003) referred to this quality and element of adoption as innovativeness. Specifically, Rogers defined innovativeness as the degree the individual adopts an innovation earlier than others. Individuals can be grouped into five categories based on their innovativeness: innovators, early adopters, early majority, late majority, and laggards (Rogers, 2003). The innovators are the first 2.5% to adopt the innovation. These individuals are highly capable to perform and embrace ambiguity and uncertainty. The innovators are key players in new ideas entering a system and beginning the innovation-decision process (Rogers, 2003). The early adopters are respected influencers of the remaining system for adopting the innovation and consist of the next 13.5% of adopters (Rogers, 2003). The early majority consists of the next 34% to adopt the innovation before the remainder of the system (Rogers, 2003). These individuals are important connectors for the diffusion process between the early adopters and the late adopters but are more deliberate than the early adopters (Rogers, 2003). The late majority are skeptical and require their peers to help influence and generate interest in adopting the innovation (Rogers, 2003). Lastly, the laggards must be certain about the innovation's success before they engage in adoption; therefore, these individuals are the last to adopt the innovation (Rogers, 2003). Engaging adopters in all categories is important for diffusion and may require various communication channels and messages to do so (Rogers, 2003).

The social system itself is where the diffusion occurs. Rogers (2003) described the social system as interrelated units engaged in the diffusion of the innovation. This could be a group of individuals, an organization, or even multiple organizations (Rogers, 2003). The particular social structure of the system helps define the types of communication needed (Rogers, 2003). In addition, the social system consists of its own norms, which contribute to acceptance of change (Rogers, 2003). The social system also determines the type of innovation decision that will occur (Rogers, 2003). According to Rogers (2003), there are three types of innovation decisions including optional innovation decisions, collective innovation decisions, and authoritative innovation decisions. These are characterized by the decision maker for adopting the innovation. Optional innovation decisions are made by an independent individual without engagement of others in the system (Rogers, 2003). In contrast, collective innovation decisions are made by the members of the system based on majority agreement with the decision (Rogers, 2003). Lastly, authority innovation decisions are those made by someone or a group of individuals with power or specific expertise (Rogers, 2003).

Most literature using DoI focuses on areas including anthropology, sociology, education, public health, communication, marketing, and geography (Rogers, 2003). In the healthcare field, most of the literature discusses DoI related to new technology such as population management information systems or supplies and medication such as anesthesia (Scheer, 2017; Leggott et al., 2016). No literature was found related to DoI and managerial epidemiology.

## **Managerial Epidemiology**

Most decisions by clinical providers are evidence-based. However, managerial decisions are not commonly based on evidence (Fleming, 2015). Managerial epidemiology is the blend of healthcare administration and epidemiology (Fleming, 2013; Rohrer, 2013). The use of epidemiology for managerial decisions could improve the health of populations (Fleming, 2015). The shift of focus from managing individuals to managing populations requires the role of management to also shift to a population-based model (Fos et al., 2018). By understanding the needs of the community and how to provide the appropriate services, managers can make decisions on planning and evaluation of their health care delivery organization (Caron & Hooker, 2011). Additionally, managerial epidemiology can be used to measure the effectiveness of a healthcare system (Caron & Hooker, 2011). The use of managerial epidemiology is urged as pressure builds for cost-containment and improved quality of care (Fos et al., 2018). Literature shows managerial epidemiology can be an essential discipline to achieve population objectives (Fos et al., 2018). Though little research has been conducted on managerial epidemiology, the application has been successful for quality improvement and demonstrates the need for education in the subject before students join the healthcare workforce.

### **Quality Improvement**

Quality improvement is often a responsibility of healthcare managers (Rohrer, Angstman, & Pecina, 2013). Managerial epidemiology can assist managers in evaluating and making decisions for improved quality of care and services. By using epidemiology



analyses, including evaluation of the person, place, and time, managers can plan and evaluate quality improvement projects more effectively (Rohrer, Grover, & Moats, 2013). Studies have tested the application of managerial epidemiology for quality improvement initiatives such as evaluating antibiotic prescribing for respiratory infections and effectiveness of care management for depression (Rohrer, Angstman, & Pecina, 2013; Rohrer, Grover, & Moats, 2013). Researchers suggest health services managers use managerial epidemiology for quality improvement (Rohrer, Angstman, & Pecina, 2013; Rohrer, Grover, & Moats, 2013).

### **Academics**

University leaders indicate that healthcare administrators should be competent in areas related to population health (Caron & Hooker, 2015; Hooker et al., 2017). However, undergraduate and graduate healthcare administration programs are inconsistently providing education on managerial epidemiology, or epidemiology topics to develop this competency (Caron & Hooker, 2011). Despite the known benefits of using managerial epidemiology, a course on the subject is only offered in approximately 50% graduate programs and less than 20% of undergraduate programs (Caron & Hooker, 2011). The absence of this course in a curriculum is due to competing content without enough capacity, lack of resources, no certification or licensure requirement associated with managerial epidemiology, and some components being taught elsewhere in the current curriculum (Caron & Hooker, 2011). Education in managerial epidemiology assists in shifting perspectives to a population-approach and underlines the need for managers to be adaptable (Caron & Hooker, 2011). Textbooks have been created to help

encourage the application of managerial epidemiology and the leadership required (Fleming, 2015).

### **Ambulatory Healthcare Leadership**

Ambulatory is a healthcare setting to provide care to patients who are not hospital bound. Ambulatory care includes areas such as primary and specialty physician offices, radiology or other diagnostic testing centers, urgent care, outpatient centers, and dental offices (Centers for Disease Control and Prevention, 2016). Due to public health attention shifting from infectious disease to preventative care, wellness and population health, the patient populations and scope of ambulatory care continues to expand (Scutchfield & Keck, 2009).

Healthcare leader responsibilities include decision making for planning, staffing, and directing of their areas of accountability in the healthcare organization (Fleming, 2013). Healthcare leaders may hold a master's in healthcare administration, master's in public health, master's in business administration, or may be nursing professionals (Love & Ayadi, 2015). In addition, there are multiple competency models for healthcare leaders including a those shared by American College of Healthcare Executives and National Center for Healthcare Leadership (e.g., Love & Ayadi, 2015).

In the ambulatory healthcare setting, leaders must execute planning, staffing, directing, as well as other management functions, and balance the triple aim of cost, quality, and access in an environment with an increasing patient volume. According to Mahbanooui, Gholipour, and Ardakan (2016), some of the core competencies for healthcare leaders include knowledge and awareness, intelligence and talent, values and

attitudes, personality traits, communication skills, decision-making skills, leadership, and management abilities. Literature also suggests emotional intelligence is another competency healthcare leaders should have (Weiszbrod, 2015). The public health shift toward preventative and population health, as well as the shift in patient volume to ambulatory healthcare settings, requires new competencies in population-approaches, and skillsets such as population health management and predictive analytics (Love & Ayadi, 2015).

### **Summary**

This chapter reviewed the literature on managerial epidemiology, on DoI, the theoretical framework of this study, and on aspects of ambulatory healthcare leadership. The shift in focus from individual health to population health has influenced the shift of traditional management to a population-based model (Fos et al., 2018). As the demand for this type of management continues to increase to achieve reduction in costs, improved access, and enhanced quality, the skills for using managerial epidemiology are imperative for managerial and organizational success (Fos et al., 2018). As the increase in patient volume and the scope of ambulatory care continues to broaden, ambulatory healthcare leaders may require and rely on the use of managerial epidemiology more than other healthcare leaders. These ambulatory healthcare leaders could be more challenged at improving cost, access, and quality than other healthcare leaders. However, most healthcare leaders have not been educated on the practice as only a few undergraduate and graduate programs offer education on managerial epidemiology, (Caron & Hooker, 2011). Despite the literature emphasizing the engagement of leaders using managerial

epidemiology, there has been no further research exploring the diffusion of managerial epidemiology. In Chapter 3, I will discuss the research methodology, the research design, and the plan for data collection and analysis.

## Chapter 3: Research Method

### **Introduction**

The purpose of this study was to understand the perspectives of ambulatory healthcare leaders on the use and diffusion of managerial epidemiology. In this study, I used traditional qualitative research using interviewing (see Ravitch & Carl, 2016). Understanding the leaders' perspectives helped inform diffusion of managerial epidemiology to create improve organizational performance and ultimately, a healthier population. In this chapter, I will share the research design, the role of the researcher, methodology, and issues of trustworthiness of the study.

### **Research Design**

The design of this study was based on the research questions exploring managerial epidemiology and its diffusion. The main research questions were as follows:

Research Question 1: What are the perspectives and experiences of ambulatory healthcare leaders on the use of managerial epidemiology for decision-making?

Research Question 2: What are the perspectives and experiences of ambulatory healthcare leaders regarding communicating the use of managerial epidemiology through the healthcare system?

The key concepts explored through the study were managerial epidemiology and diffusion. Managerial epidemiology is defined as the blend of epidemiology and healthcare administration (Fleming, 2013; Rohrer, 2013). Diffusion is the way the innovation is spread with communication to individuals (Rogers, 2003). Ibrahim (1983) described the concept of combining epidemiology with healthcare management to help

healthcare leaders make decisions based on population data to improve the health of great populations. In addition, managerial epidemiology can assist in organizational performance for cost, access, and quality. The diffusion of managerial epidemiology is not well understood, and the concept of managerial epidemiology for leaders is not seen extensively in literature. As such, qualitative methods were most appropriate for this study. To address the research questions, I used interviews to gather the perspectives of healthcare leaders in ambulatory settings. Due to the newness of the concept of managerial epidemiology, the results of the practice could not be readily observed. Therefore, observability was not included in this study, but should be assessed as part of further research. The remaining four elements of DoI were aligned throughout, including:

Subquestion 1: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the relative advantage of the use of managerial epidemiology?

Subquestion 2: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the compatibility of the use of managerial epidemiology?

Subquestion 3: What are the leaders' perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the complexity of the use of managerial epidemiology?

Subquestion 4: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the trialability of the use of managerial epidemiology?

The interview guide included questions aligned to the research subquestions to better understand the diffusion of managerial epidemiology.

### **Role of the Researcher**

My role as the researcher was to be a qualitative interviewer. According to Rubin and Rubin (2012), a qualitative interviewer is someone who is curious and interviews to listen for meaning. The qualitative researcher plans the interview with prepared questions as well as follow-up questions to uncover patterns (Rubin & Rubin, 2012). The role of the researcher is to interview participants and access the qualitative data to understand the perspectives of the participants (Sutton & Austin, 2015). My role in organizing the study included recruiting the participants, conducting the interviews, organizing the data, and evaluating the results.

The plan for recruitment of the participants involved ensuring that I did not have any relationships with the interviewees. I purposefully planned to bypass any recruitment at previous institutions of employment as well as my current employer. If recruitment proved to be challenging with these organizations excluded, I planned to recruit from my current employer, excluding the region where I was currently employed, to eliminate any relationship risks and reduce bias. Each individual region of my current employer has its own reporting structure and is considered a separate entity from other regions of the organization. Therefore, I would not have existing experience, close relationships, or insider knowledge of these segments of the organization that would influence participant engagement or data analysis. By purposefully excluding participants from my region to create this unknown environment would be an attempt to eliminate bias and uphold

validity of the data (Fleming, 2018). Later in this chapter I will discuss approaches such as structured reflexivity and dialogic engagement that I used to manage my bias throughout this study.

## **Methodology**

### **Participant Sampling**

In this qualitative study, the population included leaders at all levels with experience in ambulatory healthcare settings. Ambulatory healthcare settings include primary care, specialty care, and ancillary services such as laboratory and imaging (Centers for Disease Control and Prevention, 2016). For inclusion in the study, the participants needed experience in the qualified ambulatory setting of primary care, specialty care, or ancillary services, as well as have at least 1 year of leadership experience in an ambulatory setting. Using the participant assessment tool, each participant was evaluated on these two criterion and notes were collected to explain the reasoning for participants being excluded from the study. Purposeful sampling strategy was used to recruit participants for this study. Purposeful sampling is important for building credibility and context (Ravitch & Carl, 2016). Additionally, the research questions required purposeful sampling due to the focus of the research question on ambulatory health services leaders (van Rijnsoever, 2017). Purposeful selection of these leaders enabled sharing of their perspectives on managerial epidemiology for contribution of answering the research question.

Recruitment continued until I had interviewed at least 10 participants. This was the minimum number of participants required to build credibility and provide robust



context. According to van Rijnsoever (2017), saturation is reached when new codes or suggestions of new patterns are no longer seen in the data. In this study, participants were recruited until saturation was reached. Attaining saturation is particularly important when researching new concepts such as managerial epidemiology for healthcare leaders.

### **Instrumentation**

A prepared interview guide was used for this study. There are no published interview guides for managerial epidemiology, so I developed the interview guide myself using the components of DoI theory in the form of open-ended questions. The interview tool was developed from the literature reviewed on healthcare leaders, managerial epidemiology, and DoI theory to inform the interview questions. Additionally, the questions were focused on components of the DoI theory such as relative advantage, complexity, trialability, and compatibility. The questions were clustered by these components. To test for content validity, the instrument was pilot tested which includes vetting and rehearsing the instrument (Ravitch & Carl, 2016). Piloting the instrument with the target sample population provided feedback for changes to the interview guide, research design, and process (Ravitch & Carl, 2016). It also proactively identified problems with data collection and provided an opportunity to evaluate the alignment of data collected with the research questions (Ravitch & Carl, 2016).

### **Data Collection**

To recruit participants, I used platforms including social network sites such as LinkedIn, affiliations such as university networks, email, in-person meetings, and phone calls. Initial connections with potential participants were through referrals or

recommendations within my professional network. The communication to participants included an introduction, reason for their targeted recruitment, notification of the requirement for completing my doctorate degree, purpose of the study, time commitments, overview of process, statement of confidentiality, my contact information, deadline for response, and expression of appreciation for their time.

Once the participants contact me, I screened all participants using the participant assessment tool. Participants were notified of their inclusion and next steps via phone, Skype or electronic messaging such as e-mail. The notification of inclusion included information for next steps, such as scheduling the interview, interview logistics, the possible methods of interviewing, such as phone, in-person, or video calling, and a statement of appreciation for their time as well as commitment. In this communication, I also provided the informed consent for their review and signature. Participants who were excluded were also notified by phone, Skype, or electronic messaging. Prior to the interview, at least one reminder was provided to the participant through email, phone, or in-person communication. Recruiting participants and conducting interviews with vetted participants occurred simultaneously.

A semistructured interview style was used to enable focused questions related to managerial epidemiology with the ability to ask follow-up questions (Rubin & Rubin, 2012). Interviews were conducted in person or virtually (i.e., via telephone or video technology) in a setting that was professional and convenient for the participant. In-person interviews were held in the participant's work office or conference room. Virtual interviews were conducted in a private, professional environment such as a conference

room. The interviews were conducted for a total of 45-60 minutes. I selected this time limit to encourage recruitment with minimal time commitment. An introduction email to the study was sent ahead of the interview for the participant to become acquainted with the process and understand expectations. In Appendix A, the detailed interview guide is presented. The start of the interview included a first few minutes to introduce myself, revisit the introduction email, explain the process as well as next steps, confirm completion of the informed consent form, ensure the participant was comfortable, clarify definitions of key concepts, such as managerial epidemiology and population health, and encourage any questions from the participant before starting. Background questions were gathered before conducting the specific interview questions in order to build rapport and learn more about the participant. The data were recorded on my cell phone recording device or a LiveScribe recording pen. The recordings were transcribed before the coding process started.

### **Debrief and Follow-Up Procedures**

Each participant received an email noting my appreciation. Included in the email was the transcript from their interview, providing the participant with the opportunity to review and share any additional remarks. Follow up questions were explored as themes emerged, if information was missing, new or unanticipated ideas were uncovered, or if responses were ambiguous (Rubin & Rubin, 2012). Follow up questions would have been sent via email or asked through an in-person or virtual interview; however, no follow up questions were identified. Once the study was complete, I sent another email of appreciation with the completed study.

## **Data Analysis**

I transcribed the interview recordings verbatim. To start the data analysis, I began with precoding by reading through each interview transcript (Ravitch & Carl, 2016). I used precoding to develop preliminary codes during the coding process. Using words or phrases, I assigned labels as part of the inductive coding process to provide meaning to the data (Ravitch & Carl, 2016). After precoding, open coding was conducted to determine initial meaning from the data (Ravitch & Carl, 2016). Axial coding followed to identify patterns between the first-level codes (Ravitch & Carl, 2016). Categories were developed from the identified themes (Ravitch & Carl, 2016). A computer-assisted qualitative data analysis software was intended to be used to assist in organizing the data, but it was aborted after I determined it to be suboptimal for coding after the first attempt.

### **Issues of Trustworthiness**

To address issues of trustworthiness, critical attention was given to credibility, transferability, dependability, and confirmability. In this section, I will discuss each standard of validity and how it is upheld in this study.

#### **Credibility**

According to Cope (2014), credibility is described as the truth of the data and the researcher's interpretation. There are several strategies that can be used to support credibility including strategic sequencing of methods, participant validation, triangulation, thick description, dialogic engagement, multiple coding, and structured reflexivity (Ravitch & Carl, 2016). Of these strategies, I employed the following strategies in this study: participant validation, strategic sequencing of methods, dialogic

engagement, and structured reflexivity practice. By using strategic sequencing of methods, I helped build credibility through a research design that aims to improve contextualization of the data and handling of complexities of the study (Ravitch & Carl, 2016). According to Ravitch and Carl (2016), within-methods sequencing uses the participants' perspective to design the flow of questions to improve the quality of data gathered (Ravitch & Carl, 2016). This strategic sequencing strategy was applied by grouping questions by theme such as by elements of the DoI theory (Ravitch & Carl, 2016). Participant validation strategy confirmed the interpretations of the interviewees were credible (Ravitch & Carl, 2016). This strategy was executed by sharing the transcripts with the participant after their interview. Dialogic engagement was used by requesting peers to review the research process and interpretations including the interview questions prior to conducting the interviews (Ravitch & Carl, 2016). Lastly, practicing structured reflexivity was important for directing and self-reflecting on bias. This strategy requires the researcher to channel and challenge biases and interpretations outside through a structured approach such as journaling or mapping (Ravitch & Carl, 2016). For this study, I used a journal which included some mapping elements. With these strategies executed, credibility was upheld throughout this study.

### **Transferability**

Ravitch and Carl (2016) described transferability as the how the research is applicable to the audience and others. The common strategies for transferability include a detailed description of the data and providing context for the audience (Ravitch & Carl, 2016). To ensure transferability in this study, I included a robust description of the

background and problem statement regarding managerial epidemiology to provide context for the audience (Ravitch & Carl, 2016). The context also included definitions of the key concepts within the study such as *population health*, *managerial epidemiology*, and *diffusion of innovation*. Using quotes from the interviews provided context for the findings and building trust in transferability.

### **Dependability**

Dependability for qualitative research is defined as data stability (Ravitch & Carl, 2016). The stability of the data was upheld through alignment of the research methods and framework with the key concepts and research questions (Ravitch & Carl, 2016). This alignment was built into this study. The theoretical framework of DoI was evident throughout the research questions. Observability was purposefully excluded from the research questions due to the practice of managerial epidemiology being new and not widely used to be able to observe results. Traditional qualitative method of was used because it was the most appropriate method for the research questions because the topic is not well known. Since little is known about managerial epidemiology, other qualitative research methods were not suitable for the concept. For example, grounded theory was not appropriate as the study is not exploring the development of a theory from the data regarding managerial epidemiology (Ravitch & Carl, 2016). Ethnography was not selected as field studies would not be meaningful for this research as current literature is minimum and healthcare leaders are not trained in using managerial epidemiology; therefore, there was a risk of not finding enough data through an ethnographic approach (Ravitch & Carl, 2016). Similarly, phenomenology presented a risk of not collecting

meaningful data as there is likely minimal lived experiences using managerial epidemiology (Ravitch & Carl, 2016). For these reasons, it was evident traditional qualitative research was the most appropriate method for this study. This thorough alignment of the research design with the concepts and research questions supported dependability of the data collected.

### **Confirmability**

Ravitch and Carl (2016) discussed the need for data to be confirmable. For confirmability, it is necessary to identify bias and take proper measures to mitigate bias from penetrating the interpretation of the data (Ravitch & Carl, 2016). The main strategy used was structured reflexivity with journaling and peer review which was discussed earlier in this section. The interviews were recorded and transcribed which provided additional support for confirmability. I also encouraged and expected my dissertation committee to challenge my research process and thinking which included the oral defense.

### **Summary**

In order to understand the perspectives of healthcare leaders in ambulatory settings on the use of managerial epidemiology, the qualitative research method of DoI was used. In this section, the research method of using basic qualitative research methodology was described, as well as the role of the researcher, participant sampling, and issues of trustworthiness. This chapter provided a comprehensive review of how the study was conducted, as well as justification of the research method selected.

Importantly, the critical steps for upholding trustworthiness were also explored. In Chapter 4, I will discuss the results of this study.



## Chapter 4: Results

### Introduction

The purpose of the study was to understand the perspectives of ambulatory healthcare leaders on the use and diffusion of managerial epidemiology. The two main research questions and subquestions were as follows:

Research Question 1: What are the perspectives and experiences of ambulatory healthcare leaders on the use of managerial epidemiology for decision-making?

Research Question 2: What are the perspectives and experiences of ambulatory healthcare leaders regarding communicating the use of managerial epidemiology through the healthcare system?

Subquestion 1: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *relative advantage* of the use of managerial epidemiology?

Subquestion 2: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *compatibility* of the use of managerial epidemiology?

Subquestion 3: What are the leaders' perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *complexity* of the use of managerial epidemiology?

Subquestion 4: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *trialability* of the use of managerial epidemiology?

In Chapter 4, I provide an overview of the study used to explore these research questions. I will discuss the pilot study, setting, demographics, and data collection. For an in-depth explanation of the study results, I will detail the analysis and its trustworthiness before closing the chapter.

### **Research Tools**

Prior to the start of the study, I developed an interview guide to provide direction on the semi-structured interview process. In Appendix A, the interview guide starts with questions to gather data about the participants. For example, these questions allowed me to collect data on the participants' education and leadership experience. The remaining questions were targeted on managerial epidemiology including the diffusion and communication of the practice to address the two main research questions. The interview guide was reviewed by the dissertation committee for feedback prior to Institutional Review Board (IRB) approval (06-11-19-0652278) and starting the study.

### **Pilot Study**

Once IRB approval was received, I conducted the pilot study exactly as the formal study is outlined in the methods section. Three participants were recruited using purposeful sampling. The pilot study participants were identified through referrals from previous colleagues. Email communication was used to introduce the study, assess that they met the inclusion criteria, gain their informed consent, and schedule the interviews. One of the participants did not meet the inclusion criteria and was excluded from the pilot study. I conducted the pilot study interviews using the interview guide from Appendix A. The phone interviews were recorded on a password secure iPhone or computer. Each

was transcribed verbatim from the recordings and manually coded using open coding. The transcripts were provided to the participants for review in follow-up thank you emails. No revisions or additions were received from the participants.

The pilot study transcripts were reviewed by my dissertation chair. After the review of the transcripts, a meeting was held to discuss the interview questions, process, and next steps. The data appeared to be deep and aligned with the research questions. The end-to-end process for recruitment, interviewing, and providing the transcript to participants proved to be effective and well-designed. No changes were made to the main study design including the interview questions. The data from the pilot study were therefore included in the main study.

### **Data Collection**

Participants were mostly obtained through referrals from my own personal and professional networks. Social media posts were used on sites such as LinkedIn; however, direct messaging was more effective. Purposeful sampling was used to recruit participants and included any healthcare leaders with experience in ambulatory healthcare settings. The leaders needed to have at least 1 year of ambulatory care leadership experience. For the purpose of this study, the acceptable ambulatory settings included primary care, specialty care, and ancillary services. Recruitment continued until a minimum of 10 participants were identified as outlined in the study methods. Due to challenges with recruiting the number of participants needed to reach data saturation, I expanded recruitment to previous employer organizations. This was a deviation from the data collection plan outlined in Chapter 3; however, to mitigate relationship bias I

recruited from organizations I had left more than 3 years ago. Including the two participants from the pilot study, a total of 14 participants were identified for participation in the study. One participant cancelled their interview and did not reschedule due to personal circumstances. Another participant never scheduled an interview despite multiple outreaches. In addition to the two participants from the pilot study, another 10 participants were included in this study for a total of 12 participants.

Once participants were identified as meeting the inclusion criteria using the participant assessment tool, I provided additional context about the study. The consent form provided additional context and was shared for review through email communication. The scheduling process was largely contingent on the participants availability. Most participants scheduled their own interview while others requested assistance from their administrative assistant. Once participants consented and interviews were scheduled through email, the interviews commenced. Due to holiday travel to the same location of two of the participants, their interviews were scheduled for in-person meetings. The remaining 10 interviews, including the pilot study, were conducted by telephone.

To start the interviews, each participant was provided an overview of the interview process and encouraged to ask questions. Before starting the interview, I addressed any questions the participants had about their engagement in the study and asked if there were any questions about the consent form. There were never questions about the consent form, which had been reviewed and returned to me via email prior to the interview. Additionally, uncommon terms were defined at least once before the

interview started and often again during the interview especially the term *managerial epidemiology*. I asked permission before starting the interview to record the interaction. I closed every interview by expressing my gratitude for their engagement. After the interview was complete, I transcribed all recordings in Microsoft Word. The transcripts were sent to each participant for validation as part of a thank you follow-up email. Participants were asked for feedback on the transcripts including any additions or revisions. However, no feedback was received on any transcript.

### **Setting**

There were no personal or organizational conditions to report for this study. Two interviews were conducted in person in participants' professional offices with the door closed for privacy. The majority of the interviews were conducted via telephone. The phone interviews were completed from my personal space or a secluded conference room for privacy. I always communicated the privacy of my location for the interviews. The settings where the participants engaged in the phone interviews varied. Of note, some were in their work offices while a couple were completed during their work commute.

### **Data Analysis**

I attempted to use a computer-assisted analysis software called NVivo with one transcript in the pilot study and discovered it to be suboptimal for use because of the steep technology learning curve, cumbersome process for assigning codes, and challenging visual representation of data analysis. All interview data were stored and manually analyzed using Microsoft Excel. To start data analysis, I read all transcripts and used precoding by assigning labels to begin developing meaning (Ravitch & Carl,

2016). After precoding was complete, I used visual mapping of first-level codes to identify patterns (Ravitch & Carl, 2016). Once patterns were discovered, categories were outlined, and themes were deduced. An example of the data analysis progression from codes to categories and finally theme is provided in Table 1.

Table 1

*Data Analysis for Theme 4: Current Level of Adoption is Variable*

Participant number	Data	Code	Category	Theme
4	Right now, our current practices don't even focus on managerial epidemiology. So, that's how it is misaligned—there's no connect right now.	ME not adopted.	Current Adoption	Current level of adoption is variable
4	Right, it is currently not used here yet.	ME not adopted.	Current Adoption	Current level of adoption is variable
5	Um, can you define a little bit better on the managerial epidemiology term. That's not a term that I've used... Maybe we do use it more here or equivalently, but I don't think so. Maybe we do use it more here or equivalently, but I don't think so.	org not using ME, currently	Current Adoption	Current level of adoption is variable
11	Where I am just with people who are at least attempting to think outside of the box, to think of different solutions to different problems. None I mean One conference touches a little bit of this. The other conferences do not touch it at all.	Not well adopted in educational settings like conferences.	Current Adoption	Current level of adoption is variable
11	I think so— seeing it more and more that's for sure. [ME in op plan process]	Starting to see adoption in operating planning process	Current Adoption	Current level of adoption is variable
1	I would think it is very much integrated. I don't think we use that term today. But, I think that is -- We have formed complete separate divisions in the health system get good at that so we can make good decisions and we can be effective managers. ...	Integrated	Current Adoption	Current level of adoption is variable
3	So, for managerial epidemiology, you know-- I think a lot of people do this but they just don't call it that."	Using, but do not know term	Current Adoption	current level of adoption is variable
10	I might not be the right guy to ask, I live and breathe it. I mean, the organization might not be ready for it or the term.	Individual using ME, but not organization	Current Adoption	Current level of adoption is variable
9	I think it has to happen. I think it does happen. I think sometimes it happens more purposefully than others. I think sometimes people are more aware of it than some. Some by default, back into it, but they get there.	Using by accident; not part of process	Current Adoption	Current level of adoption is variable
12	I definitely have colleagues who take more of a hands-off approach to the data—they look at all of the top-line data and they look at the productivity for their physicians and throughput for their patients, but they don't do a deep dive to discover...	Not using. Superficial use of data analysis	Current Adoption	Current level of adoption is variable

*Note.* Data displayed are direct quotes from participants. ME = managerial epidemiology.

## **Research Findings**

In this section, I will first share demographic data to provide a general background of the participants. The remainder of this section is organized by study findings for each theme. Each theme will be discussed in-depth and align back to the two main research questions.

### **Demographics**

Twelve leaders met the participant criteria and were interviewed. The participants were all working in healthcare organizations in the United States. The study captured data from healthcare systems in all regions of the United States. The locations of their current employer provided representation for the Northeast, Northwest, Southern, and Midwestern parts of the United States. The sample included a mix of male and female ambulatory healthcare leaders. Of the 12 participants, there were five male participants and seven female participants. Some leaders also had current or previous clinical experience, for example, as a midlevel practitioner, physician, nurse, or phlebotomist.

In Table 2, I provide an overview of the participants' demographics including years of experience, education, and clinical background. All participants had at least 2 years of ambulatory leadership experience; however, the sampling was well representative including up to 45 years of experience and a calculated median of 11 years. The ambulatory setting experience of the participants was vast. Some participants' current oversight spanned across all ambulatory services, whereas others had focused oversight of a single department such as oncology. Of note, two participants worked the majority of their careers solely in oncology. Commonly, participants shared



that their experience in ambulatory settings grew or changed over their career progression. For example, one participant had laboratory operations management experience and now has responsibilities in an oncology setting. Another participant's experience encompassed a significant variety of ambulatory settings such as otolaryngology and neurosciences among others but stopped listing examples because "the list can go on and on, but that's probably a good smattering."

Participants achieved a minimum of a bachelor's degree and some held a doctoral degree. More than half of the participants (58%) held a master's degree as their highest level of education. Seventy-one percent of the master's educated leaders specialized in healthcare administration-related degrees. Four participants or 33% of participants held a doctoral degree including a Doctor of Philosophy or Doctor of Medicine. It is notable to mention that one participant with a Doctor of Medicine degree completed a dual program for a Master's in Business Administration as well. I characterized all participants as altruistic based on their description of their journey into healthcare leadership and how they remain energized and engaged. Specifically, their responses described the desire to impact patients or the greater population, and frequently responses mentioned the people or mission at their organization were energizers.

Table 2

*Participant Demographics*

Participant number	Highest level of education	Ambulatory experience	Clinical experience (Y or N)
1	Master's degree in Business Administration	7 years	N
2	Master's degree in Healthcare Administration	3 years	N
3	Master's degree in Health Systems Management	12 years	Y
4	PhD in Nursing	10 years	Y
5	Master's degree in Healthcare Administration	14 years	N
6	Master's degree in Nursing	2.5 years	Y
7	Master's degree in Healthcare Administration	16 years	N
8	Bachelor's degree in Community and Health Sciences	28 years	N
9	PhD in Adult & Higher Education	45 years	Y
10	Doctor of Medicine	30 years	Y
11	Doctor of Medicine	5 years	Y
12	Master's degree in Healthcare Administration	2 years	N

Note. To display if the participants have clinical experience, Y = Yes and N = No.

### Themes

Initially, pattern analysis of all codes developed multiple categories. These categories were assessed for commonalities and differences. Themes emerged quickly and were aligned with the two research questions:

Research Question 1: What are the perspectives and experiences of ambulatory healthcare leaders on the use of managerial epidemiology for decision-making?

Research Question 2: What are the perspectives and experiences of ambulatory healthcare leaders regarding communicating the use of managerial epidemiology through the healthcare system?

In this section, I organized each theme under the aligned research question. I discuss the themes thoroughly and the linkage to the research question.

### **Research Question 1**

For the first research question, I sought to understand the perspectives and experiences of ambulatory leaders on the use of managerial epidemiology for decision making. To do so, I asked interview questions such as “How would the use of managerial epidemiology be an advantage to ambulatory healthcare leaders?” Four themes were identified for the first research question.

#### **Managerial Epidemiology Is Critical and Has No Disadvantages**

When asking participants about the benefits of managerial epidemiology and compatibility, participants were emphatic in their responses. As I listened to their responses to my question, they sounded incredulous, implying, “why would you even ask such a question?” or “isn’t the answer evident?” Eighty-three percent of participants responses were statements that managerial epidemiology is critical. When discussing the essential nature and importance of managerial epidemiology, the participants were emphatic in their responses by using words or phrases that expressed conviction. Participant 10 used a definitive tone when stating, it did not matter “whether or not its compatible or not, it is necessary.” I interpreted this response as meaning that the practice is needed regardless of any potential barriers to using it. Participant 9 responded similarly to Participant 10 by stating, “Well, honestly- I think it is essential.” Participant 12 used expressive language in stating, “I think that the use of managerial epidemiology is paramount to ambulatory leaders”. Participants elaborated on the essential nature of

the practice of managerial epidemiology such as Participant 4 stating, “Well, I think what it would do for the managers is help understand their population which I think is critical and we don’t do a good job at that.” Similarly, Participant 5 explained, “I think we need to be more focused on that [managerial epidemiology] as we continue to move to the future. I don’t see how you can ignore it.”

Most participants stated there are no disadvantages with using managerial epidemiology. The participant responses were direct and short such as “I don’t see a lot of disadvantages to applying that practice” from Participant 9 or “You know, I don’t have a good answer for that” from Participant 8. Participant 4 stated, “In my head, I don’t see a disadvantage”. Three participants responded with challenges to adoption of managerial epidemiology rather than a disadvantage. For example, Participant 3 noted that there is a lack of awareness by senior leaders for the need of a data personnel to support managerial epidemiology and thereby, the funding may not be available. Participant 2 answered that adoption is generally slow for new things and gave recommendations for increasing the rate of adoption of managerial epidemiology. Uniquely, Participant 7 discussed the challenge of data integrity as well as unconscious bias of the leader or analyst that could inadvertently miss capturing populations or variables of populations in the reporting or analysis.

### **Managerial Epidemiology Provides Objectivity and Supports Transformation**

Participants discussed the main advantage of managerial epidemiology is the ability to bring objectivity and focus to leadership functions especially decision-making. The participants shared that without managerial epidemiology, decisions are often made

based on individual or limited experiences, emotion or assumptions, and a piece of the puzzle without seeing the bigger picture. Ultimately, participants believed managerial epidemiology equips leaders to make more focused and better decisions. In this section, I share participant responses on how managerial epidemiology brings objectivity and how it supports healthcare transformation.

Eighty three percent of participants referred to gaining objectivity as a benefit of using managerial epidemiology. I noticed the topic of objectivity woven through interview responses frequently.

Participant 11 stated, “you only know what you experience and none of us experience everything” to describe the benefit of objectivity through using managerial epidemiology. This participant went on to describe that a wider viewpoint provided by managerial epidemiology can have an impact on greater patient populations by stating,

[Managerial epidemiology] is helpful for people to see the high level. If we look at our patients as a whole thirty-thousand patients and not just the 10, 20, 30 patients that I am going to see today. This is what we are doing as a whole, not just impacting 1:1 care.

Managerial epidemiology provides a broad, systems thinking view as Participant 11 described and a focused vantage point as described by Participant 9:

It [managerial epidemiology] keeps you focused and helps your decision making. It is very easy to be bombarded with a lot of information, a lot of requests, a lot of need. It helps to provide a focus and sometimes it can be narrowly defined and sometimes it can be very broad.

To elaborate on the focus provided by managerial epidemiology, Participant 2 described, “I think it could also support a number of different initiatives that ambulatory leaders are grappling with.” From this discussion, it is evident that the objectivity from managerial epidemiology can help ambulatory health services leaders with workload management.

Further, Participant 12 shared the benefit of managerial epidemiology for decision-making on clinical outcomes:

Having that data will give better clinical outcomes because you are able to—you would have the data backing up your decision; whereas, I mean- a lot of people like to make decisions that don’t have any information backing them up. Having some of that data would lead to better choices for our patients and hopefully, end up with better patient care as a result.

This elaboration on the benefits of managerial epidemiology suggested leadership decisions informed through managerial epidemiology can impact clinical outcomes for patients.

Conversely, Participant 12 described what decision-making is like without managerial epidemiology by stating, “I feel like it would be a hit or miss approach and it would go back to really what has been done in the past--where it is the physicians’ gut feeling.” In that same vein, Participant 4 shared that managerial epidemiology “narrows down to very patient-centric things and moves away from provider focused, but more patient-focused.” Participant 1 shared a similar perspective, “I would think that it would be used in almost every aspect. I mean really, not having it basically you’d be shooting

in the wind. You would have to have it.” Participant 5 described the benefit of managerial epidemiology providing objectivity in decision-making by noting,

I’ve had people tell me things that they just assumed... It slows things down but it’s important to try to understand [managerial epidemiology] because your assumptions can often be wrong.

While managerial epidemiology might slow the pace of decision-making, the benefits of improved identification of problems and informed decisions are valuable as Participant 8 shared,

And like I said, there’s a lot of times it is just you know—we tend to have...I don’t want to call it like knee jerk reactions, but more emotional responses to things going on in the clinic and emotional responses in trying to lead different things and go with it instead of taking more of a really complex, analytical approach to decide where our problems are and what we can do to mitigate that.

As I listened to the response of Participant 8, I interpreted that incorporating managerial epidemiology could provide objectivity for an ambulatory healthcare leader as they make decisions that are sometimes emotionally charged and challenging.

Interestingly, the two participants who did not explicitly discuss objectivity were the participants who already use managerial epidemiology in their organizations. I suspect objectivity is already hardwired with the use of managerial epidemiology in their decision-making process; therefore, they are not experiencing the lack of objectivity as much as other participants.

From the responses, it is evident that most decisions made by ambulatory leaders are not informed by the existing data that could provide a better understanding of the populations they serve. Despite this, participants went on to describe that the objectivity from managerial epidemiology could support various healthcare transformation efforts. Healthcare transformation was discussed frequently in the interviews. It is evident that managerial epidemiology is a catalyst for healthcare transformation. Participants described the use of managerial epidemiology to support healthcare transformation in a few ways including: the shift of patient volume towards ambulatory settings from hospital settings, value-based care, population health, and physician shortages. Multiple participants discussed the transformation of shifting patients from the hospital settings to ambulatory settings. Participant 6 expressed the importance of the ambulatory setting and heightened awareness of shifting patient volumes to this division of healthcare organizations by stating, “The ambulatory setting is really what is driving healthcare. We want to shift the focus to the outpatient, not the inpatient.” Participant 3 elaborated on using managerial epidemiology can provide necessary information to determine how to shift patient volumes

It should be every hospital that has an outpatient setting, every health system that has an ambulatory division should be paramount to ensuring the healthy bottom line. I mean, inpatients are expensive. They are rarely reimbursed at the rate that you hope to be. Your procedural lists tend to make up that via your surgeons or anybody invasive to a patient. So, in order to have a healthy bottom line, you really need ambulatory process to see patients who don't really need admissions



anyway. So, to me- if you have a healthy data set that allows you to make clinically sound decisions that way you are not discharging someone home that really does need to be admitted or coming up with a hospital at home model or 72-hour stay model where they are not admitted, but they're in the ambulatory setting. These are good ways of controlling costs. So, you know, those analytics and that discipline [managerial epidemiology] would allow to make good objective decisions. For example, you know- one of the things you look at a cancer center is emergency room visits during business hours of the cancer center. They would just come here [ambulatory cancer center] as they should and not clog up the emergency room. This seems like a simple report that you pull down and figure out ED volumes and attach them to active chemo or treatment.

From the response and examples provided by Participant 3, financial performance of the healthcare organization is dependent on shifting patients from higher cost settings such as hospital settings to lower cost settings such as ambulatory setting and can be supported by managerial epidemiology.

Unfortunately, the healthcare financial challenges exert pressure on shifting patient volumes to ambulatory settings. This pressure is compounded by an industry physician shortage as described with urgency by Participant 6, "There aren't physicians running into primary care anymore". Later in the interview, Participant 6 shared an example of how managerial epidemiology is used to allocate mid-level practitioners based on the physician shortage to assure that population needs are matched. Not only can managerial epidemiology be utilized for identifying the patients appropriate for

ambulatory settings but can also be used by ambulatory care leaders to be better prepared for an influx of patient volume by planning allocation of healthcare provider resources.

Additionally, participants discussed managerial epidemiology benefiting the transformation to value-based care. Thirty-three percent of participants used the exact term, “value-based care” or described the evolution of healthcare models from quantity to quality. A failure of our current state of traditional healthcare was described by Participant 11,

1:1 patient interactions... There is like this an art of medicine that to me, I think is over-used and used to compensate for us doing nothing like in any organized way. So, I think with what is being demanded of healthcare with the changes, it [managerial epidemiology] will actually align both [art of medicine and value-based care].

In response to our failing traditional healthcare system, Participant 6 expressed the emerging model of value-based care, “I think we are just now starting to turn the corner where we are looking more at quality over quantity.” This response sounded warm and slightly higher pitched which I interpreted as hopeful. To turn the corner to value-based care, Participant 2 shared the utility of managerial epidemiology, “I think it [managerial epidemiology] obviously supports this cultural shift from volume to value.” Government programs incentivize the healthcare system to transform and managerial epidemiology can help identify participation in these programs Participant 1 elaborated,

Last example [for using managerial epidemiology] might be-- which government programs to participate in. There are a number out there that challenge hospitals

to act in a more value-based way. We go through a lot of analytical functions to see which ones we would like to play in and which we would not like to play in. The benefit of such value-based contracting was thoroughly explained by Participant 10 who discussed,

So, we contract with companies/entities that are providing healthcare to a group of people and then monitor the way that they are spending money on individual patients. Then, we engage the physicians to help us manage the cost and improve clinical outcomes. So, if we save money, we can share savings with the physicians involved.

As exemplified by participants' responses, it is clear that our healthcare system is being transformed into a value-based care model, the government is supporting this change through value-based contracting incentives, and managerial epidemiology can support this transition to the new healthcare model.

As it relates to value-based care, Participant 2 noted value-based care and population health are often used interchangeably. Participant 2 continued to discuss the inconsistency in defining population health and the importance of developing a common definition and language. Importantly, it was clear that all participants were describing population health as understanding and managing the populations they serve to achieve improved organizational performance especially financial performance. Participant 2 shared,

Basically, we agreed to a population health management definition. Basically, the design, delivery, & coordination of high value healthcare services to manage the

quadruple aim: Population health, patient experience, cost, and joy in work for populations using the best resources we have available to us within the healthcare system.

This definition provided by Participant 2 is congruent with how the participants described population health.

Interestingly, the participants readily assumed managerial epidemiology was associated with population health. Without prompting, and prior to the population health interview questions, participants frequently discussed population health on their own when talking about managerial epidemiology. This validated that it was appropriate to include interview questions on population health. Based on minimal literature of managerial epidemiology being used by ambulatory healthcare leaders for the emerging priority of population health, the questions on population health were last on the interview guide (see Appendix A). Directly or indirectly, all participants expressed the use of managerial epidemiology as beneficial and supportive of population health. For example, a common code presented throughout the data was examples of using managerial epidemiology for population segmentation.

Early in the interview, Participant 5 was asked how managerial epidemiology might be misaligned with current norms. Participant 5 responded,

I don't see that it is misaligned. I think we need to be more focused on that [managerial epidemiology] as we continue to move to the future. I don't see how you can ignore it. Yeah, we need that especially as we move to population health.

I think the fact that we don't have it everywhere—like we're not...managerial decisions are not necessarily based off of information that they should be.

From this response, it is clear Participant 5 readily associated managerial epidemiology with population health prior to the specific population health questions were asked.

Participants 9 and 12 discussed the benefits of managerial epidemiology for population health. Participant 9 elaborated,

First of all, you really have to understand the population you're serving. And the population is going to be a diverse population. So, you need to understand about that diversity and it's going to be diverse in so many ways. We can talk about socioeconomic, racial diversity, and certainly within the difference diseases that you see. What is exciting now- is the attention that is being given to the Social Determinants of Health. And while you need to understand your population, you also need to understand your organization and organizational resources.

Participant 12 stated,

And I think population health level seeing what patients are—what patients; for lack of a better way of saying it, cost the most—and seeing what we can do to work on that and improve not only their health but reduce the amount of cost associated with their health. I think managerial epidemiology has huge potential to benefit things like that.

These participants highlighted the benefits of using managerial epidemiology to understand the population and their needs especially for patient populations for whom healthcare is costly.

Despite the acknowledgement by participants that managerial epidemiology is critical for ambulatory healthcare leaders and would provide an understanding of their patient population and the population's needs for better decision-making, two participants expressed the view that population health was not in their responsibility. Participant 3 stated,

I am focused on what I am focused on and has very little to do with population health because that's not my role. But someone two levels above me could be saying yeah, but we need to put all these physicians in this market because they would control admissions. Then, when it gets to me, I'll get the why and I'll recruit the physicians, hire them, and deploy them. It's very situational.

Participant 4 explained,

We have a population health expert. We have a couple in the department and are mostly focused on research agenda. There are meaningful use criteria that will play a role in that somehow. It doesn't relate to my role as an operational administrator here.

Participants 4, 6, and 8 described newly hired personnel are dedicated to population health strategy. Participant 4 shared,

Right now, we hired a Chief of Strategy & Population Health. She has probably been here about 3 months now. She is building a whole population health team.

Participant 8 stated,

We have a population health expert. We have a couple in the department and are mostly focused on research agenda.

The noted contradiction of leaders' responsibility in population health as well as the recognition of newly hired population health leaders, suggested that the emerging concept of population health is starting to be adopted, but not yet widely integrated.

To elaborate on the adoption of population health, participants such as Participant 10 and 12 mention discussed some reasoning behind the recent uptick in adoption.

Participant 10 shared,

And frankly, the fact that population health is coming to the fore—I've been in the space for 30 years. And now people seem to care about it. I was pretty sure, I was going to die before people starting to care about it. But now people are starting to pay attention. So, now people are starting to care about population health because there is so much money for gain or loss.

Participant 12 stated,

And I think, population health level seeing what patients are—what patients for lack of a better way of saying it, cost the most—and seeing what we can do to work on that and improve not only their health, but reduce the amount of cost associated with their health.

Interestingly, both participants discussed a reason for population health being adopted is due to the financial benefits such as cost savings or incentives to the organization.

Additionally, it appeared the current awareness around population health is revolving around social determinants of health and care management. Commonly, social determinants of health were described as a key part of population health strategy and the

need to use population data to look at the whole picture and whole person, as described by Participants 2, 6 and 9. Participant 2 discussed,

I would say that often times whether good, bad, or indifferent, decisions are sometimes driven by things other than incorporating pop health data -- I think they are looking at financials or one siloed piece of the organization instead of the whole picture.

Participant 6 shared,

So, I think if you look at what's surrounding the ambulatory setting you know, demographically—what's our population, what's the average age, race, gender, socio-economic status. And making sure that not only those patients have access to you, but do we have the resources to help them... You know, reminding people that you are not just there to click off some boxes, you know prescribe medication and then go about your day. There's a whole patient there that we need to be looking at and treating.

Furthermore, Participant 9 explained,

Again, I think it is because the embracing social determinants of health. And understanding where that fits in with the organization. It is creating a positive change in that direction.

While the current focus and awareness for population health is on social determinants of health, it is giving momentum for using managerial epidemiology and a broader population health view throughout a healthcare organization.



The examples of healthcare transformation given by participants such as shifting patient volume to ambulatory settings and value-based care were describing tactics or action plans of shifting our healthcare system towards a population health approach. In other words, the examples of shifting patient volume to ambulatory settings, resource allocation to address physician shortages, and development of a value base care model were all describing drivers of healthcare transformation and the healthcare transformation is interpreted as transforming our healthcare system into a population health approach. It is evident that managerial epidemiology can be used as a tool for this transformation of the healthcare system. To elaborate, shifting patient volume from hospital settings to ambulatory settings is a byproduct and key tactic of implementing value-based care models which can be supported by managerial epidemiology. The physician shortage described can be considered a barrier for achieving value-based care models and the transformation to a population health approach; however, this roadblock can be resolved through using managerial epidemiology for resource allocation. Additionally, value-based care models and contracts are methods driving the transformation to a population health focused healthcare organization and can be supported by managerial epidemiology. Lastly, the interchangeable nature of value-based care and population health as well as the definition of population health demonstrated an interlinkage of these use cases as well validation of the interpretation for healthcare transformation as being a transformation of our healthcare system to a population health approach.

In summary, this second theme provides insight on why managerial epidemiology is considered critical by outlining the benefit of objectivity and the utilization of

managerial epidemiology for healthcare transformation, which is population health. It appeared value-based care, shifting patient volumes, and resolving physician capacity challenges are pieces of the transformation to population health. Fortunately, managerial epidemiology can support all these components. The spread of population health strategy is underway and incorporating a heavy focus on social determinants of health currently but will spur momentum for adopting managerial epidemiology and population health more broadly. Despite ambulatory health services leaders' acknowledgment for the use and benefits of managerial epidemiology and for healthcare transformation, an awareness for ambulatory health services leaders' role in population health is needed.

### **Managerial Epidemiology Can Impact Triple Aim for Overall System Performance**

The use of managerial epidemiology and integration of population health strategy were both described to impact the overall system performance and triple aim. These terms were often used fluidly. In fact, Participant 10 expressed the fluidity,

I mean the phrase, I have been in this field for forever, but I've never heard the phrase before... but I get what it is. So, you'll have to explain it. But managerial epidemiology could be population health, finance, outcomes or triple aim. Triple aim, you know what that is right? So, I use that a lot. You know, I use that phrase a lot. Everyone understands that!

To tease this apart further, it appears managerial epidemiology is a tool for population health strategy which impacts overall system performance through improvement of the triple aim.

Additionally, the metrics and goals of healthcare organizations and healthcare leaders were linked to the triple aim such as reducing total cost like total cost per member per month (PMPM), reducing hospital admissions and emergency department utilization, improving patient satisfaction, and improving quality metrics such as those set by the government or payers. Interestingly, many of the examples for managerial epidemiology described by the participants were aligned with the organization and healthcare leaders' goals for impacting the triple aim. Participant 2 exclaimed,

I mean, I think so [managerial epidemiology impacting triple aim]. It seems like it would be hard not to, if you are incorporating the use of population health data and epidemiology into practice, how could it not that have some impact and understanding and help us to make decisions whether that is resource allocation? Programmatically, that [managerial epidemiology] could really help us move forward.

Participant 2 emphasized the clear impact managerial epidemiology could have on the triple aim and the progress of the organization. Some participants expressed current use or future interest in using managerial epidemiology for strategic planning, operating plans and goal cascade processes as Participant 10 described,

I think for some, it has become more of an action plan. It is something that the CEO is made aware of—so generally what I call the goal congruencies. So, if the CEO is being held to standard around population health, then he/she will hold their [teams] to some similar standard so that the goals of the organization are

congruent up and down the organization at every level from the senior people then all the way down to primary care offices.

Similarly, Participant 2 explained,

Yeah, I think so. [Managerial epidemiology could be helpful for strategic planning] And I think the epidemiology piece really speaks to kind of the clinician's heart which is obviously our audience especially in academics—there's more of that lens. So, I think it would be a really interesting tool to use to kinda drill down and determine where we want to go.

Interestingly, Participant 12 noted,

I think that not that it [managerial epidemiology] is misaligned with leadership, I think that leadership is misaligned with the available tools to create a high-quality healthcare system.

It is clear that the friction between the use of managerial epidemiology and traditional leadership styles can hinder realization of an improved healthcare system. I interpreted the response from Participant 12 as leaders need to adapt their leadership styles to align with the practice.

A key takeaway is the more a leader can know about their patients and patient population, the better and more focused the decision-making will be for impact on the organizational performance, leadership goals, and ultimately the triple aim. Of the three triple aim components, participants resounded with heightened awareness of financial constraints and incentives on the healthcare system which is driving the need for improved performance particularly financially. Participants provided examples of many

managerial epidemiology cases for improved financial performance and the need to use managerial epidemiology in financial decision-making. Participant 2 shared,

Often times, we are looking at different populations where we are financially at risk or where patients have a narrow network...As we transition [to value-based care], we're trying to understand if I take on a patient population of 10k new Medicaid lives and they're incredibly ill, how can I use that information that we know clinically to translate that into proactively hiring resources to best care for those patients and achieve the quad aim... The norm is shifting and becoming much more common regular claims-based feedback that are looking at different specific populations, we're stratifying consistently- so, we are segmenting different populations. So, I would say yes—we are definitely swinging in that direction [to using population data and managerial epidemiology in financial performance].

Additionally, Participant 7 elaborated,

Yeah, yeah- so a lot of financial incentives right as most folks have. So, in [state], we are in this total cost of care approach. So, you know, our hospital with the 30-day readmission rate, we are penalized if we go over a certain amount. You know, the patients that are going into the hospital contributing to the total cost of care, we want to make sure they are utilizing the right resources in the right way at the right time. A lot of this—there are a lot of financial incentives for managing outcomes, access, and utilization.

As described by Participants 2 and 7, financial incentives and improved financial performance are motivators for impacting triple aim such as incentives tied to reduced utilization or controlling access and managing particular patient populations.

Overall, participants believed managerial epidemiology could be used for managing patient populations to impact the triple aim. Many practical applications of using managerial epidemiology were discussed by participants. Participant 1 described an application by discussing,

We utilize you know, big data a lot to provide access. So, you know- where our patient population lives, works, the items that they needs, the access they may need is a big-obviously, the main focus of when we decide where we deploy services whether it is more primary care practices or specialty care related... My group uses big data and financial performance within our health plan which is a 10k lives health plan to also discover which prime conditions are most prevalent, most costly, most effectively improved through case management programs.

The managerial epidemiology application shared by Participant 1 detailed use of the practice for case management programs as part of population health efforts for improving access and reducing costs. Another example is quoted by Participant 8. Participant 8 explained,

Well, I think it [managerial epidemiology] obviously is useful to determine what is needed to improve the patient experience. Obviously, not so much directly related to my job, but improving health outcomes. So, like the example of monitoring for falls, how many times do patients fall on an inpatient unit and

what can we do about it to prevent those falls in the future, improving the general health outcomes of our patients. For sure, this is big today-- reducing cost- to the organization. You know, that is an important thing that we really deal with on a daily basis. I mean, my recent work has been looking at the efforts of the team and how do we capitalize on that and how do we minimize hand-offs, make efficient use of all of our resources-- rooms, equipment, staff, docs, you name it.

What's the best way to make efficient use of the team and everything required?

This response from Participant 8 described a myriad of practical applications of using managerial epidemiology to impact patient satisfaction, cost, and health outcomes which can be often daily priorities for ambulatory health services leaders.

Continuing on with health outcomes, Participants 12 and 5 provided insight on how managerial epidemiology supports improving patient care. Participant 12 discussed, Absolutely [agrees that without managerial epidemiology there would be implications to the triple aim]. I think – I mean we say that quality of care is top notch all the time. And it really is, but the patient has a much better quality of care when they have the most appropriate treatment. And that might not be the case if we couldn't hone in on the patients who would benefit the most from these new therapies.

From this response, it is evident that using managerial epidemiology for identifying proper treatment for patient populations can improve quality of care. Additionally, Participant 5 shared,

I mean, the managerial epidemiology is compatible within the current role because we are using clinical data all the time to help to make comparisons to determine what the right course of action is for patients. You know, do we have the right mix of staff, do we have the right mix of... are we doing things in the most optimal way. So, yeah, I think we can use it regularly to help us to improve the care we are providing.

Not only did this response from Participant 5 corroborate that managerial epidemiology can help leaders improve patient care, but it also assured me that managerial epidemiology is also compatible for leaders to do so.

In conclusion, it is evident managerial epidemiology can improve organizational performance by impacting the triple aim. Additionally, organizational performance metrics and leadership goals are tailored to the triple aim and could use managerial epidemiology for their development as well as for the operating plan. In the previous theme, I discussed the use of managerial epidemiology for transforming healthcare towards a population health approach. As Participant 10 described, this population health approach is more of an “action plan” to create congruencies from organizational goals and leader goals down to the front line.

### **Current Level of Adoption is Variable**

Despite the benefits of managerial epidemiology and the participants’ perspectives on impacting the triple aim and overall organizational performance, participants reported variable adoption levels of managerial epidemiology. While a



couple participants like Participant 1 and Participant 3 did not recognize the term, they did recognize the use of the practice. Participant 1 stated,

I would think it [managerial epidemiology] is very much integrated. I don't think we use that term today. But I think that is -- We have formed complete separate divisions in the health system get good at that so we can make good decisions and we can be effective managers... I think—there might be still a percentage of folks who do not utilize it [managerial epidemiology] and go off of how we've always done it. I think effective management teams out there utilize data in ways that work in the past and help educate those around them.

Participant 1 noted that the term, *managerial epidemiology* is unfamiliar to some ambulatory healthcare leaders. They may be adopting the practice of managerial epidemiology through the support of a team but not calling it managerial epidemiology; additionally, some ambulatory healthcare leaders might not use it. . Similarly, Participant 3 mentioned,

So, for managerial epidemiology. You know, I think a lot of people do this, but they just don't call it that.

In the same vein, Participant 10 noted,

I might not be the right guy to ask, I live and breathe it [managerial epidemiology]. I mean, the organization might not be ready for it or the term.

A different perspective was provided by Participant 9 who shared,

I think it [the use of managerial epidemiology] has to happen. I think it [managerial epidemiology] does happen. I think sometimes it [managerial

epidemiology] happens more purposefully than others. I think sometimes people are more aware of it [managerial epidemiology] than some. Some by default, back into it [managerial epidemiology], but they get there.

This interesting response from Participant 9 was interpreted that the variable adoption of managerial epidemiology is achieved often by happenstance rather than purposeful implementation.

Participant 11 provided the perspective that there is a slow awareness and poor adoption level of managerial epidemiology,

Like people are just knowing this [managerial epidemiology] is important.

People, they notice, but they are just misinformed or are just too busy to do it.

Where I am just with people who are at least attempting to think outside of the box, to think of different solutions to different problems. None. I mean, one conference touches a little bit of this. The other conferences do not touch it at all.

From this response, it is evident the awareness and importance of using managerial epidemiology is starting to emerge; however, managerial epidemiology not consistently adopted.

In contrast, others such as Participant 4 reported that they did not see any adoption of managerial epidemiology. While others such as Participant 5 seemed unclear of the specific terminology of managerial epidemiology but based on the definition did not believe that it is being adopted. And lastly, Participant 12 expressed that some leaders use superficial data, but some do not use any data at all. Participant 4 noted the

lack of adoption of managerial epidemiology, as well as lack of general awareness by senior leaders.

Right now, our current practices don't even focus on managerial epidemiology...

It is currently not used here yet. No, I don't think half of them [senior leaders] know what it is.

Similarly, Participant 5 highlighted the unfamiliarity with the term, *managerial epidemiology* and the lack of adoption, "Um, can you define a little bit better on the managerial epidemiology term. That's not a term that I've used... Maybe we do use it more here or equivalently, but I don't think so." Sharing a similar weak adoption of managerial epidemiology, Participant 12 shared that there was a weak level of adoption by colleagues.

I definitely have colleagues who take more of a hands-off approach to the data—they look at all of the top-line data and they look at the productivity for their physicians and throughput for their patients, but they don't do a deep dive to discover...

In summary, current adoption of managerial epidemiology is clearly not integrated across the United States healthcare system. Participants reported variable adoption levels ranging from well-integrated within the healthcare organization, weak levels of integration, use of data but not *managerial epidemiology*, to no adoption. Consistently, participants expressed a lack of awareness with the term, *managerial epidemiology*. The term was unfamiliar even to participants who reported a high level of integration of using managerial epidemiology. Even at an organization characterized by

well-integration of managerial epidemiology, the use of managerial epidemiology by some leaders was still variable. Additionally, current adoption of managerial epidemiology occurs spontaneously rather than concerted implementation which could be the culprit of variable adoption. It is evident there is opportunity for hardwiring the adoption of managerial epidemiology and creating awareness on the term itself to capitalize on its benefits.

### **Research Question 2**

The second research question explored was as follows: What are the perspectives and experiences of ambulatory healthcare leaders regarding communicating the use of managerial epidemiology through the healthcare system? To answer this question, participants were asked about the difficulties for ambulatory leaders in using the practice of managerial epidemiology and ways for mitigating these difficulties. Additionally, participants were asked about ways to easily test the practice of managerial epidemiology. Two key themes were elicited from the interviews and open-coding analysis. The first theme I will discuss elaborates on the barriers of adoption of managerial epidemiology. Lastly, I will close this section by sharing the last theme which includes recommendations for improved adoption.

#### **Leader Competency and Data Challenges are Barriers for Adoption**

More than half of the participants (58%) discussed leader competencies as a major barrier for adoption of managerial epidemiology. The majority of these participants shared insights on the potential driver of competency challenges being skill-sets such as

analytical skills and strategic thinking. Participant 10 exclaimed, “The #1 thing is you have to have a competency first.” Similarly, Participant 1 shared, “It could be the analytical ability of some managers. They might be really good people, but they can’t—they aren’t strong at finding the support through the data. It is a skillset”. It is evident the analytical skills may be a competency barrier for the adoption of managerial epidemiology. Participant 8 elaborated on this competency challenge stating,

Our clinic managers are people you know—many of them grew up through the ranks. So they started as a scheduler or a supervisor and kind of continuously added to their scope and become effective managers in terms of building a team and kind of understanding the operations and why—why we got to where we are today- they have that historical knowledge but they do not have these technical skills. And, we are in our department really deficient of people that have these skills. It is a real impediment to us—always doing the right thing and using data to inform decisions... I think that you know, while we have a lot of people that don’t have a lot of skills. Actually, in the department, there’s a real deficit of individuals with analytic skills.

The competency barrier impeding the use of managerial epidemiology, technical skills, noted by Participant 8, are a detriment to departmental performance. Participant 8 also noted that people may advance in the organization without gaining these skills, which impedes the use of managerial epidemiology. Participant 3 expressed similar concerns of leaders rising in organizations without the appropriate, needed competency for using or adopting managerial epidemiology.

Well, there's a couple of factors. The first would be competency. So, depending upon where you are in the country, some managers don't have a lot of education. Maybe they legacy-ed their way to a leadership role. Maybe they've worked there for 30 years and they believe they know everything, but they struggle with some of these fundamental things. The other thing would be the understanding of quantitative methods. You don't have to be a statistician, but you do need to know the difference between mean, median, and mode which kind of laugh at in a haphazard kind of way because sometimes I ask managers these questions and they don't know. And I have to just kind of not say anything condescending, but also—you should know the difference between mean, median, and mode that is the most basic statistical analysis.

Participant 3 elaborated on the knowledge and skillset gap for even the basic principles needed for using managerial epidemiology. Similar to Participant 8, Participant 3 expressed this can be caused from rising internally through the organization with institutional knowledge and lack of other knowledge such as skillsets for using managerial epidemiology. Participant 3 also asserted geography and education could play a role in competency barriers to using managerial epidemiology.

Not having the analytical competency for utilizing managerial epidemiology could generate fear as described by Participant 7 and Participant 12. Participant 7 stated, Some folks might not have the skillset to interpret what they see or have a fear of it because some folks have a fear of numbers or not being able to read it appropriately. Just because they don't use it all the time.

I interpreted this response as some ambulatory healthcare leaders could struggle reading reports or understanding numerical data because they do not engage in the task frequently which could cause fear of using managerial epidemiology. Similarly, Participant 12 shared,

That sort of stuff [such as dashboards] at a high level makes it easier for them to understand that it is all coming from those gigantic spreadsheets that are scary to them, but it doesn't have to be. If you work with somebody who is experienced or seasoned enough to collate the data and collect it in a meaningful way, data analytics can be very useful.

I interpreted the response from Participant 12 as ambulatory healthcare leaders can be fearful of analytical data; however, this response reiterated the utility of the information provided from practicing managerial epidemiology and the availability of resources such as tools or experienced colleagues can help with adoption. The remainder of participants answered these questions with recommendations for adoption rather than detailing difficulties such as a need for culture change or stakeholder engagement. These will be discussed in the next theme section.

Besides the key barrier of leader competency, another well-represented barrier in the data analysis was data availability and accuracy. More than 80% of participants discussed the major difficulties with data for adoption of managerial epidemiology which included data integrity, accessibility, and reporting. Responses described that data is sometimes not accurate or conflicting across sources. A main source of data collection described by participants was via an electronic health record (EHR). Participant 1

discussed the challenges specific to EHR integration and interoperability by stating, “you can’t do population health without interoperability between systems.” Participant 2 mentioned EHR data for managerial epidemiology is “only as good as what you put in.” In addition, data is stored and extracted from multiple sources which creates inefficiencies and confusion as described by Participant 12, Participant 2, and Participant

3. Participant 12 noted,

One thing that we definitely have an overload on is information. 16 different scorecards to look at to discover a whole host of information about patients and practices across the institution. And while it’s great to have all of that information at my fingertips, it can also lead into information overload. So, it can sometimes slow down the process as well because while this dashboard says one thing and another pulling from a different system says another thing. Which one do we go off of? And how do we reconcile the two?

Participant 2 provided more detail about data types and delay in receiving data by sharing,

And certainly, some of that is due to our inability to access timely data. Often times, many people are working off of claims data for a given population that is not super timely because you’re looking at EHR data that may not be the full picture- or trying to combine the two. Um, which can be really challenging depending on which payers you’re working with... I think we want everyone to be speaking the same language and accessing the same data.

Giving additional perspective on data sources and data integrity, Participant 3 elaborated,



But they [data elements] live in several different databases... It is just a matter of patience and time. So, I could say give me the same analysis to an administrator who doesn't have those resources. They would be able to pull it together in what I would say is a reasonable timeframe, if they know what they are doing, if they have an analyst that can think critically. But if you don't have that, then you spend a lot more of your cognitive time on building and essentially coming up with the template. And it tends to be very manual. So, you'll have an abstraction period, you'll have a quality assurance period. It only takes one person keying a number in wrong and it throws everything off. So, again it's not insurmountable. It can be managed, and it could be managed well if your scale is smaller... If you work for a really small group, that didn't invest in the IT infrastructure, you're never really going to have real time data. You're always dependent upon a monthly report that may or may not be accurate. Your data integrity struggles. That's another piece of it as well- understanding data integrity. Those are a few key factors.

Even with multiple data sources, access to data is limited and restricted to ineffective distributions of dashboards. Further, to request access to data or for a specific report, a lengthy requesting process is required. Moreover, interviewees described reports as being inflexible, overloaded with information, or hard to read for some leaders. Participant 7 detailed the struggle of having too much data or too little data and complications with finding the balance by discussing,

Access to it [data]. So, a lot of folks don't have the skillset. You need to have the right folks to analyze the data and you need to have the data available. You know- where I am at, we have the [software name] system which is huge. It is really great at looking at the population and understanding what their needs are. Not everyone has that. So, just being access it and utilize it in a way that works for you could be a barrier... We are so data driven. Everything we do, we rely on data for. We probably do more than we should. In certain settings, because we rely on the data so much that there's analysis paralysis, you know what I mean. So, decisions are made based on data/ variables... Maybe you use the data and exclude a certain population of patients or withholding what might be helpful for them so you know- if you are only looking at what's available, you might not be providing something that's actually needed...

Participants 8 and 12 elaborated on the laborious, lengthy process for submitting a data request, the inflexibility of report structure, and the delay in receiving the reports.

Participant 12 noted that requesting data or report changes as a "herculean effort."

Participant 1 described the strain on the health system caused by the siloed data housing and numerous reporting and measurement requirements by the various government programs and payer relationships. Participant 1 provided an example of the same healthcare service such as mammography having various screening metrics depending on the payer. Participant 1 explained,

It used to be that people would track things [data] in different silos. And you might ask a question and the answer would depend on who you were asking in the

hospital... You know, there's obviously claims data, government big data, hospital, ambulatory separated into silos. So, I think the more that we can normalize data across different players—it would be helpful. For example, different payer relationships that we have with the hospital, they might try to incentivize us to have a high mammogram percentage rate for their population. They're on the hook for these folks. They pay hospitals to help keep them healthy—great. They all—United and Humana might have two different ways of calculating what a successful mammogram rate might be—they might have different denominators, different Ns, everything. They might have different thresholds. Different annual, 5-year requirements vs. 4-year requirement. It's a lot of straining on the healthcare system to be able to do the work because there's so many different rules. So, I think normalizing the data, normalizing best practices for each issue would help a lot.

Participants 5 and 6 described data integrity challenges as well. Participant 5 stated, Sometimes you get too much data, you know—we drown in information and we don't do anything about it... I feel like we could use more data. But it's hard to get. It's hard to get out of our systems right now. To make it...make sure: Number 1- Validation is important. Being able to actually locate it too is a challenge. The data is not always readily available, and the data is not always correct. One of the biggest things: we do find holes in the data. And we try to— or we think that there are holes in the data, and we try to get them fixed. And in

my current role, I can't always get people to pay attention to fix that stuff. So, we just choose to ignore it [chuckle].

Participant 6 continued on this topic,

We've had issues on not sure we are always getting the right data—like we are capturing the right information sometimes things seem more skewed than we thought... From a leadership standpoint, I think the overarching theme is really just data support.

In summary, this theme shared barriers for adoption of managerial epidemiology which included competency and data challenges. For leader competency, participants described the major barrier of analytical skills needed for managerial epidemiology. For data challenges, there were a combination of prominent issues including access to data, data integrity, and reporting. The leaders' fear for using managerial epidemiology might be amplified from not having the competencies needed to use managerial epidemiology not having confidence in the data. In the next section, I will share the last theme which provides recommendations improving adoption of managerial epidemiology which may alleviate leaders' fear.

### **Recommendations for Adoption: People and Process**

All participants readily provided recommendations for improved adoption of managerial epidemiology. I have grouped the recommendations provided by the participants into two categories: people and process as depicted in Figure 1.



*Figure 1.* Overview of recommendations for managerial epidemiology adoption.

For people recommendations, 75% of participants described the need for human resources to mitigate the data barriers, close the gap for the competency challenge, and overall, support the use and adoption of managerial epidemiology. Participant 5 discussed the need for additional resources to improve the data integrity or “fix the holes.” Participant 1 described the current use of a data analytical team by stating,

We have formed complete separate divisions in the health system to get good at that [managerial epidemiology] so we can make good decisions and we can be effective managers.

The majority of the participants discussed the need for a similar approach such as hiring a data analyst or scientist to provide actionable data. For example, Participant 7 shared the need to hire a team member for support leaders lacking the analytical competency by discussing,

So, a lot of folks don't have the skillset. You need to have the right folks to analyze the data and you need to have the data available...So, it's nice to have folks who actually have data available, who can run data and act on what data the managers need. Those who can actually look at the data and be a part of the decision-making process and at the table.

Participant 11 elaborated on the relationship between the leader and analytical team member by describing,

So, I'd imagine- someone who has a lot of data points their trying to follow—that's where delegation is important. Someone else who is following it more intimately and they you're getting a high level every 3 months, 6 months, every year. And then, anything that comes up that needs to be addressed that comes up to you... Give them your top 3 priorities and have them work on that.

Similarly, Participant 8 shared a real-time example of this recommendation by noting,

Well, I actually think we need—I am actually advocating for this today—we need a clinical analytics person that is part of the department leadership team. Somebody that is-- can develop some reports that get send out on a very routine basis or just made available at all times, but then also someone that can be part of project teams. That can be called upon to get data and to take a look at a couple of things and make some high level recommendations as to what's the data is telling us and how can we design things so that it plays out the way it would be you know optimal.

Participant 3 described their experience in hiring these team members by sharing,

I've been able to hire an analyst for the reactive side and a scientist for the proactive side. And my data scientist, I used to the full extent of their capability to really go into the population health data point to discover trends and very broad data needs that an analyst can only accumulate but cannot build the IT infrastructure that I'd need.

In addition to the personnel to support data analytics of managerial epidemiology for healthcare leaders, the people portion of recommendations focused on the current leaders and stakeholders. Multiple participants such as Participant 4, 11, and 12 shared the need for multi-level awareness and engagement including C-suite leaders, ambulatory leaders, and providers. For example, Participant 4 exclaimed, "The best way is going to be that everyone at senior level has to have buy-in." With a somber tone and a few pauses, Participant 11 shared the need for engagement by stating,

And I've given up—not given up... I haven't been putting the pressure on like I have been for a little bit because again, it is like herding cats. It can be a lot of work. I think- you know it goes down to involving people in the process. For me, I just think that's the way to do it the easiest without having to pull so many teeth—having people involved in the process whatever it is.

I interpreted this response, the low tone of voice with pauses, and self-correction of "I've given up" that the participant seemed weary of their pursuit in engaging in using managerial epidemiology.

Elaborating on engagement, Participant 12 stated,

So, you really need buy-in and support from all sides in order to really move the needle in any of those measures... But really, we need buy-in from every part of leadership. So, we have a triad model in most areas. We have a scientific or physician leader, a nursing leader, and an administrative leader.

Participant 10 stressed the need for C-suite buy-in and clout for the adoption of managerial epidemiology by sharing,

The way to mitigate it is to have buy in from the C-suite. Particularly, the CEO. Typically, they nod their heads and say this is the latest of the brand-new thing and we all know how that ends. The important thing is there needs to be congruency up and down the organization and the sense of urgency, too... If you get dropped into a place where they've never heard of it or don't think it is important. Then, it'll be a long slog. I think most everybody is going to be in this organizational space. But I think organizational readiness is going to be key.

Participant 10 also suggested creating leadership position for using managerial epidemiology practice which would indicate its importance to the organization.

Engagement from leaders should also include communication and spreading awareness as commonly seen through the data. Participant 9 shared the need to communicate the vision and role for all stakeholders in using the practice of managerial epidemiology and consistently use and communicate the practice in meetings to create a unified effort. Participant 9 explained,

I think it is consistency, painting the picture, I think it is being very concise to what it means to each of the individuals particularly in management roles and



what the expectations are as well as what it looks like...I think just helping particularly the leaders gain an understanding not only in what it is, but how you apply it. Then, I think living it in all your meetings.

Additionally, participant responses detailed the need for culture change as described by Participant 4 who discussed,

Well, like anything else that's new, there's going to be culture change. It will be changing the culture to this. So that's the biggest challenge especially the culture here. It is very unique. To implement something like that, it would be major strategic planning with a focus on a cultural paradigm shift...The best way is going to be that everyone at senior level has to have buy-in. We'd have to build a strategic plan to ensure the right resources and tools in place to integrate this into the culture.

Participant 3 elaborated on the critical nature of culture for hardwiring adoption of managerial epidemiology by sharing,

If I train you in it, you'll say that's nice and good to know, but if I don't hold you accountable for using that then it is all for nothing. So, what you fundamentally have to do is change the culture and say, "This is the way we are going to manage our business". So, the way to make is successful is to make is system-dependent which again comes from a cultural standard. And then, allows every decision you make has to filter through all the same things that everyone should be looking at.

In addition to engagement efforts and culture change, Participant 9 discussed the need for education. Participant 9 exclaimed with a chuckle, “I am a big believer in education.” Participant 4 discussed this idea further by sharing,

I think what we would have to do is we would have to first go back to the grassroots and ensure we train everyone to be sure they understand what this model is. And reframe orientation, processes, and governance structure around this model.

To support education and training, Participant 3 suggested visual boards to hardwire the learned skills and process. Participant 1 elaborated on leveraging training with effective managers already using managerial epidemiology. Participant 1 noted,

I think effective management teams out there utilize data in ways that work in the past and help educate those around them. There are ways—right and wrong in some regards that you can prove through data. Just wide-spread adoption.

In addition to focusing on the people aspect of recommendation for adoption, participants shared recommendations for an adoption process. Participant 7 mentioned the need for a process and commitment to include the analytical personnel in decision-making in order to be a source of recommendations to leaders. Participant 7 described, “Those who can actually look at the data and be a part of the decision-making process and at the table.” This inclusive approach of integrating the data analytic team member in decision-making could better support the use of managerial epidemiology.

In addition to creating a process and environment for analytical personnel to be a part of the decision-making, the participants also shared insights on improvements to

characteristics of reports that will support testing the use of managerial epidemiology.

Participants 3, 7 and 11 suggested the deliverables should be easy to access, timely, easy to interpret, and actionable. Participant 3 simply stated, “I think managerial epidemiology hinges largely on ease of use and accessibility.” Participant 7 shared the same viewpoint, “I think making it easy for folks to access or easy to read and interpret.”

Participant 11 elaborated,

I think it is extremely helpful, but it needs to be done in a way that is useful and that is practical... So, the data is 100% important, but it has to be presented in a way where people aren't labored by it. I think right now there are a lot of data being presented that more laborious, helpful at the same time. But it needs to be-- the scale needs to be completely disparate and it needs to be much more helpful than it is laborious... And getting the data that you're actually going to act on.

For adoption of managerial epidemiology, multiple participants such as

Participants 1 and 2 recommended the use of a tool to guide leaders such as a checklist, standards, framework or process. Participant 1 explained,

Maybe have a process in place where you need to justify a position of yours.

Maybe a requirement is some kind of measure of some kind. Make it a process-driven decision.

Participant 2 elaborated on the need for a process and tool to be adaptable for multiple settings by stating,

So, I think creating standards that can apply across many different diverse specialties, primary care, inpatient, outpatient settings. I could see that being challenging if we did not have an agile way.

Participant 3 shared this belief as well as urged for managerial epidemiology tools or processes to be leader-independent for sustained adoption. Participant 3 noted,

I mean, with anything- if you have some very tangible, tactical tools like a one-page checklist or excel doc or something that can do some of the passive analysis, then there is a great adherence no matter what you're talking about... A lot of people take new positions in leadership and they don't know what they're doing. They may have just been promoted and they may have a lot of strong qualities, but they're just trying to figure it out. So, if you can give them some tool/ process that is not dependent upon one leader who might have left or a data dump everything on you—you're probably for the better.

The majority of the participants suggested an easy way to test managerial epidemiology is to “just start doing it” as Participant 11 shared. Participants 2, 4, 7, and 8 recommended using a pilot or a small intervention to get ambulatory leaders using this practice of managerial epidemiology. Participant 2 described a pilot with clinic leaders first before broad adoption of managerial epidemiology by sharing,

I think that you could start to pilot it—umm, my two cents would be to pilot it with those close to the front line so practice managers and administrators who are making decisions that are informing clinic populations. Then, understanding

either how it's helpful, not helpful, what could be tweaked to inform a broader push.

Participant 8 shared an engaging approach early in pilot development by discussing,

They would have to see some sort of data that is compelling and help them wrap their head around what the data is suggesting. And then, you know--agree on a pilot or some sort of a plan for you know, re-designing the workflow or whatever it is we are working on.

Participant 7 explained,

Exactly that. So, you could look at small subsets and make small decisions and put things into place to see what happens for a short period of time. There's not a huge investment there financially or manpower or capital expenditure. So, that you could do to test it out.

The value of this pilot approach was discussed by Participant 4 when stating,

I could probably build a program where we can test this model to see how it works and be able to measure pitfalls as well successes around it. And, build strategies and opportunities for the area of weakness.

In contrast, Participant 9 shared a similar action-oriented perspective as Participant 11,

“Honestly, I get a little antsy with pilot testing because I like to charge forward.”

In summary, the participants provided recommendations to solve the competency and data challenges as well as improve the overall adoption of managerial epidemiology. An overview of recommendation for adoption of managerial epidemiology was shared in Figure 1. It is evident from the data analysis that data analytical team members should be

hired to support ambulatory healthcare leaders in decision-making. In addition, engagement from all levels of the organization, especially senior leaders, is required for adoption of managerial epidemiology. Supported by senior leaders, culture change is recommended for this new practice which can include use of strategic planning efforts. Moreover, training should be provided to ambulatory healthcare leaders and hardwire the learnings of using managerial epidemiology with agile tools that are both leader and setting independent. Lastly, pilots are recommended to begin use of managerial epidemiology before broader expansion.

### **Evidence of Trustworthiness**

#### **Credibility**

For credibility of my study, I employed strategic sequencing of methods, dialogic engagement, participant validation, and structured reflexivity practice, as outlined in Chapter 3. Strategic sequencing of methods was significant for this study. I thoughtfully grouped the interview questions to flow easily and resemble more of a conversation with the participants to enhance comfort. The interview questions started with a section to build rapport with the participants by asking questions to get to know them as an individual and a leader. After, the questions were purposefully outlined in conjunction with the DoI theory. Dialogic engagement was achieved through sharing my methods and interview guide with my dissertation committee who provided feedback before the start of the study. Importantly, participant validation was used by providing the verbatim transcripts to all participants in the follow-up thank you email. This was sent prior to coding of the data. Participants were encouraged to provide feedback as they saw fit to

ensure I captured their responses accurately. They were also able to provide any additional information. None of the participants responded with any changes or additions to the transcripts. Lastly, structured reflexivity was used by visually mapping codes, categories, and themes to channel bias and challenge interpretations.

### **Transferability**

Transferability was assured by providing a detailed description of the problem statement and background during the recruitment process and within the consent form. Additionally, definitions of key terms were provided. Managerial epidemiology was defined multiple times at the beginning of the interviews and throughout the interviews as requested by the interviewee. Participants were encouraged to stop me at any time during the interview to provide any definitions or clarification. Additionally, the relevance for this study and the study findings are applicable to ambulatory healthcare leaders as reflected in participant responses that managerial epidemiology is critical for the functions of ambulatory healthcare leaders.

### **Dependability**

For dependability, I aligned the research methods and framework to ensure data stability. The traditional qualitative method using semistructured interview technique provided robust, meaningful data. It is suspected that using any other method would not have produced enough data for saturation and thematic analysis. Moreover, the use of DoI as framework to align the interview questions ensured the data gathered would answer my research questions more completely.

## **Confirmability**

The sole strategy used for confirmability of my study was structured reflexivity. Visual mapping was crucial in outlining codes, categories, and themes to generate interpretations. This strategy channeled my biases and challenged my interpretations. Visually mapping the coding process helped focus my attention on the codes that were present in the interviews rather than external factors. Verbatim transcription of the interviews also supported confirmability as well as using preset codes. Throughout the study, my dissertation committee was encouraged and expected to provide feedback and challenge my research process. This primarily occurred before starting my pilot study, during my pilot study, and before starting the formal study. My dissertation chair reviewed the de-identified verbatim transcripts from my pilot study to ensure the data was meaningful, deep enough, and answered my research questions before moving forward. We also met to review if any adjustments were needed before interviewing additional participants for my formal study. We did not find any adjustments needed. The final oral defense will be another mechanism for challenging my process and thinking in this study.

## **Summary**

The purpose of my study was to understand the perspectives of ambulatory healthcare leaders on the use of managerial epidemiology. Using the DoI theory as a framework, the interview questions enabled an understanding of the diffusion of managerial epidemiology as well as recommendations for adoption. In Chapter 4, I shared the recruitment process following a purposeful sampling method as well as the



consenting process and pilot study. For each of the two research questions, I organized my findings by theme. Despite variable adoption levels, the use of managerial epidemiology was discovered to be critical and without disadvantages. It was also discussed as beneficial to population health and contributing to the triple aim and thereby, overall healthcare system performance. Importantly, the barriers for adoption were explored and found to be ambulatory health services leader competency and data challenges. My findings were concluded with an in-depth discussion of recommendations for adopting managerial epidemiology which included both a people aspect as well as process needs. Lastly, I shared the process for upholding trustworthiness of my study including the credibility, dependability, transferability, and confirmability of the study.

In Chapter 5, I will discuss my interpretations of the findings as well as any limitations of the study. In addition, I will share overall recommendations from the study and implications of positive social change. Finally, I will close Chapter 5 with a description of my experience as the researcher.

## Chapter 5: Discussion, Conclusions, and Recommendations

### Introduction

This study was aimed at understanding the perspectives of ambulatory healthcare leaders on the use of managerial epidemiology, a practice shown by previous literature to have the potential impact on the triple aim but has not been widely adopted. This is the first study to explore ambulatory healthcare leader perspectives on managerial epidemiology, and thus expands the knowledge in the discipline. The study was conducted in a traditional qualitative research design by interviewing 12 participants recruited through purposeful sampling method. The two main research questions and subquestions were as follows:

Research Question 1: What are the perspectives and experiences of ambulatory healthcare leaders on the use of managerial epidemiology for decision-making?

Research Question 2: What are the perspectives and experiences of ambulatory healthcare leaders regarding communicating the use of managerial epidemiology through the healthcare system?

Subquestion 1: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *relative advantage* of the use of managerial epidemiology?

Subquestion 2: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *compatibility* of the use of managerial epidemiology?

Subquestion 3: What are the leaders' perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *complexity* of the use of managerial epidemiology?

Subquestion 4: What are the perspectives and experiences of healthcare leaders in ambulatory healthcare settings on the *trialability* of the use of managerial epidemiology?

There were multiple key themes from this study. The first theme derived from the data analysis was that managerial epidemiology is critical and presents no disadvantages. The next themes were that the practice of managerial epidemiology brings objectivity to decision-making and supports healthcare transformation, including impact on the triple aim and overall system performance. Another theme was that the current adoption of managerial epidemiology is variable. The fifth theme was there are challenges of leadership competency and data issues. The final theme included recommendations for adoption encompassing people and process change management.

In Chapter 5, I provide a discussion of my interpretation of these findings compared to the literature as well as limitations of the study. Additionally, I provide recommendations for further research in the discipline of managerial epidemiology. To close this chapter, I discuss the implications including the impact on social change.

### **Interpretation of Findings**

In this section, I share the interpretation of my findings from the study in comparison with the literature. Although many of the study findings validate existing literature on managerial epidemiology, there are significant findings that further elaborate on the discipline of healthcare administration by lending new insights on managerial

epidemiology. I will compare and describe the relationship of the study themes with literature on education of managerial epidemiology, unconscious bias, evidence-based management using managerial epidemiology, and current workforce adoption of managerial epidemiology. Lastly, I will discuss how this study supports or rejects the theoretical framework before transitioning to study limitations.

## **Managerial Epidemiology**

### **Education**

Based on the literature, there is inconsistency in a managerial epidemiology curriculum being provided in healthcare administration programs despite the benefits of the practice, the need for this application in the healthcare system, and healthcare leaders shifting to a population-based approach (Caron & Hooker, 2011). Consistent with the literature, most of the participants in this study were not aware of the term *managerial epidemiology*. The inconsistency of adoption of managerial epidemiology and gap in leader competencies also confirm findings in the existing literature that most leaders with healthcare administration degrees did not receive the education necessary to apply the practices for a population-based approach such as managerial epidemiology. The findings of this study, that leadership competency is a key challenge to adoption of managerial epidemiology, validate the literature indicating that healthcare leaders lack and need the competency in population-health approaches such as managerial epidemiology (Caron & Hooker, 2011). Although researchers have discussed the need for academia to include curriculum on managerial epidemiology, the findings from this study elaborate on the

discipline by offering insights on adoption for leaders already in the workforce, starting with ambulatory healthcare leaders (Caron & Hooker, 2011).

More than 70% of participants had completed a healthcare administration-related degree and participants' years of ambulatory leadership experience ranged from 2 to 45 years. These findings validate that there continues to be a gap in managerial epidemiology courses offered in academic settings and curriculum (Caron & Hooker, 2011). This is contrary to a recent textbook that noted many academic programs include a managerial epidemiology course (Khaliq, 2018). For the first time, this study extends the knowledge of healthcare administration by offering challenges and recommendations for the use of managerial epidemiology for current ambulatory healthcare leaders. These challenges and recommendations should also be considered for inclusion in academia for emerging healthcare leaders. This will be discussed later in the recommendations section.

### **Unconscious Bias**

The study also elaborated on the discipline by exploring the advantages and disadvantages of managerial epidemiology. There were no disadvantages for using managerial epidemiology based on the data analysis. However, an important response from a participant did highlight a challenge that needs to be considered. Specifically, Participant 7 discussed unconscious bias of the leader or analyst, which could cause them to inadvertently miss populations or characteristics of populations.

Bias in managerial epidemiology has been discussed as it relates to specific epidemiology practices such as length bias and lead-time bias in screening programs

(Fleming, 2015). Unconscious bias is only referenced briefly related to epidemiological bias, but unconscious bias of the leader using the output from applying managerial epidemiology was not explored in the leader's decision-making, or how it can be carried throughout their managerial functions (Fleming, 2015; Fos et al., 2018; Khaliq, 2018). Unconscious bias exists in everyone in any role, but unconscious bias in healthcare professions is shown to correlate with lower quality of care (FitzGerald & Hurst, 2017). Although neither the literature nor this study explored the unconscious bias of the leader when directing the analytical personnel conducting managerial epidemiology, this study has uncovered another gap in the discipline: the understanding and effects of unconscious bias by health services leaders in using managerial epidemiology. It is important to better navigate unconscious bias particularly with managerial epidemiology as it focuses on health services delivery for patient populations. Unconscious bias related to managerial epidemiology could cause inadvertent negative impacts of health services provided for populations which raises ethical concerns.

### **Evidence-Based Management**

Existing literature addressed epidemiology as being critical for healthcare managers and their functions such as planning and directing (Fleming, 2015; Khaliq, 2018). The findings of this study, the first to explore the perspectives of ambulatory health services leaders on using managerial epidemiology, provide confirmation on the critical nature of applying managerial epidemiology and need for evidence-based management. Regardless of the variability in the participants' adoption or awareness of managerial epidemiology, the essential nature of utilizing managerial epidemiology was

recognized by all participants. Additionally, this study validated that use of managerial epidemiology can impact the triple aim of improved access, reduced costs, and enhanced quality, as well as overall healthcare system performance.

The literature indicated that planning follows a historical pattern and is often based on employees' experiences (Fleming, 2018). This study confirmed and expanded on existing literature that managerial epidemiology should be included in managers' planning function, especially strategic planning and operational planning of a healthcare organization (Fleming, 2015; Khaliq, 2018). The findings of this study reinforce that managerial decisions should use evidence and elaborate on how the practice of managerial epidemiology can be supportive by finding that current healthcare leadership decisions are often subjectively based on individual experiences and using managerial epidemiology can provide objectivity to the decision-making process. Specifically, the objectivity is gained through the use of managerial epidemiology providing a better understanding of the population that the healthcare organization or leader serves. Further, study findings expanded on the literature to suggest the use of managerial epidemiology in goal setting processes and goal congruency from senior healthcare leaders such as the chief executive officer to the front-line leaders of ambulatory healthcare clinics. Moreover, this study examined the use of managerial epidemiology for population health strategies to impact the triple aim for the population. This study discovered and strengthened the use of managerial epidemiology as a tool for healthcare transformation namely population health including the value-based care healthcare model

as well as supporting leaders in the shift of patient volume from hospital settings to the ambulatory settings (Fos et al., 2018).

To illustrate the potential use of managerial epidemiology throughout a healthcare organization, Figure 2 was created to incorporate the current literature with the findings of this study. The interpretation of the data analysis led to the understanding that the population being served is at the center of the healthcare organization and managerial epidemiology can be used throughout the organization's strategic plan, operating plan, leader goals, and population health strategy. By using managerial epidemiology, healthcare leaders can create multilevel congruency towards the triple aim and support overall organizational performance. As portrayed in Figure 2, the population and the population's needs are central to the functioning and performance of the healthcare organization. In this figure, population health strategy refers to both the organization's population health strategy broadly, as well as the strategy for the populations that the leaders and their departments or clinics serve.





*Figure 2.* Managerial epidemiology used for alignment of strategic planning.

This study validated the use of managerial epidemiology in planning and expanded upon the concept that using managerial epidemiology throughout the healthcare leaders' planning and goal setting process ensures objectivity and impact on the triple aim of access, quality, and cost. Managerial epidemiology can align throughout an organization and support transforming healthcare leaders from being focused on managing sick individuals to managing based on the population (Fos et al., 2018; Khaliq, 2018). In addition to planning and transforming, this study also validated and elaborated on the application of managerial epidemiology for assessing the effectiveness of a healthcare system (Caron & Hooker, 2011). Managerial epidemiology could evaluate the

effectiveness of each element in Figure 2: strategic plan, operating plan, leadership goals, and population health strategy as well as the actual impact on the triple aim. I will come back to this topic in later sections for recommendations and implications.

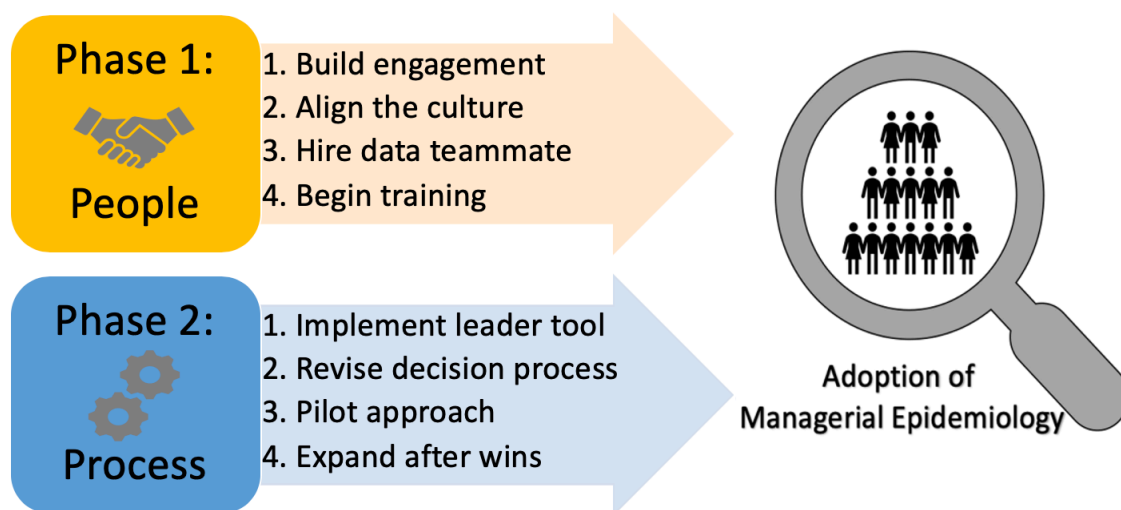
### **Current Workforce Adoption**

Importantly, this study confirmed and elaborated on the existing literature that demonstrated the need to shift from traditional management towards a population-based model (Fos et al., 2018). This study further reinforced the need for new competencies in population-approaches and skillsets for leaders such as managerial epidemiology (Love & Ayagi, 2015). While there is some uptake of managerial epidemiology curriculum in healthcare administration-related academic programs, this is the first study to explore adoption of the practice by the current workforce of ambulatory healthcare leaders. The findings highlighted that managerial epidemiology adoption is not hardwired and is highly variable, requiring efforts to increase the adoption for current ambulatory health services leaders in addition to new graduates.

Although this study confirmed the need for ambulatory health services leaders to use a population-based approach, and the current lack of leadership competency in using managerial epidemiology, this study expanded on the literature finding that ambulatory healthcare leaders need not be the experts in managerial epidemiology themselves (Caron & Hooker, 2011; Fos et al., 2018). Specifically, findings of this study included that ambulatory healthcare leaders need data analysts or scientists who utilize managerial epidemiology to assist them with the tools needed for their decision-making. Thus, ambulatory health services leaders do not need the expertise to perform managerial

epidemiology themselves, but they do need to have the knowledge of the practice of managerial epidemiology and understand the concepts as it relates to healthcare administration in order to inquire, direct, and collaborate with their data personnel for enhanced decision-making and improved organizational performance. This approach would also consider not burdening ambulatory healthcare leaders with additional work that might be required to overcome fear, to learn the practice of managerial epidemiology, and to incorporate the concepts into their individual leadership approach.

Current literature and this study provided examples for how managerial epidemiology can be applied and explains the importance of ambulatory health services leaders using the practice; however, current literature does not discuss the adoption of managerial epidemiology nor the steps required for adoption. The findings of this study can be used to address this gap in knowledge. Recommendations for adoption of managerial epidemiology provided by participants in the fourth theme (see Figure 1) were used to outline a two-phased framework of steps for current ambulatory healthcare leaders to use for adoption of managerial epidemiology (see Figure 3).



*Figure 3.* Steps for adopting managerial epidemiology in healthcare organizations

Based on the study findings, Figure 3 outlines two phases for adopting managerial epidemiology in ambulatory healthcare organizations including people and processes.

Starting with Phase 1, there should be a concerted effort on building engagement, aligning the organization's culture with the use of managerial epidemiology, hiring a data teammate, and beginning training of the leaders and data team. Phase 2 is focused on the processes required for adoption of managerial epidemiology. This includes implementing a tool for leaders, revising the decision-making process, piloting the use of managerial epidemiology, and expanding the use of the managerial epidemiology beyond the pilot.

For Phase 1, participants said that building engagement and creating buy-in can result from leaders communicating the vision for using managerial epidemiology. Based on the research, healthcare organizations can establish a goal for ambulatory healthcare leaders to use managerial epidemiology which can support buy-in. Likewise, using

managerial epidemiology at the most senior level for strategic planning can create broader engagement as well as culture alignment. In addition to a new team member, engagement, and culture change, participants discussed that training was found to be important for ambulatory healthcare leaders in order to understand the model.

For Phase 2, participants suggested a tool to help support ambulatory healthcare leaders in the adoption of managerial epidemiology that is actionable yet nimble to be applicable across many ambulatory healthcare settings. Participants also indicated that the tool must be adaptable for diverse settings as well as tactical to hardwire the adoption and not be dependent on the individual leader. To date, the need for a standard tool or the proposal of such tool for ambulatory healthcare leaders have not been discussed in the literature. In addition to the tool, a revised decision-making process should be implemented to require the use of managerial epidemiology to justify the ambulatory healthcare leader's position or decision.

In addition to building managerial epidemiology into a decision-making process, inclusion of the data teammate at the table for decision making was suggested. The data scientist or analyst should be considered a key partner to the leader in decision-making rather than only a producer of reports. Participants described the analytical partner as a collaborator in understanding the ambulatory healthcare leaders' needs for data as well as offering analysis suggestions. Further, participants suggested the new team member should provide recommendations to the ambulatory healthcare leader to support decision-making.

Piloting the use of managerial epidemiology will create visibility to the practice. A pilot that is small and easy to trial should be used to not delay wider adoption. This pilot could be a quality or process improvement effort, for example. Participants discussed piloting the practice of managerial epidemiology at the clinic level to inform refinements of using managerial epidemiology before expanding to healthcare leaders with greater patient population purview. Once wins are seen from the small pilots, the awareness will help with enhanced engagement and the practice of managerial epidemiology should be expanded thereafter. The steps for adoption (see Figure 3) including the leader tool will be discussed again in the recommendations section.

### **Diffusion of Innovation**

In Chapter 2, I outlined existing literature on the underpinning theoretical framework for this study, DoI theory. This is the first study on the discipline of managerial epidemiology to use DoI theory to research leadership perspectives on its adoption. Of the five DoI theory attributes, four were explored in this study: relative advantage, compatibility, complexity, and trialability. Observability was not included in this study due to poor adoption, which will be discussed later in the section on limitations of the study. The attributes of DoI were demonstrated to increase the rate of adoption (Rogers, 2003). Therefore, the interview questions were aligned to understand each of these DoI components as it relates to the adoption of managerial epidemiology. As a result, the themes that emerged from the data analysis aligned to the specific DoI attributes of relative advantage, compatibility, complexity, and trialability.

Relative advantage describes how the innovation is perceived as being better than what is existing (Rogers, 2003). The relative advantage of an innovation is correlated to the rate of adoption (Rogers, 2003). Meaning, if individuals viewed the innovation as being better than the status quo, the rate of adoption would be accelerated. Relative advantage was explored by asking participants about the perceived advantages and disadvantages of using managerial epidemiology for decision-making. The findings demonstrate no disadvantages of using the practice of managerial epidemiology for decision-making. Importantly, managerial epidemiology provides objectivity for decision-making which was viewed as better than the current subjective decision-making process based on individual experiences. The favorable perceptions suggested the adoption of managerial epidemiology should be more rapid based on the attribute of relative advantage. However, adoption of managerial epidemiology was found to be variable. Therefore, the findings of this study cannot support the attribute of relative advantage confidently.

The attribute of compatibility describes if the innovation fits well with the current norms to understand the speed and needs of the adoption (Rogers, 2003). Literature shows that incompatibility will slow adoption (Rogers, 2003). Compatibility was explored by asking the participants about the alignment and misalignment of managerial epidemiology with current norms and ambulatory health services leadership roles. For managerial epidemiology, I found alignment by the expressed criticality. Participants suggested the critical nature of managerial epidemiology superseded any potential misalignments, if there were any. Almost all participants responded that there were not

any misalignments of managerial epidemiology with current norms. Although this suggests high compatibility and indicates the rate of adoption should not be hindered based on compatibility; the current adoption of managerial epidemiology is variable. This study cannot confirm or support the attribute of compatibility.

As shared in Chapter 2, complexity is the perception of how difficult the innovation is to utilize and understand (Rogers, 2003). This was explored with participants by asking about the difficulties for using managerial epidemiology. This study found key challenges with data as well as the gap in leadership competency. According to literature, this complexity slows the adoption rate of an innovation such as managerial epidemiology. Since the current adoption of managerial epidemiology is variable, this study supports the attribute of complexity.

Lastly, the attribute of trialability is used to understand if the innovation can be viewed by the adopters to understand the results and benefits of the innovation in order to help with adoption (Rogers, 2003). The uncertainty of an innovation such as managerial epidemiology is reduced through use of trials (Rogers, 2003). For managerial epidemiology, this attribute was considered in the study by understanding how ambulatory healthcare leaders could trial the use of managerial epidemiology. The study concluded that a pilot or small intervention was readily desired and easily feasible. In comparing to the literature, the rate of adoption of managerial epidemiology should be enhanced with the attainable trialability. However, the current adoption of managerial epidemiology is variable; therefore, the study cannot support the attribute of trialability.



The findings of this study could not support all attributes of DoI theory because of the variable adoption of managerial epidemiology currently. Based on the findings in this study for the attributes of relative advantage, trialability, and compatibility, the adoption rate should be accelerated. However, it is evident that complexity is supported by this study and may present a challenge for the rate of adoption that leads to variable adoption. Though, observability was a DoI component unable to be explored at the time of the study and is suspected to be one of the barriers for adoption rate because of the lack of ability to observe managerial epidemiology and the results due to the poor adoption. On the other hand, the participants mentioned a recommendation for ambulatory healthcare leaders to learn from other leaders and their wins from using this practice as a way to improve adoption. This suggests that observability could be possible in some situations.

Additionally, the literature noted that particular individual characteristics could impact the rate of adoption (Rogers, 2003). This is similar to the response of Participant 1 relating to generational and personality differences interplaying with the adoption of managerial epidemiology. Though, the participant pool was diverse in education, experience, and individual characteristics. Furthermore, the years of experience did not correlate with adoption of the managerial epidemiology. The median amount of experience for the participants was 11 years. Even still, no notable differences in adoption, awareness or competency of managerial epidemiology was found to be based on years of experience or education. The adoption was not hardwired among the participants and adoption was inconsistent overall. This means that the findings and recommendations can be translated to all ambulatory healthcare leaders.

### **Limitations of Study**

One limitation of this study is the exclusion of the fifth element of DoI, observability. Observability was not included in this study because existing literature demonstrated the poor adoption of managerial epidemiology. Therefore, observing this practice and the results of using managerial epidemiology would be nearly impossible.

Another limitation was the necessity to use the telephone for the majority of the interviews. The use of telephone for many of the interviews eliminated the ability to understand non-verbal communication (Ravitch & Carl, 2016). The absence of non-verbal communication during the telephone interviews did limit my full understanding of messages conveyed by the participants such as facial expressions which can provide emotion or additional context to the data provided. Two interviews were conducted in person which enabled me to consider non-verbal communication during the interview as well as potential to build increased rapport with those participants. Importantly, I did not feel the rapport with participants of the in-person interviews differed from those engaged via telephone.

Additionally, the setting of the interviews may have also presented a limitation. For example, some participants were completing the interview via phone and were on their commute. It is unclear how their commute or technology could have distracted their participation in the interviews and their responses. Moreover, it was difficult to understand the setting of any participant beyond those that disclosed their engagement during commutes.

Lastly, this study was conducted with healthcare leaders in the ambulatory setting. While participants did mention the need for using managerial epidemiology in other settings and other leadership roles, generalizing the findings to other health services leaders would need to be considered carefully. One could argue that the core components of managerial functions applies to any healthcare leaders as all healthcare leaders are serving a population; therefore, managerial epidemiology would also apply to their leadership approach and decision-making process.

### **Recommendations**

Despite the need for managerial epidemiology and uptake in some academic institutions, the literature on managerial epidemiology remains minimal. Based on the existing literature and this study, I provide many recommendations for further research. The research recommendations presented here reflect gaps remaining in the literature and highlights needs based on current events.

First, additional research is needed on the steps outlined in Figure 3 for adoption of managerial epidemiology. While the steps are built directly from the study findings, the steps themselves should be studied to explore the implementation and effectiveness on adoption of managerial epidemiology. Furthermore, a leadership tool as part of the steps for adoption should also be researched and developed as an evidence-based tool. Similar to researching the overall steps of adoption provided in Figure 3, testing the implementation and effectiveness of a leadership tool itself should be conducted.

Another recommended research topic on managerial epidemiology is to study the fifth component of DoI, observability. Observability was not studied here because of

poor adoption of managerial epidemiology overall. Once managerial epidemiology is more widely adopted from using the steps and findings of this study, the observability of managerial epidemiology should be researched to better understand the current adoption and other ways to accelerate adoption. Additionally, the alignment of research questions with DoI may suggest the recommendations presented in this study could apply for adoption of other innovations in a population of ambulatory healthcare leaders.

Adoption of this practice of managerial epidemiology has been discussed predominantly as a way to impact triple aim. However, there is a recognized quadruple aim that was not discussed in this study or in the literature of managerial epidemiology. Specifically, the fourth objective is improving workforce experience. In congruence with this objective, this study noted the use of managerial epidemiology and the objectivity provided could benefit ambulatory healthcare leaders' priorities and workload. However, further research should be completed to explore how using managerial epidemiology could improve the leader and care team experience.

The adoption challenges discussed from this study should be further explored and addressed. Specifically, data integrity, data accessibility, and interoperability challenges related to managerial epidemiology in support of population health and overall system performance should be studied. While the data personnel will assist leaders with the analysis and support decision-making, this recommendation does not solve the data integrity, data accessibility, or interoperability challenges. In terms of interoperability and data usage especially population data in managerial epidemiology, the protections and challenges of data privacy should also be explored. The heightened awareness from

the pandemic on the use of managerial epidemiology and the barriers presented for the adoption further contribute to the urgency of finding solutions more quickly.

Given the recent awareness of managerial epidemiology due to the pandemic and often the first-time some healthcare leaders are using managerial epidemiology, additional research should be conducted to explore healthcare leaders use of this practice before the pandemic and after the pandemic. Alternatively, it is recommended to research the use of managerial epidemiology to navigate through the rest of the pandemic as well as forecast and plan for reviving the healthcare system to fully operational. This future study could include using managerial epidemiology to understand the impact of the pandemic on populations who have experienced reduced access to healthcare services, associated health outcomes, and the effect on the healthcare system.

While literature shows the importance of managerial epidemiology for pandemics and health policy, there is more research needed for the use of managerial epidemiology by health policy leaders and government agencies. The earlier comment of using managerial epidemiology for before and during the pandemic further underlined the need for health policy leaders and government agencies to use managerial epidemiology. The literature discussed the use of managerial epidemiology for pandemic and health policy in general such as the use of the Dever model for policy analysis (Fleming, 2015). However, there is insufficient knowledge on the adoption or use of managerial epidemiology in the public sector or government agencies. Arguably, the healthcare transformation that is discussed in this study can be maximized through public policy. Furthermore, this study highlighted government contracts and programs such as value-

based care models which ambulatory healthcare leaders could use managerial epidemiology to support. One could suggest managerial epidemiology should also be used by the government to plan and implement such programs. On a macrolevel, I hypothesize that the improved performance individual health organizations can experience by using managerial epidemiology could be experienced on local, state, and federal health system levels as well. For these reasons, the public sector and government agencies are unrepresented target audiences in the discipline of managerial epidemiology and should be prioritized for further research.

This study also uncovered another gap in the literature regarding unconscious bias. While the literature discussed unconscious bias in the epidemiological practices, the literature does not discuss the unconscious bias of the leader or data personnel. This challenge was highlighted in this study from a participant response and concern regarding populations being left out of analyzed differently which could negatively impact their health and healthcare services. As noted previously, unconscious bias in the healthcare profession has been attributed to lower quality of care (FitzGerald & Hurst, 2017). Therefore, it is recommended that research is conducted on the role of unconscious bias in leaders' use of managerial epidemiology.

In addition to exploring unconscious bias of leaders using managerial epidemiology, other leadership characteristics should be explored to maximize the shift towards a population health approach and use of managerial epidemiology. This study found the participants shared an altruistic trait. I hypothesize that this trait could be a common characteristic needed for a population health leadership approach and supportive

of the utilizing managerial epidemiology. To that end, I suspect there are other characteristics and a leadership theory that should be studied to accelerate the use of managerial epidemiology and effectiveness of healthcare leaders.

Lastly, a limitation of this study was the narrow focus on ambulatory healthcare leaders. The findings of this study should be applied to leaders of other settings carefully as it is under-studied. Based on literature, I hypothesize that the findings and managerial epidemiology could be translated to all healthcare settings and all healthcare leaders. However, this would need to be evaluated through further research. Additional research on using managerial epidemiology by hospital leaders should be explored.

### **Implications**

The findings of this study are significant for impacting positive social change. First, this study validated the use of managerial epidemiology for improving the health of our population by providing ambulatory healthcare leaders with this practice to better understand the population and their needs in order to be effective in their roles. More specifically, current literature discussed the implementation of managerial epidemiology in academic programs for emerging healthcare leaders. The wait for these healthcare leaders to graduate and use managerial epidemiology to impact the population's health could be long. By studying the adoption of managerial epidemiology for the current workforce, the recommendations can be implemented more readily in the healthcare system rather than waiting for graduates to diffuse the practice. This could simply take many years to impact change; whereas, supporting the current ambulatory healthcare leaders to use managerial epidemiology could impact change now, have the most impact,

and not delay the improvement of the population's health. That is provided by this study's findings.

In this study and the literature, managerial epidemiology is shown to be impactful on the triple aim. More specifically, the use of managerial epidemiology can improve the access to healthcare services based on the needs of the population. Furthermore, the use of managerial epidemiology can reduce costs to patients and the healthcare system overall. Additionally, managerial epidemiology can provide leaders with insights to improve the quality of care provided to the patients they serve. From this study, the adoption of managerial epidemiology by ambulatory healthcare leaders should be rapid. The rapid adoption potential of managerial epidemiology and its impact on the triple aim as well as overall healthcare system performance proves to be promising for the health of our nation and its struggling healthcare system. Moreover, this study provided managerial epidemiology as a solution for ambulatory healthcare leaders wanting to make an impact but grappling with the triple aim and many often-conflicting priorities. This study provided steps to accelerate the adoption and highlighted the use of managerial epidemiology during a pandemic which has worldwide health implications on improving health and performance of healthcare globally.

### **Conclusion**

Further spotlighted by the COVID-19 pandemic, the health of our nation is dependent on the practice of managerial epidemiology. While textbooks and curricula have been developed for students and newly emerging healthcare leaders, this is the first study to explore and discuss how essential the adoption of managerial epidemiology is by



the existing workforce of ambulatory healthcare leaders. This study validated and elaborated on the importance of managerial epidemiology. This study also found that managerial epidemiology is critical without any disadvantages for ambulatory healthcare leaders and supports healthcare transformation including population health and value-based care models, improvement of the triple aim, and overall healthcare system performance. From this study, I provided clear steps for hardwiring adoption of managerial epidemiology by current ambulatory healthcare leaders. I also shared examples for using managerial epidemiology including application in organizational strategic planning, operating planning, and leadership goal setting. Lastly, I have provided numerous recommendations for additional research needed in the discipline. In the light of the pandemic, an important recommendation is the need for studying managerial epidemiology in public policy and the public sector to protect the population's health and impact the performance of the entire US healthcare system.

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## Appendix A: Interview Guide

### Interview Opening:

The researcher will begin by providing an introduction. The researcher will thank the participant for their engagement and share the purpose of the study. A review of the recruitment content will be provided. The researcher will reiterate the voluntary, confidential nature of the study as well as review the consent form with the participant that was emailed or signed in-person prior to the start of the interview. The process of the study will be shared. Clarification of the key concept definitions will be reviewed. The researcher will request the use of a recording device for the interview. Lastly, the researcher will ask if the participant is comfortable and if there are any outstanding questions before the interview begins. The interview will start using the following background questions:

1. Start with background questions to build rapport and learn more about the participant
  - a. What is your full name? (Researcher should remind that this will not be included in the study)
  - b. What type(s) of ambulatory setting is your leadership experience in?
  - c. How many years of experience do you have in healthcare leadership?
    - i. How many of those years are in ambulatory settings?
  - d. What is your educational background?
  - e. Tell me about your healthcare experience and journey into leadership.
  - f. What keeps you energized and engaged in healthcare leadership?
2. How would the use of managerial epidemiology be an advantage to ambulatory health services leaders?
3. How would the use of managerial epidemiology be a disadvantage to ambulatory health services leaders?
4. In what ways would managerial epidemiology benefit the decision-making process in healthcare organizations?
5. How does/would the practice of managerial epidemiology fit (be compatible with) within current ambulatory leadership and management role?
6. How does/would the practice of managerial epidemiology fit (be compatible with) within current ambulatory leadership and management decision-making?
7. How is the practice of managerial epidemiology misaligned with current norms?
8. What are your perspectives of the difficulty for ambulatory leaders in using managerial epidemiology?
9. How could these difficulties be mitigated for integration of managerial epidemiology in ambulatory leadership practices?
10. In what ways could you easily test the use of managerial epidemiology in your regular work?
11. In what ways have you used managerial epidemiology in your leadership approach?



12. What ways are you or your organization addressing population health?
  - a. How are you or your organization identifying the populations to address?  
What factors are you evaluating?