



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**GOING UPSTREAM: BUILDING A PROACTIVE MODEL
OF INTERVENTION AT THE INTERSECTION OF
PUBLIC HEALTH AND PUBLIC SAFETY**

by

Emily Pelliccia

September 2022

Thesis Advisor:
Second Reader:

Anke Richter
Cristiana Matei

Approved for public release. Distribution is unlimited.

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE September 2022		3. REPORT TYPE AND DATES COVERED Master's thesis
4. TITLE AND SUBTITLE GOING UPSTREAM: BUILDING A PROACTIVE MODEL OF INTERVENTION AT THE INTERSECTION OF PUBLIC HEALTH AND PUBLIC SAFETY			5. FUNDING NUMBERS	
6. AUTHOR(S) Emily Pelliccia				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.			12b. DISTRIBUTION CODE A	
13. ABSTRACT (maximum 200 words) This thesis is a call to action for the public health and public safety fields to become more integrated outside times of widespread emergencies or disasters. This strategic-level analysis of the current integration of the two disciplines seeks to identify opportunities for first responders to get further upstream of the problems they are tasked to resolve and take a more proactive role in improving population health. A comparative analysis of five mobile integrated healthcare and community paramedicine programs was conducted to understand how these emerging programs were developed and how their effectiveness is measured. An examination of the assessment tools in use today by public health and healthcare officials was also conducted to understand how the health of communities is measured and inform where the integration can take place. This thesis presents recommendations at the local and national levels to improve emergency medical service delivery toward a more upstream approach through integrating public health concepts and practices.				
14. SUBJECT TERMS public health, public safety, social determinants of health, mobile integrated healthcare, community paramedicine, community risk reduction			15. NUMBER OF PAGES 101	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release. Distribution is unlimited.

**GOING UPSTREAM: BUILDING A PROACTIVE MODEL OF INTERVENTION
AT THE INTERSECTION OF PUBLIC HEALTH AND PUBLIC SAFETY**

Emily Pelliccia
Deputy Chief, Albemarle County Fire Rescue
BS, National Labor College, 2014

Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(HOMELAND SECURITY AND DEFENSE)**

from the

**NAVAL POSTGRADUATE SCHOOL
September 2022**

Approved by: Anke Richter
Advisor

Cristiana Matei
Second Reader

Erik J. Dahl
Associate Professor, Department of National Security Affairs

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

This thesis is a call to action for the public health and public safety fields to become more integrated outside times of widespread emergencies or disasters. This strategic-level analysis of the current integration of the two disciplines seeks to identify opportunities for first responders to get further upstream of the problems they are tasked to resolve and take a more proactive role in improving population health. A comparative analysis of five mobile integrated healthcare and community paramedicine programs was conducted to understand how these emerging programs were developed and how their effectiveness is measured. An examination of the assessment tools in use today by public health and healthcare officials was also conducted to understand how the health of communities is measured and inform where the integration can take place. This thesis presents recommendations at the local and national levels to improve emergency medical service delivery toward a more upstream approach through integrating public health concepts and practices.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	PROBLEM STATEMENT	2
B.	RESEARCH QUESTIONS.....	3
C.	LITERATURE REVIEW	3
D.	RESEARCH DESIGN.....	6
E.	CHAPTER SUMMARY.....	6
II.	PUBLIC HEALTH 101 FOR FIRE AND EMS.....	9
A.	HISTORY OF THE SHARED ORIGINS OF FIRE/EMS AND PUBLIC HEALTH FIELDS.....	9
B.	DEFINING THE SOCIAL DETERMINANTS OF HEALTH	12
C.	UPSTREAM MOVEMENT.....	14
D.	DOWNSTREAM EXAMPLE.....	18
E.	CHAPTER SUMMARY.....	19
III.	EMERGING PREVENTION AND INTERVENTION MODELS.....	21
A.	EVOLUTION OF U.S. FIRE AND EMS AND ADVENT OF MODERN PREVENTION INITIATIVES	21
B.	COMMUNITY RISK REDUCTION.....	24
C.	MOBILE INTEGRATED HEALTHCARE AND COMMUNITY PARAMEDICINE	28
D.	MOBILE INTEGRATED HEALTHCARE-COMMUNITY PARAMEDICINE CASE STUDIES.....	32
1.	Los Angeles Fire Department’s Mobile Integrated Health Care Unit.....	32
2.	Colorado Springs Fire Department’s Community Assistance, Referral and Education Services	35
3.	Acadian Health and Ambulance Services.....	37
4.	Northwell Health System—Center for Emergency Medical Services Community Paramedicine Program	39
5.	Baltimore City Fire Department Mobile Integrated Healthcare—Community Paramedicine.....	40
E.	SUMMARY—KEY FINDINGS.....	42
IV.	RESEARCH AND COMPARATIVE ANALYSIS: ASSESSMENT AND EVALUATION TOOLS.....	45
A.	CENTER FOR DISEASE CONTROL’S SOCIAL VULNERABILITY INDEX.....	46

1.	How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?	46
2.	How Were the Metrics to Assess or Evaluate Selected?.....	46
3.	How Is the Information that Is Gathered Used?.....	47
4.	What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)	47
B.	NATIONAL HEALTH SECURITY PREPAREDNESS INDEX	48
1.	How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?	49
2.	How Were the Metrics to Assess or Evaluate Selected?.....	50
3.	How Is the Information that Is Gathered Used?.....	53
4.	What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)	53
C.	COMMUNITY HEALTH NEEDS ASSESSMENTS	54
1.	How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?	55
2.	How Were the Metrics to Assess or Evaluate Selected?.....	56
3.	How Is the Information that Is Gathered Used?.....	56
4.	What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)	56
D.	EMS SYSTEM EVALUATION	58
E.	NASEMSO—2020 NATIONAL EMS ASSESSMENT	59
1.	How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?	59
2.	How Were the Metrics to Assess or Evaluate Selected?.....	59
3.	How Is the Information that Is Gathered Used?.....	60
4.	What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)	60
F.	NAEMT’s MIH-CP—SECOND NATIONAL SURVEY RESULTS	61
1.	How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?	61
2.	How Were the Metrics to Assess or Evaluate Selected?.....	62
3.	How Is the Information that Is Gathered Used?.....	62
4.	What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)	63
G.	SUMMARY OF KEY FINDINGS	64

V.	CONCLUSION	67
A.	RECOMMENDATIONS.....	68
1.	Realign National EMS Governance	68
2.	Develop a Standard for Measurable Health Outcomes.....	69
3.	Use Public Health Assessments and Evaluation Tools to Ensure a Cycle of Continuous Improvement	69
B.	SUGGESTIONS FOR FUTURE RESEARCH.....	69
	LIST OF REFERENCES	71
	INITIAL DISTRIBUTION LIST	81

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

Figure 1.	EPHS Framework.	16
Figure 2.	NHSPI 2021 Index Release Domains and Subdomains	51

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF ACRONYMS AND ABBREVIATIONS

ACA	Patient Protection and Affordable Care Act
ACS	American Community Survey
APHA	American Public Health Association
APP	Aging in Place Program
CARES	Community Assistance, Referral and Education Services
CDC	Centers for Disease Control and Prevention
CFAI	Commission on Fire Accreditation International
CFR	case-fatality risk
CHDS	Center for Homeland Defense and Security
CHI	community health improvement
CHNA	Community Health Needs Assessment
COVID-19	coronavirus disease 2019
CP	community paramedicine
CPSE	Center for Public Safety Excellence
CRR	community risk reduction
CSFD	Colorado Springs Fire Department
DOT	Department of Transportation
EMS	emergency medical services
EPHS	Essential Public Health Services Framework
ET3	Emergency Triage, Treat, and Transport
FEMA	Federal Emergency Management Agency
GRASP	Geospatial Research, Analysis, and Services Program
HHS	Department of Health and Human Services
HOP	Homeless Outreach Program
IOM	Institute of Medicine
LAFD	Los Angeles Fire Department
MD	doctor of medicine
MIH	mobile integrated healthcare
MIH-CP	mobile integrated healthcare and community paramedicine
MPH	master of public health

NAEMT	National Association of Emergency Medical Technicians
NASEMSO	National Association of State EMS Officials
NFPA	National Fire Protection Agency
NHSPI	National Health Security Preparedness Index
NHTSA	National Highway Traffic Safety Administration
PLACES	Population Level Analysis and Community Estimates Project
RDHRS	Regional Disaster Health Response System
SDOH	social determinants of health
SOP	scope of practice
SVI	Social Vulnerability Index
USFA	U.S. Fire Administration
WHO	World Health Organization

EXECUTIVE SUMMARY

On a day-to-day basis, first responders serving on the front lines of this nation's crisis of declining health bear witness to the social determinants of health. Public safety, particularly fire and emergency medical services (EMS), are well positioned to serve as public health extenders to identify the factors that contribute to an individual's poor health. Unfortunately, the alignment of EMS within the healthcare system rather than alongside public health has rendered fire/EMS relatively ineffective at improving community health outcomes. The impact of the COVID-19 pandemic exposed population health inequities and insecurities of epic proportions. With the proper tools, training, and infrastructure, fire and EMS professionals are poised to make a profound difference in the public health of the communities they serve.

The origins of the modern-day EMS system can be traced to the recognition of a public health trend. An increase in cases of death and disability as a result of motor vehicle accidents prompted the need to bring medical care out of hospitals and onto the nation's streets and highways to save lives. This identification of a specific risk provided the basis for the national EMS system's alignment with the Department of Transportation.¹ As the complexity of the EMS system grew over time various elements such as licensing and direct oversight were added under other umbrella organizations at the federal, state, and local levels resulting in a fragmented national EMS system. Today EMS is delivered through a multitude of different models but fundamentally serves as a pipeline for individualized acute care and entry into the healthcare system.

As professional problem-solvers, first responders naturally seek to understand the problems they face and identify the root causes to be more efficient and effective with the services they provide. This has led to the emergence of two innovative areas of focus for the fire service: the community risk reduction framework and mobile integrated health/community paramedicine (MIH-CP) services. This thesis provides an examination of how

¹ National Academy of Sciences and National Research Council, *Accidental Death and Disability: The Neglected Disease of Modern Society* (Washington, DC: National Academies Press, 1966), <https://doi.org/10.17226/9978>.

these concepts evolved coupled with an analysis of various elements of a sample of programs that revealed several key findings. First, having formal ties to the public health field through physicians with public health expertise facilitates a more upstream approach to MIH-CP program development. The idea that an individual's health can be dramatically impacted by the social determinants of health serves as the basis for MIH-CP programs with public health influence. Programs without that basis focus on helping individuals resolve immediate needs rather than applying a more upstream approach to identify structural or social challenges requiring collaborative strategies and longer-term solutions. Another key finding is the need for better data to facilitate shifting the focus from the individual toward a more strategic approach to problem-solving for the community.

The fire service accounts for over 70 percent of the licensed EMS agencies in the United States.² As such, the opportunity exists for the fire service to help change the trajectory of healthcare service delivery from a reactive model to one focused further upstream on structural and societal issues. Fire and emergency medical service leaders and organizations can guide and shape the future of fire and emergency services toward a more strategically designed delivery of EMS by advocating for a national re-organization of EMS governance and oversight. A significant restructuring to align better with the public health field under the United States Department of Health and Human Services would provide the structural connection needed to facilitate enhanced collaboration. The opportunity for more coordinated training, policies, data collection, and other infrastructure would provide the public health perspective necessary for the development of more effective future alternative models of service delivery. Further aligning public safety with the public health enterprise is necessary to build the resilience of this nation.

² “National Fire Department Registry Summary,” U.S. Fire Administration, January 2021, 8, <https://www.usfa.fema.gov/downloads/pdf/registry-summary-2021.pdf>.

ACKNOWLEDGMENTS

Most students at CHDS only get to know one cohort of students, but I had the honor and pleasure to be a part of two amazing cohorts. When I had to suspend my studies and leave cohort 1901/1902, I was heartbroken—but cohort 2001/2002 took me in and made me feel welcome. That's when I realized just how special this program is to have such incredible cohorts. To the students of both cohorts, your personal, professional, and academic drive and determination has inspired and humbled me throughout the past three years. To the CHDS Garden Club, you will forever be some of my closest sister-friends, most especially Lisa, who dragged me across the finish line with her: thank you for your persistent support.

As this adventure comes to an end, I am so grateful to have been in this program. To the faculty and staff at CHDS, thank you so much for providing engaging, interesting, and challenging courses and for the hours of unconditional support from staff. You all made this a most unique and rewarding educational experience. I am especially grateful to Dr. Anke Richter for the grace with which she encouraged and supported me throughout my thesis endeavor.

To my close friend and neighbor, Jen, who inspired the topic for my thesis and helped me every step of the way, we'll start that empire soon.

To my sister, Charlotte, who had to mature faster than the rest of us, prematurely, any accomplishments I've had are a testament to a job well done by her. Her love, support, and pride in me go well beyond that of a sister.

And finally, to my wife, Jodie, whose love and support were essential and appreciated throughout this journey: Thank you for your patience, and now it's your turn to go "dance hard."

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

For too long, the personal health care and public health systems have shouldered their respective roles and responsibilities for curing and preventing separately from each other, and often from the rest of the community as well. However, working alone and independently, our formal health systems cannot substantially improve population health at the level of fundamental determinants. The burden on these systems and the lost opportunities in our society from this fragmentation, segmentation, and isolation are evident in the resources consumed and repeatedly responding to the health consequences of persistent problems that can be traced to a variety of factors.

—Institute of Medicine¹

The preceding passage is from the preface of a book entitled *Improving Health in the Community*, published in 1997 by a working group of public health experts and healthcare practitioners assembled by the Institute of Medicine (IOM). The IOM, part of the National Academy of Sciences, was established in 1970 as an independent, non-profit organization whose mission was “to advise the nation on matters of health and medicine.”² In July 2015, the IOM was reconstituted as the National Academy of Medicine. Its mission expanded “to improve health for all by advancing science, accelerating health equity, and providing independent, authoritative, and trusted advice nationally and globally,” signifying a trend toward the integration of public health concepts with the healthcare system.³ Pre-hospital providers by nature of the work they do are an extension of the healthcare system, though consideration should be given to reconsider them as first responders in the public health field.

¹ Institute of Medicine, *Improving Health in the Community: A Role for Performance Monitoring* (Washington, DC: National Academies Press, 1997), <https://doi.org/10.17226/5298>.

² Institute of Medicine, *Informing the Future: Critical Issues in Health*, 5th ed. (Washington, DC: National Academies Press, 2009), <https://doi.org/10.17226/12709>.

³ “About the National Academy of Medicine,” National Academy of Medicine, accessed July 30, 2022, <https://nam.edu/about-the-nam/>.

A. PROBLEM STATEMENT

Day-to-day emergencies in communities across the United States often signal bigger societal problems that need to be addressed. As research conducted by public health scholars and experts reveals, such social determinants of health as living and working conditions are primary contributing factors to poor health outcomes, higher morbidity, and even mortality rates.⁴ The public safety sector serves on the front lines of this nation's health crisis and rarely discusses these determinants. Fundamentally, emergency medical service (EMS) is a reactive model of service delivery involving individually focused medical care on demand. The EMS system is an extension of the healthcare system which emphasizes disease diagnosis, treatment, and care of individuals. By contrast, the public health field is population-based and focused on macro-level health trends.⁵ Only recently, within the last decade, has public safety begun to focus on studying health trends using EMS data to identify the overuse of pre-hospital services and prevent readmission rates in emergency departments or as a catalyst to provide targeted specialized care such as for mental health or drug addiction crises.

The COVID-19 pandemic exposed first responders to the realities of a global pandemic's effects on the health of communities and the greater population. The impact of COVID-19 on the U.S. healthcare system, first responders, and communities uncovered health inequities and insecurities on a scale never experienced before in modern times. An article in the *American Journal of Human Biology* described the pandemic as following "the fault lines of society."⁶ The challenges of daily living that most vulnerable populations

⁴ Gopal K. Singh et al., "Social Determinants of Health in the United States: Addressing Major Health Inequality Trends for the Nation, 1935–2016," *International Journal of MCH and AIDS* 6, no. 2 (2017): 139–64, <https://doi.org/10.21106/ijma.236>.

⁵ "Public Health and Medicine," Harvard T. H. Chan School of Public Health, accessed September 21, 2022, <https://www.hsph.harvard.edu/about/public-health-and-medicine/>.

⁶ Clarence C. Gravlee, "Systemic Racism, Chronic Health Inequities, and COVID-19: A Syndemic in the Making?," *American Journal of Human Biology* 32, no. 5 (2020): e23482, <https://doi.org/10.1002/ajhb.23482>.

faced before the pandemic reached unprecedented, unsustainable levels.⁷ While COVID-19 highlighted the capability of the nation's public health and public safety systems to work closely together during major emergencies and public health crises, it also helped expose institutional vulnerabilities and presented an opportunity for improvement. Outside of major disasters, these two fields neither plan nor coordinate the prevention, preparedness, or responses to foundational health issues. Addressing the social and systemic problems that lead to a decrease in the general health of a community and an increase in emergency incidents will require a new way of thinking critically about the services that emergency responders provide for the public moving forward. Public safety, particularly the fire and EMS services, are well regarded, trusted organizations in communities. This trust allows EMS providers to experience communities in crisis within their environments and gain a unique perspective. The potential to leverage this privileged perspective to help communities and not just the individual in crisis is a course of action yet to be fully explored.

B. RESEARCH QUESTIONS

1. What role does public safety currently play in identifying areas of concern in the health of the community?
2. What role should fire and EMS play in effecting positive change in a community's health outcomes?
3. How can fire/EMS take a more proactive role in improving population health?

C. LITERATURE REVIEW

The public health field has a well-researched body of work about the importance of understanding social science and the determinants of health. This literature review

⁷ Michael D. Baker, "Social Networks and High Healthcare Utilization: Building Resilience through Analysis" (master's thesis, Naval Postgraduate School, 2016), <https://calhoun.nps.edu/handle/10945/50564>; Meeri Kim, "The Impact of COVID-19 on Vulnerable Populations," *Lindau Nobel Laureate Meetings* (blog), July 1, 2020, <https://www.lindau-nobel.org/blog-the-impact-of-covid-19-on-vulnerable-populations/>.

examines previous research conducted to support the role of public safety in identifying structural and social issues that contribute to poor health outcomes. While some literature has been published recently regarding the alignment of public safety within the public health system during times of disaster response, almost no literature has explored this alignment outside of times of crisis.

An extensive search of databases including PubMed and Google Scholar, among other open sources, was conducted using terms to find alignment between public health and public safety, such as “mobile integrated healthcare” and “community paramedicine.” Only one study was found (not peer-reviewed literature, but in the public domain) that examines alternate and expanded uses of emergency medical personnel during non-crisis periods and frames them as public health extenders.⁸ The study, by Jason Jones, is entitled “Non-Emergency Utilization of EMS” and was a capstone project for a master’s in public health.⁹ Jones conducted a comprehensive review of national EMS data and research to see whether mobile integrated health/community paramedicine (MIH-CP) “holds the key” to improving community health and can reduce non-emergency use of EMS. He states that the “inappropriate use of the emergency department for non-urgent complaints has led to overcrowding for decades and is an issue that has been studied extensively with no clear solution.”¹⁰ Community paramedicine programs are being created throughout the United States, but there is still much work to be done to ensure they are well positioned to effect positive change at a societal level. Chapter III explores this idea in greater detail.

A recent study published in 2022 examined 108 community paramedic (CP) programs assessing the levels of integrated models of care and concluded that “the lack of rigorous, longitudinal studies with control groups makes rendering conclusion as to the

⁸ Jason Jones, “Non-Emergency Utilization of EMS: Contributing Factors and Strategies to Promote Effective Care with Appropriate Resources” (master’s capstone, University of Nebraska Medical Center, 2020), https://digitalcommons.unmc.edu/coph_slce/128.

⁹ Jones.

¹⁰ Jones, 26.

value and effectiveness of CP programs difficult.”¹¹ Part of the reason for this dearth of literature exploring extended and alternate uses of emergency medical technicians (EMTs) is because emergency medical service providers are limited in their ability to take a more proactive approach to EMS due to their limited scope of practice (SOP).

In 2017, a team of researchers conducted an audit and analysis at a national level to understand the status of state regulations of community paramedicine programs. The analysis found that all 50 U.S. states have laws related to EMS delivery. Less than a third of the states, however, have laws that allow for an expansion of the SOP to allow a paramedic to perform outside of a traditional model of care and provide mobile integrated healthcare or case coordination instead of transport to an emergency department.¹²

In 2014, a controlled trial studied expanding the SOP for paramedics to include providing non-emergency care to chronically ill patients at home to improve health outcomes and prevent hospitalization. Drennan et al. shared their conclusions:

Paramedics are under-utilized healthcare providers who are well-suited for delivering integrated care for patients with chronic illness given their mobility and ability to reach patients in the home setting; though there is a lack of large-scale research on the efficacy of paramedics working in an expanded capacity outside of emergency response.¹³

The study further discusses the importance of careful planning to meet the needs of the community and suggests conducting a community health needs assessment to inform targeted outreach efforts as a recommendation signaling the need for a more strategic, population-based focus.¹⁴

¹¹ Amir Allana et al., “Designing and Governing Responsive Local Care Systems—Insights from a Scoping Review of Paramedics in Integrated Models of Care,” *International Journal of Integrated Care* 22 (2022), <https://doi.org/10.5334/ijic.6418>.

¹² Melody Glenn et al., “State Regulation of Community Paramedicine Programs: A National Analysis,” *Prehospital Emergency Care* 22, no. 2 (2018): 244–51, <https://doi.org/10.1080/10903127.2017.1371260>.

¹³ Ian R. Drennan et al., “Expanding Paramedicine in the Community (EPIC): Study Protocol for a Randomized Controlled Trial,” *Trials* 15, no. 1 (2014): 473, <https://doi.org/10.1186/1745-6215-15-473>.

¹⁴ Drennan et al.

D. RESEARCH DESIGN

This thesis is a strategic-level analysis of the current integration of the public health and public safety disciplines. To address the research questions posed, it was necessary to explore and analyze case studies of existing emergency services interventions to illustrate or argue that public safety can have an expanded role and responsibility in improving health outcomes at the community and population levels. It was also important to identify gaps or inadequacies in those current approaches.

A comparative analysis of today's risk assessment tools was conducted to identify opportunities for root-cause analysis not previously used in intervention model design and development. Additionally, an examination was conducted of the existing evaluative processes such as the U.S. Department of Health and Human Services (HHS) Community Paramedicine Evaluation Tool, among others, to determine the effectiveness of current evaluative tools in use.

This thesis builds on work done by another student, Michael Baker, at the Center for Homeland Defense and Security (CHDS), by expanding beyond his focus on one social determinant of health (SDOH) to a more strategic, upstream approach to all SDOH.¹⁵ To be part of the discussion and engage with public health and social/human service organizations, the fire/EMS service, among other public safety entities, must understand the terminology, concepts, and approaches used by public health and human services. As Baker discovered in his research, standardization of the terminology will allow for a shared framework to identify SDOH issues and enhance coordination and collaboration to address them.¹⁶

E. CHAPTER SUMMARY

To date, limited progress has been made to intentionally align the day-to-day efforts of the public health and public safety disciplines. By leveraging the strengths of public safety, public health efforts could be enhanced or more effective and vice versa. Applying

¹⁵ Baker, "Social Networks and High Healthcare Utilization."

¹⁶ Baker.

principles from the upstream movement, a set of recommendations has been developed. Ultimately, this thesis aspires to transform existing intervention models to identify not only individual health problems or those within the community but also the root causes—those foundational or social issues that trigger the downstream negative health consequences. Once the upstream causes are identified, scalable collaborative solutions may be developed to more effectively and sustainably prevent the structural and social challenges our communities experience each day.

THIS PAGE INTENTIONALLY LEFT BLANK

II. PUBLIC HEALTH 101 FOR FIRE AND EMS

Emergency medical care is delivered in various forms using different service models throughout the United States. As the name suggests, “pre-hospital” providers are traditionally extensions of the healthcare system having been created to bring life-saving techniques from emergency departments out into communities to stabilize patients until they arrive at the hospital. This chapter explores the relationship between the fire/EMS and public health fields through the history of their shared origins and by examining the barriers to increased coordination and further alignment.

A. HISTORY OF THE SHARED ORIGINS OF FIRE/EMS AND PUBLIC HEALTH FIELDS

The only national agenda that formalizes collaboration between the fire/EMS and public health fields comes from the Center for Preparedness and Response, an emergency preparedness and disaster response framework within the Centers for Disease Control and Prevention (CDC).¹⁷ As the name implies, this center focuses on the preparedness and response stages of emergency management for major public health emergencies, such as a global pandemic. Ensuring the best possible health outcomes in our nation’s communities involves work that must be done well in advance of a public health crisis, through a systematic effort to identify structural and societal risks and barriers to good health.

In 2011, President Obama issued Presidential Policy Directive 8, also known as the National Preparedness Directive, directing emergency management efforts to use a more holistic community approach to prepare for disasters.¹⁸ Later that year, the Department of Homeland Security’s Federal Emergency Management Agency (FEMA) released its *Whole Community Approach to Emergency Management*, a guide that encourages the inclusion of a broader base of stakeholders.¹⁹ In an analysis of FEMA’s guide, Paul

¹⁷ “Center for Preparedness and Response,” Centers for Disease Control and Prevention, accessed April 17, 2021, <https://www.cdc.gov/cpr/index.htm>.

¹⁸ “Presidential Policy Directive 8: National Preparedness,” Department of Homeland Security, accessed April 16, 2022, <https://www.dhs.gov/presidential-policy-directive-8-national-preparedness>.

¹⁹ Department of Homeland Security.

Biedrzycki and Raisa Koltun note that the “‘social determinants of community preparedness and resiliency’ must thoughtfully be considered in all aspects of emergency management planning.”²⁰ They go on to provide three major events as examples in which a more holistic approach to integrating social determinants could have resulted in better outcomes. The analysis concludes with a call to action for emergency managers and public safety to “improve active involvement of non-traditional stakeholders” to identify the SDOH that will affect any given community.²¹

The National Highway Traffic Safety Administration (NHTSA)’s *EMS Agenda for the Future* recognizes the immediate need for a “federal lead EMS agency” and goes on to say it must be “mandated by law, sufficiently funded and credible.”²² The NHTSA boldly states that “EMS operates at the crossroads between health care, public health, and public safety” and further states that EMS providers “are often the first to identify public health problems and issues.”²³ This vision for the impact EMS can have on public health is limited, however. All of the strategic-level work done by the NHTSA to date including their *EMS Agenda 2050* is focused on improving the delivery of EMS within the confines of existing response models both at a tactical level as well as institutionally.²⁴ A strong case could be made that the legacy administrative location of EMS under the NHTSA no longer makes sense and action should be taken to place all EMS system governance nationally under the HHS. This move would align the administration of EMS not only with the CDC but also with major leading agencies and organizations focused on the health and well-being of our nation such as the Health Resources and Services Administration, Centers for Medicare and Medicaid Services and the National Institutes of Health to name

²⁰ Paul A. Biedrzycki and Raisa Koltun, “Integration of Social Determinants of Community Preparedness and Resiliency in 21st Century Emergency Management Planning,” *Homeland Security Affairs* 8 (August 2012): 14.

²¹ Biedrzycki and Koltun.

²² National Highway Traffic Safety Administration, *Emergency Medical Services Agenda for the Future* (Washington, DC: National Highway Traffic Safety Administration, 2010), https://www.ems.gov/pdf/advancing-ems-systems/Provider-Resources/EMS_Agenda_For_The_Future_2010.pdf.

²³ “What Is EMS?,” EMS.gov, accessed July 30, 2022, <https://www.ems.gov/whatisems.html>.

²⁴ National Highway Traffic Safety Administration, *EMS Agenda 2050: A People-Centered Vision for the Future of Emergency Medical Services*, Report No. DOT HS 812 664 (Washington, DC: National Highway Traffic Safety Administration, 2019).

a few. While not specifically the focus of this research, foundational, national change such as this could have a profound impact on the health of our communities and the implications of such change should be studied further.

Within HHS, the Office of the Assistant Secretary for Preparedness and Response coordinates the Regional Disaster Health Response System (RDHRS) and is currently in the process of building a new RDHRS “to create a more coherent, comprehensive, and capable healthcare disaster response system integrated into daily care delivery.”²⁵ The proposed RDHRS acknowledges the need to collaborate with EMS outside times of disaster. Four pilot demonstration sites have been selected to date, with targeted partnership priority initiatives underway.

In a 2018 report, the National Association of State EMS Officials (NASEMSO) encouraged collaboration between EMS and state health departments using community health needs assessments (CHNAs) as a tool to develop MIH-CP programs.²⁶ The NASEMSO report is the only example found while researching for this thesis to suggest that a community-based assessment be included in MIH-CP program development. Under the 2010 Patient Protection and Affordable Care Act, all non-governmental, non-profit hospitals are required to complete a CHNA every three years. Many leading organizations in both fields—public health and public safety—acknowledge the need to coordinate and collaborate; however, no consistent national strategy for alignment has been developed to date.

The COVID-19 pandemic exposed vulnerabilities communities face in the structural and social infrastructure needed to respond to such a widespread public health crisis.²⁷ Furthermore, it has reinforced the need for all public safety and emergency

²⁵ “Regional Disaster Health Response System,” Administration for Strategic Preparedness and Response, accessed September 21, 2022, <https://www.phe.gov/Preparedness/planning/RDHRS/Pages/default.aspx>.

²⁶ National Association of State EMS Officials, *Community Health Needs Assessments: Resources for Community Paramedicine & Mobile Integrated Healthcare*, Deliverable for Condition 10-57 (Falls Church, VA: National Association of State EMS Officials, October 2018), <https://nasemso.org/wp-content/uploads/NASEMSO-NEPS-10-57-CHNA-Resources-for-CP-MIH-Update-October-2018.pdf>.

²⁷ Gravlee, “Systemic Racism, Chronic Health Inequities, and COVID-19.”

services professionals to understand and embrace the idea that the community's health is paramount to the health and security of the nation.²⁸ A shared language is the necessary first step in identifying and building collaborative approaches to resolving structural and social inequities. The advent of community risk reduction (CRR) and MIH-CP programs in our nation's fire/EMS services, coupled with the recent shared experience of the global pandemic, make this an opportune time to explore these possibilities.

B. DEFINING THE SOCIAL DETERMINANTS OF HEALTH

For years, public health, human services, and healthcare researchers and clinicians have widely discussed the concept of the SDOH. Fundamentally, it is the idea that certain factors in one's living and working conditions determine how healthy or unhealthy a person can be. However, there is some debate about how the concept is defined. The lack of clarity in terminology has made it "harder to communicate and collaborate" using the SDOH concept.²⁹

The definitions of the SDOH are inconsistently and inaccurately used and applied. In 2005–2008, the World Health Organization (WHO) convened the Commission on Social Determinants of Health to increase global awareness about SDOH. As defined by the WHO, SDOH includes "economic policies and systems, development agendas, social norms, social policies, and political systems."³⁰ The WHO's inclusion of policies and political systems is likely due to its global mission and perspective. The CDC, "the nation's health protection agency" under the HHS, added education in its assessment of the "physical and social environments."³¹ Health Begins, a national healthcare consulting and training firm whose work is centered around the "upstream movement," believes that "as a concept and term,

²⁸ Administration for Strategic Preparedness and Response, National Health Security Strategy 2019–2022 (Washington, DC: Administration for Strategic Preparedness and Response, 2019), 24.

²⁹ Health Begins, "Upstream Communication Toolkit" (Burbank, CA: Health Begins, May 2019), 2, https://www.healthbegins.org/uploads/2/2/0/4/22040328/upstream_communications_toolkit_-_may_2019.pdf.

³⁰ "Social Determinants of Health," World Health Organization, accessed January 5, 2020, http://www.who.int/social_determinants/en/.

³¹ "Mission, Role and Pledge," Centers for Disease Control and Prevention, accessed September 21, 2022, <https://www.cdc.gov/about/organization/mission.htm>; Brian L. Cole and Jonathan E. Fielding, "Health Impact Assessment: A Tool to Help Policy Makers Understand Health beyond Health Care," Annual Review of Public Health 28, no. 1 (April 2007): 407, <https://doi.org/10.1146/annurev.publhealth.28.083006.131942>.

[SDOH] is widely and inconsistently used by healthcare stakeholders to reference everything” and cites examples of health initiatives and social risk data projects that range from the community- to population-based health in scope.³² Notably, many of the leading public health organizations in the United States disagree on what social areas to include as domains of SDOH.

Healthcare system organizations, such as the American Medical Association, identify six determinants including economic stability, neighborhood or built environment, education access and quality, food access and quality, community/social support, and quality of and access to health care.³³ The HHS does not recognize food quality and access as one of the fundamental domains of SDOH, as evidenced by its exclusion in the Healthy People 2030 initiative, used within the CDC as a “place-based framework to outline the five key areas of SDOH.”³⁴ However, further review of the tools, programs, and policy resources available through the CDC to “target high-priority SDOH” revealed several resources that support efforts to address food access and quality issues. For example, the CDC’s centralized policy database has tracked related data for 50 states and the District of Columbia over 17 years. In addition to this data are state and local legislation and regulations on nutrition, physical activity, and obesity in various settings such as schools, daycares, and other institutions.³⁵

Michael Baker, a graduate of the Naval Postgraduate School’s CHDS, explored one of the SDOH—community/social support—using social network analysis of high utilizers of EMS and determined that a person’s social network could positively or negatively affect one’s

³² Health Begins, “Levels of HRSN and SDH Integration Framework” (Burbank, CA: Health Begins, April 2019), 2, https://2hdp0l1trjr524kvdq3mg5sa-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/levels_of_hrsn_and_sdh_integration_framework.pdf.

³³ Nancy M. Bennett, Marie T. Brown, and Theresa Green, “Addressing Social Determinants of Health (SDOH): Beyond the Clinic Walls,” American Medical Association Ed Hub, August 31, 2016, <https://edhub.ama-assn.org/steps-forward/module/2702762>.

³⁴ “Social Determinants of Health Literature Summaries,” Healthy People 2030, accessed April 11, 2021, <https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries>; “About Social Determinants of Health (SDOH),” Centers for Disease Control and Prevention, accessed April 26, 2021, <https://www.cdc.gov/socialdeterminants/about.html>.

³⁵ “CDC Nutrition, Physical Activity, and Obesity—Legislation,” Centers for Disease Control and Prevention, accessed August 24, 2021, <https://chronicdata.cdc.gov/Nutrition-Physical-Activity-and-Obesity/CDC-Nutrition-Physical-Activity-and-Obesity-Legisl/nxst-x9p4>.

health.³⁶ His research focused primarily on how to reduce the frequency of EMS calls among high utilizers of EMS services through increased social connection. In researching community paramedicine programs, Baker found that frequent non-emergency visits to patients who often call 911 led to a decrease in 911 calls by those individuals. This finding led to one of Baker's four recommendations to "create an understanding for all levels of healthcare practitioners of the social determinants of health and the impact they have on individual and community wellness."³⁷ Further research on this topic is needed to support a causative claim that social interaction is more impactful than the actual medical screening that takes place. Regardless his findings support the idea that a basic education about the social determinants of health among first responders could not only enhance the assessment of a patient's chief complaint but also inform decisions about the patient's health care and their compliance with a recommended healthcare plan.

C. UPSTREAM MOVEMENT

Identifying the root cause or collection of causes that create poor social determinants of health is the basis of the upstream movement. Improving population health requires developing upstream strategies to prevent the conditions that lead to poor health. Traditional medical practice is the "act of diagnosing and treating a specific clinical condition" for an individual.³⁸ It focuses on biomedical signs and symptoms that can be assessed, tested, diagnosed, and treated, not on social or environmental factors that may contribute to a patient's overall health status. Fundamentally the medical practice takes place downstream once a medical condition has been identified and involves treatment and/or medication to improve an identified injury or illness. The upstream movement emerged out of a desire by healthcare practitioners to do more for their patients, particularly in cases of long-term chronic states of illness. This concept was first introduced in an article published by the American

³⁶ Baker, "Social Networks and High Healthcare Utilization."

³⁷ Baker, 79.

³⁸ Katie Oberkircher, "Social Determinants of Health Surface in U.S. Policy Agenda," *Leader's Edge Magazine*, August 16, 2019, <https://www.leadersedge.com/healthcare/social-determinants-of-health-surface-in-u-s-policy-agenda>.

Heart Association in 1975.³⁹ In the article, entitled “A Case for Refocusing Upstream: The Political Economy of Illness,” John McKinlay described the healthcare industry at that time as having “a newly emerging interest in the political economy of health care” and takes the concept further by suggesting that there are public and private entities that benefit financially from poor health trends, even labeling them as “manufacturers of illness.”⁴⁰ McKinlay identified the need to reorient the practice of medicine using an upstream lens and identify the root causes of illness. However, he also explained that such analysis was rarely done because of the “political economy of illness,” referring to the capitalist context of the American pharmaceutical industry. McKinlay further acknowledged that “the preventive orientation is itself largely a downstream endeavor” and went on to attribute this to a preoccupation with a focus on the individual.⁴¹

To understand how to get further upstream we must first understand the orientation of public health and medical professionals on the upstream continuum. By nature of the respective services provided, our healthcare system (including pre-hospital care) is naturally downstream, while the field of public health is fundamentally further upstream. The American Public Health Association (APHA) summarizes the distinction between medical and public health professionals, noting “while a doctor treats people who are sick, those of us working in public health try to prevent people from getting sick or injured in the first place.”⁴² Interestingly, the APHA’s introductory webpage goes on to list “some examples of the many fields of public health” and offers “first responders” as the first in a long list of professions including epidemiologists, public health physicians, and nurses much lower down on the list.⁴³ While I agree that first responders should be an integral part of the public health system, I posit that a majority of first responders are unaware that they are viewed in this way by the

³⁹ John B. McKinlay, “A Case for Refocusing Upstream: The Political Economy of Illness,” *IAPHS Occasional Classics*, no. 1 (2019), <https://iaphs.org/wp-content/uploads/2019/11/IAPHS-McKinlay-Article.pdf>.

⁴⁰ McKinlay.

⁴¹ McKinlay.

⁴² “What Is Public Health?,” American Public Health Association, accessed August 24, 2022, <https://www.apha.org/What-is-Public-Health>.

⁴³ American Public Health Association.

public health community. More importantly, in the absence of a formal connection, the linkage between first responders and public health is tenuous at best.

In 2020, the APHA worked with the Public Health National Center for Innovations (part of the Public Health Accreditation Board) to update the 10 Essential Public Health Services (EPHS) Framework. This framework had originally been created in 1994 by a federal working group. The work in 2020 was done under the umbrella of “The Futures Initiative” to “provide a roadmap of goals”; one of these goals was “to create communities where people can achieve their best possible health.”⁴⁴ Figure 1 provides a diagram of the 10 service areas included in the framework.

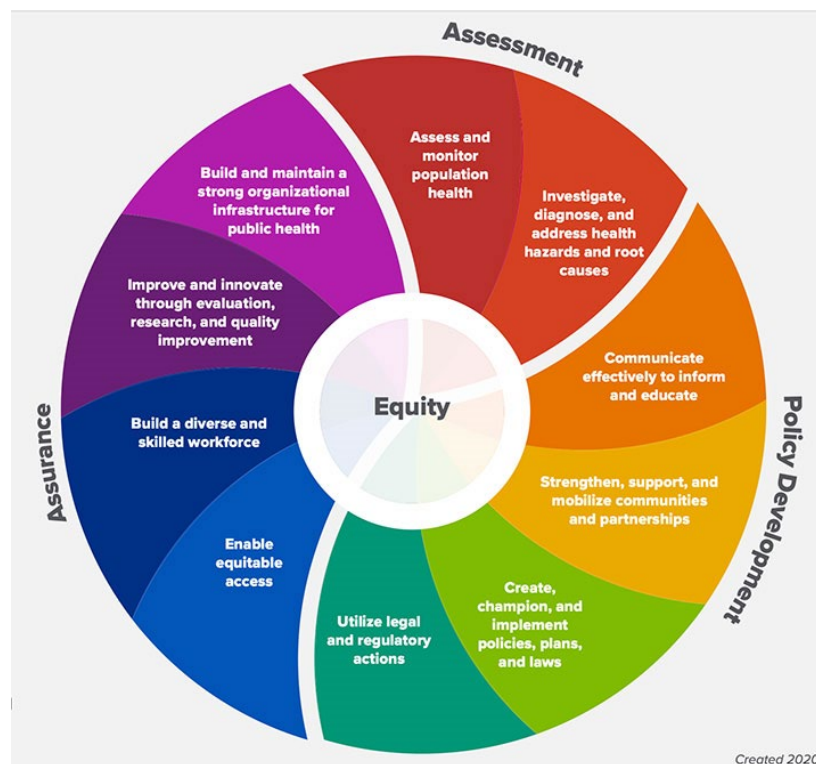


Figure 1. EPHS Framework.⁴⁵

⁴⁴ “The 10 Essential Public Health Services,” Public Health National Center for Innovations and de Beaumont Foundation, 2020, <https://www.apha.org/-/media/Files/PDF/factsheets/EPHS.ashx>.

⁴⁵ Source: Public Health National Center for Innovations and de Beaumont Foundation, “The 10 Essential Public Health Services.”

In studying the services identified through a public safety lens, a case could be made for better collaboration and coordination in each area; however, the area which offers the greatest opportunity for integration of first responders is likely under “assessment.” First responders, as the name suggests, are the first point of health care contact for a person who is having a health crisis. The direct service provided by first responders is often solely focused on the individual and the immediate signs and symptoms of their health crisis. As will be discussed in Chapter III, there is an evolving trend and desire in the fire and EMS industry to provide more proactive services to prevent acute emergencies from happening and improve health outcomes. However, within emerging service delivery models these interventions still occur too far downstream to affect any real shift in community or public health outcomes, nor are any of the programs developed in coordination with public health.

So, where exactly is “upstream”? Essentially, three different levels serve as layers of contributing factors shaping an individual’s health. These levels are sometimes defined as the levels of change opportunity.⁴⁶ The first level is the micro or individual level which is the downstream impact from upstream factors. In the public safety context, this is the immediate health crisis of an individual and the reason they called 911. More than likely this individual health crisis will require changes at the meso and macro level to have a more profound impact on the individual’s health. The meso level of change happens midstream and involves intermediary determinants, often seen by public safety as the individual’s living conditions such as housing, employment opportunities, and the service environment (e.g., access to health care, education, and social services). To truly get upstream to the macro level of change opportunity requires examining the structural determinants to identify the root cause(s) or “the causes of the causes” that contribute to an individual’s poor health outcomes.⁴⁷ These structural factors include social and institutional inequities. Class, race/ethnicity, immigrant status, gender, and sexual orientation are all examples of

⁴⁶ Matthias Richter and Nico Dragano, “Micro, Macro, but What about Meso? The Institutional Context of Health Inequalities,” *International Journal of Public Health* 63, no. 2 (2018): 163–64, <https://doi.org/10.1007/s00038-017-1064-4>.

⁴⁷ Karen Fish, *Let’s Talk: Moving Upstream* (Antigonish, NS: National Collaborating Centre for Determinants of Health, St. Francis Xavier University, 2014), https://nccdh.ca/images/uploads/Moving_Upstream_Final_En.pdf.

social inequities while institutional factors include government agencies, schools, laws, and regulations.

D. DOWNSTREAM EXAMPLE

To illustrate the different levels of change and how EMS interacts with individuals primarily downstream consider the following hypothetical scenario. A call is made to 911 and EMS is dispatched for a person experiencing extreme difficulty breathing. An ambulance arrives on the scene to find an obese young man who appears anxious and is taking very shallow, rapid breaths. The EMS crew recognizes that he is hyperventilating and coaches him to try to take slow, deep breaths while they take his vital signs. His blood pressure is elevated, and he has a rapid strong pulse. After a few minutes of coaching and a little supplemental oxygen, the patient slows his breathing down and appears to be less anxious. The crew retakes his vital signs and both the blood pressure and heart rate have come down. The crew asks him about his medical history, and he says he “used to be in better shape” but has struggled more recently and has been told that “he needs to be more active and watch his sugar intake.” The patient goes on to explain to the crew that he had just received a distressing phone call from his mom who lives in another state, and he became overwhelmed. The crew offers to take him to the hospital “to get checked out” but he says he feels much better and does not want to go. He signs a refusal of transport, thanks the crew, and apologizes for “wasting their time.”

At face value, there may be a micro change that the individual could make to improve his overall health, such as losing weight, being more active, and lowering his sugar intake. But after he apologized, the crew reassured him that he was not “wasting their time.” He went on to explain that he used to love to cook healthy meals and was in better shape because he would hustle at his old job. He would get his groceries using his employee discount at the small family-run grocery store three blocks away where he worked almost every day of the week. Unfortunately, when a large grocery store and the retail chain were built 20 blocks away the local grocer could not compete and ultimately had to shut down leaving him unemployed; he had not yet been able to find a job. Soon after he lost his job, his vehicle broke down, and he did not have enough money to repair it, so he has been

eating overprocessed food that is high in sugar and sodium that he purchased from the gas station/convenience store a block away because there is no public transportation to take him to the closest grocery store. He used to send his mom half of the money he made weekly to support her but stopped when he lost his job. Over the last eight months, he has become sedentary, depressed, and isolated which led to significant weight gain, pre-diabetes, high blood pressure, and depression. When his mom called him earlier, she told him that she was getting evicted from her public housing, and she did not know where she was going to go.

The crew listened to his story and felt helpless. They asked if there was anything they could do and even offered to drop him off at the grocery store and give him cab fare for the ride home. He once again thanked them and said he had taken up too much of their time, so the crew left and went into service. On the way back to their station, the crew talked about how they wished they could do more, but he was not sick enough for them to insist he go to the hospital. They empathized with his circumstances, but his depression did not present harm to himself or others and/or rise to the level of a psychiatric evaluation at the hospital. They considered making a social services referral but had only been trained to make referrals in cases of abuse. While they contemplated what else they could do for this gentleman they were dispatched to a car accident and the rest of the day went by quickly with a steady stream of emergencies. They never discussed the gentleman again.

E. CHAPTER SUMMARY

While this story is completely fictional, a version of it happens many times a day throughout communities across this country and highlights the ineffectiveness of our pre-hospital system. Both the patients and first responders are left feeling helpless and even hopeless at times. There are an estimated 240 million calls made to 911 in the United States each year, according to the National Emergency Number Association.⁴⁸ Yet on average, approximately 3 percent of all 911 calls are considered “critical” by the National Emergency Medical Services Information System and require true life-saving care and

⁴⁸ “9-1-1 Statistics,” National Emergency Number Association, accessed November 7, 2021, <https://www.nena.org/page/911Statistics>.

treatment.⁴⁹ The remaining 97 percent of emergency calls for service are lower acuity calls for service for individuals experiencing some type of health disparity.⁵⁰ To reverse the growing rate of health disparities in our communities will require a paradigm shift for public safety and collective, multi-sectoral action further upstream.

⁴⁹ “EMS Data Cube,” National Emergency Medical Services Information System, accessed August 19, 2022, <https://rp.nemsis.org/reportportal/design/view.aspx>.

⁵⁰ National Emergency Medical Services Information System.

III. EMERGING PREVENTION AND INTERVENTION MODELS

This chapter provides a brief overview of the origins of fire and EMS to illustrate how the United States fire service plays a principal role in the delivery of EMS today and explores how and where improved coordination with public health could be achieved. By examining two emerging areas of focus within the fire/EMS field—CRR and mobile integrated healthcare/community paramedicine—it is possible to analyze the effectiveness of each and identify areas for improvement.

A. EVOLUTION OF U.S. FIRE AND EMS AND ADVENT OF MODERN PREVENTION INITIATIVES

Statutory and regulatory oversight for the delivery of EMS in the United States has evolved. This evolution has resulted in a fragmented system of care that predates the modern public health field, but ironically has origins traceable to the identification of public health trends. To understand the stakeholders and processes involved in the shaping of EMS policy it is important to first understand how oversight for the delivery of EMS has evolved. Civilian ambulance services first began in Cincinnati and New York City in the 1860s.⁵¹ One hundred years later the Highway Safety Act of 1966 established the Emergency Medical Services Program under the Department of Transportation (DOT). This placement under DOT was in response to a report released earlier that year by the National Research Council entitled *Accidental Death and Disability: The Neglected Disease of Modern Society*, which emphasized a growing trend in deaths following accidents on the nation's highways and the need for immediate medical attention.⁵² In 1970, the NHTSA was established under the DOT. The NHTSA's involvement in EMS continues today through their Office of EMS, which provides "leadership and coordination" with federal partners in EMS to "advance a national vision for EMS."⁵³

⁵¹ National Highway Traffic Safety Administration, *Agenda for the Future*, 3.

⁵² National Academy of Sciences and National Research Council, *Accidental Death and Disability: The Neglected Disease of Modern Society* (Washington, DC: National Academies Press, 1966), <https://doi.org/10.17226/9978>.

⁵³ "Office of EMS," EMS.gov, accessed August 28, 2021, <https://www.ems.gov/officeofOEMS.html>.

However, licensing, and direct oversight for most EMS agencies is decentralized and managed at the state or local level. The stated vision of NASEMSO is a “seamless nationwide network of coordinated and accountable state, regional and local EMS and emergency care systems.”⁵⁴ NASEMSO’s most recent and comprehensive national assessment of EMS agencies in 2020 noted that “agencies that provide emergency medical services vary in the types of services provided . . . and state EMS offices vary in the types of regulatory oversight they administer for these services and agencies from state to state.”⁵⁵ While NHTSA and NASEMSO have visions that aspire to make the national EMS system more seamless and coordinated, both acknowledge there is much work to be done to that end.

Until recently there has been no national coordination of the major stakeholders involved in EMS policy to establish a collective vision for the future of EMS or to align with the public health field. In 2019 NHTSA published a report entitled *EMS Agenda 2050* with support from the HHS, Office of the Assistant Secretary for Preparedness and Response. The report was an update to the 1996 *EMS Agenda for the Future*. Seventy-one national organizations were asked to provide a liaison to serve on a working group to develop this report. This was the first time all major organizations involved in the delivery of EMS in the United States collaboratively provided input toward a collective vision. This strategic-level work identified six overarching, systemic challenges, and corresponding guiding principles were crafted to address each challenge. These principles included acknowledgment of the need to “move away from a patchwork of responders” and establish the “best practices, based on evidence and patient-centered outcomes . . . across the country.”⁵⁶ The recognition that “EMS must collaborate with public health, mental health,

⁵⁴ “Overview,” National Association of State EMS Officials, accessed March 14, 2021, <https://nasemso.org/about/overview/>.

⁵⁵ National Association of State EMS Officials, *2020 National Emergency Medical Services Assessment* (Falls Church, VA: National Association of State EMS Officials, 2020), https://nasemso.org/wp-content/uploads/2020-National-EMS-Assessment_Reduced-File-Size.pdf.

⁵⁶ National Highway Traffic Safety Administration, *EMS Agenda 2050*.

and social service resources” was also a theme throughout the report, suggesting the need for a more holistic approach to address determinants of health.⁵⁷

The complicated patchwork of EMS service delivery along with statutory and regulatory oversight makes understanding the field more difficult. Today, there are 23,272 licensed EMS agencies across 56 states and territories in the United States.⁵⁸ This number does not account for many ambulance services, which may not fall under the same licensing requirements because of their scope of care. In very rural areas of the country, EMS is provided only by helicopters, which are licensed and managed differently than traditional ground EMS systems. Of the total licensed EMS agencies, many are fire service organizations that also provide EMS services. The U.S. Fire Administration (USFA) maintains and updates annually a comprehensive national fire department registry of all career and volunteer fire departments. As of January 2021, there were 27,201 registered fire departments. Just under 40 percent, or approximately 10,880, provide EMS non-transport services while 21 percent, or 5,712, provide EMS ambulance transport services.⁵⁹ Based on USFA data, almost a quarter of the total licensed EMS ambulance transport services in the United States are provided by fire departments. Combining transport and non-transport services, the fire service accounts for over 70 percent of licensed U.S. EMS agencies responding to EMS emergencies.⁶⁰ Given the U.S. fire service’s major role in the delivery of EMS, it must play a significant role in the future of EMS.

As the only service that is invited into people’s homes during times of crisis, fire, and emergency, medical service professionals are well positioned not only to assess and gather important data but also to help develop and implement strategies to improve the health outcomes of our communities. Over the last two decades, fire and EMS services in the United States have dramatically expanded their service delivery models with a focus

⁵⁷ National Highway Traffic Safety Administration.

⁵⁸ National Association of State EMS Officials, *2020 National Emergency Medical Services Assessment*.

⁵⁹ “National Fire Department Registry Summary,” U.S. Fire Administration, January 2021, <https://www.usfa.fema.gov/downloads/pdf/registry-summary-2021.pdf>.

⁶⁰ U.S. Fire Administration.

on prevention efforts. Two such examples of this are the CRR concept and the addition of MIH-CP services in a growing number of localities. As of May 2020, there were 146 “community paramedicine-type” programs, fewer than 1 percent of the total licensed EMS agencies in the United States.⁶¹

B. COMMUNITY RISK REDUCTION

Preventing fires and making communities safer has been a national priority for the fire service for almost 100 years. However, it was not until recently that a more comprehensive approach to prevention emerged called CRR. In October 1925, President Calvin Coolidge proclaimed the first National Fire Prevention Week intended to bring national attention to fire safety and prevention.⁶² Fire Prevention Week continues annually today led by the National Fire Protection Agency (NFPA) which describes the safety week as the “longest-running public health observance in our country.”⁶³ This recognition of fire prevention education as a public health initiative is a good example of how the traditional fire prevention mentality is evolving toward a more inclusive approach to CRR.

The advent of the CRR concept may hold the key for the fire service to identify and address risk more comprehensively. Vision 20/20, one of the leading pioneer organizations for CRR, defines the concept as “a process to identify and prioritize local risks, followed by the integrated and strategic investment of resources (emergency response and prevention) to reduce their occurrence and impact.”⁶⁴ Vision 20/20 goes on to say in its mission statement that CRR “builds strategies, facilitates collaboration, and overcomes barriers to make communities safe, healthy and resilient,” though much of what they include within the CRR scope is focused on the built environment and fire loss

⁶¹ National Association of Emergency Medical Technicians, *Mobile Integrated Healthcare and Community Paramedicine (MIH-CP) 2nd National Survey* (Clinton, MS: National Association of Emergency Medical Technicians, 2018), http://www.naemt.org/docs/default-source/2017-publication-docs/mih-cp-survey-2018-04-12-2018-web-links-1.pdf?Status=Temp&sfvrsn=a741cb92_2.

⁶² “Fire Prevention Week,” National Fire Protection Association, accessed September 19, 2022, <https://www.nfpa.org/Events/Events/Fire-Prevention-Week/About>.

⁶³ National Fire Protection Association.

⁶⁴ John A. Stouffer, “Community Risk Reduction,” in *Community Risk Reduction Planning* (Warrenton, VA: Vision 20/20, n.d.), <http://riskreduction.strategicfire.org/introduction/community-risk-reduction/>.

prevention.⁶⁵ Their six-step model of risk analysis, which “can be scaled to any community and applied,” emphasizes the identification and prioritization of risk followed by the development of strategies and tactics to mitigate the risks.⁶⁶ These strategies and tactics are then built into a CRR plan to be implemented, evaluated, and modified as necessary.

The use of CRR as a framework for risk analysis involves data collection to inform identified risks, and the complexity of this data depends on the data sources. Most localities employ sources such as the federal census to create models for their communities that identify socioeconomic data points as well as elements in the natural and built environment.⁶⁷ Such baseline community data in combination with historical emergency incident data can be used to map trends in call types and identify recurring issues or high utilizers of emergency services. The Vision 20/20 CRR model includes a demographic analysis of the community as part of the identification of risk; however, income level is the only category included in this analysis that maps to one of the social determinants of health.⁶⁸

A comparison of various CRR models around the country reveals that most of these efforts are still heavily focused primarily on the built environment and how to prevent structure fires; however, structure fires account for less than 4 percent of the total emergency incidents nationally.⁶⁹ By comparison, using the same sample year for data (2019), 66 percent of the emergency incidents handled by the fire service were EMS calls.⁷⁰

⁶⁵ “CRR—An Overview,” Vision 20/20, accessed April 17, 2021, <https://strategicfire.org/community-risk-reduction/crr-an-overview/>.

⁶⁶ “Community Risk Reduction: A Fire Service Context,” Vision 20/20, accessed April 18, 2021, <https://strategicfire.org/wp-content/uploads/2015/04/V2020-CRR-Review-Model-8-12-14.pdf>.

⁶⁷ Vision 20/20.

⁶⁸ Vision 20/20.

⁶⁹ “U.S. Fire Statistics,” U.S. Fire Administration, August 26, 2021, <https://www.usfa.fema.gov/data/statistics/index.html>.

⁷⁰ “Fire Department Calls,” National Fire Protection Association, accessed April 17, 2021, <https://www.nfpa.org/News-and-Research/Data-research-and-tools/Emergency-Responders/Fire-department-calls>.

An article in the May/June 2020 issue of the *NFPA Journal* specifically discusses the COVID-19 response as “an ideal example of community risk reduction” and goes on to describe the efforts to prevent the spread of COVID-19 as a “CRR process.”⁷¹ This identification of mitigation measures taken during the early stages of COVID-19 as a “CRR process” demonstrates progress toward aligning the fire service with public health.

In his 2021 article entitled “Taking the Long View,” one of the leading innovators in CRR, Joe Powers, defined it as “a complete transformation to a model of risk assessments, prioritization, resource deployment, and evaluation.”⁷² Powers’ article challenges today’s fire service leaders to ask themselves, “are we courageous enough to create our future now?”⁷³ He goes on to explain that, as fire services leaders, we need to dig deeper into our risk analysis, engage the community, and leverage strategic partnerships to “better understand the risk faced by residents.”⁷⁴

Achieving accredited status is the gold standard of fire and emergency services and signals a long-term commitment to providing the highest level of service in one’s community. The Commission on Fire Accreditation International (CFAI), part of the Center for Public Safety Excellence (CPSE) exists to support fire and emergency service agencies by providing “an all-hazard, quality improvement model based on risk analysis and self-assessment that promotes the establishment of community adopted performance targets for fire and emergency service agencies.”⁷⁵ Accreditation is a voluntary process and requires a very rigorous and thorough analysis of the community as the context for the services provided by an applicant agency. It is challenging for smaller and more rural communities to become accredited. As such, there are only 301 accredited agencies in

⁷¹ Lorraine Carli, “This Is CRR: How the COVID-19 Pandemic Is a Study of Community Risk Reduction in Action,” *NFPA Journal*, May 7, 2020, <http://www.nfpa.org/News-and-Research/Publications-and-media/NFPA-Journal/2020/May-June-2020/Columns/Outreach>.

⁷² Joe Powers and Ben May, “Taking the Long View,” *Firefighter Nation*, March 27, 2021, <https://www.firefighternation.com/firerescue/taking-the-long-view/>.

⁷³ Powers and May.

⁷⁴ Powers and May.

⁷⁵ “Accreditation Overview,” Center for Public Safety Excellence, accessed August 15, 2021, <https://cpse.org/accreditation/>.

North America, equating to only 12 percent of the United States and 18 percent of the Canadian population protected by accredited agencies.⁷⁶ This process is long and arduous. It involves support and engagement at all levels of the organization to complete a strategic plan, conduct a very thorough structured self-assessment, and develop a community risk assessment and “standard of cover” (response plan) to address the risk identified. Once accredited, maintaining accredited status requires annual submission and approval of a compliance report, and requires that a full application be submitted to CFAI every five years that includes all supporting documents.

In November of 2020, the 10th edition of the CFAI model was published after a two-year revision process. The revision process benefited from widespread industry involvement, constituting major advancement for the CRR concept. In the press release announcing the new edition, CPSE’s chief executive officer proudly highlighted a “primary focus on the changing needs of communities” going a step further with “a shift in the types of services provided by departments.”⁷⁷ In the new edition, all types of services provided by an agency (e.g., fire suppression and EMS) are now categorized as various programs under the umbrella of CRR. Each program should be designed to address findings from the community risk assessment, track performance metrics, focus on outcomes, and identify the impact on the community. This restructuring of all programs and services under the umbrella of CRR is a step in the right direction as it both validates and formalizes a shift in the fire service toward a more inclusive and comprehensive approach to addressing risk in our communities. Unfortunately, there is little to no mention in the 10th edition of the social determinants of health, their impact on community risk, or the need to engage public health in the analysis of risk, program design, or delivery of services.

Also in 2020, the NFPA formalized CRR with its development and release of national standard NFPA1300 on *Community Risk Assessment and Community Risk*

⁷⁶ “Accredited Agencies,” Center for Public Safety Excellence, accessed July 31, 2022, <https://www.cpse.org/accreditation/accredited-agencies/>.

⁷⁷ “CPSE Publishes Quality Improvement for the Fire and Emergency Services Book,” Center for Public Safety Excellence, November 5, 2020, <https://cpse.org/2020/11/05/cpse-publishes-quality-improvement-for-the-fire-and-emergency-services-book/>.

*Reduction Plan Development.*⁷⁸ Recognizing that most localities may not have the capabilities to perform their risk assessments, in July 2021, NFPA debuted a new tool called CRAIG 1300, the NFPA Community Risk Assessment Insight Generator.⁷⁹ Further discussion of this tool is included in Chapter IV of this thesis which compares different risk assessment tools and models in use today.

In some of the more progressive localities that have embraced the CRR concept, the identification and prioritization of risk have been the catalyst to create MIH or CP programs as part of an overall CRR strategy. Most emerging MIH-CP programs were created because an analysis of historical emergency incident data revealed “frequent utilizers” of the 911 system who inappropriately use EMS as their primary medical care.⁸⁰ Often these cases do not need emergent medical attention but rather a case management approach to connect the caller to other resources, such as social or human services available in the community. In some cases, the emergency response may help the individual access social or another support service to resolve an immediate need; however, most of these calls signal underlying social and structural issues further upstream that need to be addressed.

C. MOBILE INTEGRATED HEALTHCARE AND COMMUNITY PARAMEDICINE

There has been a significant influx of MIH-CP programs created and in operation throughout the United States over the last decade in response to the growing non-emergency use of EMS resources. These interdisciplinary programs vary widely with

⁷⁸ National Fire Protection Association, *Standard on Community Risk Assessment and Community Risk Reduction Plan Development*, NFPA 1300 (Quincy, MA: National Fire Protection Association, 2020), <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1300>.

⁷⁹ “NFPA Announces Launch of CRAIG 1300, an All-New Community Risk Assessment Insight Generator That Helps Identify, Assess, and Mitigate Public Safety Risks,” National Fire Protection Association, July 21, 2021, <https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/News-releases/2021/NFPA-announces-launch-of-CRAIG-1300-an-all-new-Community-Risk-Assessment-Insight-Generator>.

⁸⁰ Bryan Y. Choi, Charles Blumberg, and Kenneth Williams, “Mobile Integrated Health Care and Community Paramedicine: An Emerging Emergency Medical Services Concept,” *Annals of Emergency Medicine* 67, no. 3 (March 2016): 361–66, <https://doi.org/10.1016/j.annemergmed.2015.06.005>.

differing missions depending on locality. Many programs consist of a team of providers who visit the home of someone who calls 911 frequently with the intent of reducing the recurrence of calls to 911 for emergency responses. At the time of the research for this thesis, there was no nationally adopted standard for the creation and development of MIH-CP programs. As noted previously, CFAI does not yet recognize MIH-CP as an established program in their latest edition even though the MIH-CP concept is fundamentally a community-based risk reduction strategy. The inclusion of MIH-CP in the CRR framework by CPSE would help to provide structure and validation of the emerging innovation.

In 2016, the Research Foundation at the NFPA endeavored to create a guidance document to support the development of fire-based MIH-CP programs and services. In their research, they concluded that the primary purpose of MIH-CP programs was to provide health care “to patients on location and to minimize trips to the hospitals.”⁸¹ It is worth noting that their research defined MIH and CP separately, but since 2016 the terms have been used interchangeably. In this thesis, MIH-CP is used as an umbrella term to encompass the various models of out-of-hospital preventative care discussed in this thesis.

Also in 2016, following the 50th anniversary of the Wingspread Conference, over fifty national fire service leaders published the Wingspread Report VI which included a call to action for the United States fire and emergency services to “adapt its emergency medical resources into a more robust, integrated mobile healthcare system.”⁸² The action plan to support this initiative outlined steps to create a new framework for oversight of the “next generation of EMS including community paramedicine.”⁸³ However, the vision for the plan makes no mention of establishing outcome measures or identifying key partnerships to inform future upstream solutions. A review of many of the more established MIH-CP programs suggests that efforts to date have been constructed in response to trends

⁸¹ Sreenivasan Ranganathan, *Fire Based Mobile Integrated Healthcare and Community Paramedicine (MIH & CP)—Data and Resources* (Quincy, MA: Fire Protection Research Foundation, 2016), 42, <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Emergency-responders/RFFireBasedMobileIntegratedHealthcareCommunityParamedicineDataResources.ashx>.

⁸² Johnson Foundation at Wingspread, *Wingspread VI: Statements of National Significance to the United States Fire and Emergency Services* (Racine, WI: Johnson Foundation at Wingspread, 2016), <https://strategicfire.org/wp-content/uploads/2017/02/Wingspread-Report-2016-1.pdf>.

⁸³ Johnson Foundation at Wingspread.

in historical incident data at the individual level rather than studying public health trends. The Wingspread Conference is typically held every 10 years; however, the decision to hold Wingspread VII in 2021, five years early, was based on the “rapid changes taking place . . . as compared to the last 50 years,” citing particular growth in the area of community paramedicine.⁸⁴ Once again, the need for MIH-CP programs was highlighted as one of the 12 national areas of significance, but unfortunately the vision remains limited in its framing of the complexity of the challenge.

Often the creation of an MIH-CP program occurs in response to a persistent problem rather than as a result of a comprehensive risk assessment and identification of needs. As Iezzoni, Dorner, and Ajayi note in their article “Community Paramedicine—Addressing Questions as Programs Expand,” the majority of MIH-CP efforts attempt to solve one of three common issues: readmission rates at emergency departments, a healthcare gap in very rural settings, or the fire service problem of rising costs of operating large apparatus as compared to a smaller deployment model.⁸⁵ The third of these issues was explored more in-depth by Tyler McCoy in his 2019 CHDS thesis. He analyzed 10 fire departments in the United States and offered the establishment of an MIH-CP as one of his recommendations to reduce costs and meet service demands.⁸⁶

In the last five years, there has been an increase in emergency responses to behavioral health crises for both police and fire/EMS services. Furthermore, the COVID-19 pandemic has been described as having a syndemic effect on society as it exacerbates the conditions of social inequality such as poverty, stress, and violence, which in turn

⁸⁴ Johnson Foundation at Wingspread.

⁸⁵ Lisa I. Iezzoni, Stephen C. Dorner, and Toyin Ajayi, “Community Paramedicine—Addressing Questions as Programs Expand,” *New England Journal of Medicine* 374, no. 12 (2016): 1107–109, <https://doi.org/10.1056/NEJMp1516100>; Manatt, Phelps & Phillips, LLP, “CMS Promotes Community Paramedicine in Medicare and Medicaid,” JD Supra, September 19, 2019, <https://www.jdsupra.com/legalnews/cms-promotes-community-paramedicine-in-98139/>; “Community Paramedicine,” Rural Health Information Hub, accessed December 14, 2019, <https://www.ruralhealthinfo.org/topics/community-paramedicine>; Tyler B. McCoy, “Optimize or Die: Implementing Dynamic and Innovative Deployment Models for Fire Departments” (master’s thesis, Naval Postgraduate School, 2019), <https://calhoun.nps.edu/handle/10945/64024>.

⁸⁶ McCoy.

contribute to poor mental health.⁸⁷ Police calls for service to behavioral health incidents often escalate and result in unnecessary imprisonment or, even worse, police-involved deaths. Since 2015, 21 percent of the victims of police-involved shooting deaths (a total of 1,618 people) had some type of mental illness.⁸⁸ This latest development has created a national call to action to create another version of the MIH-CP program, one that includes a mental/behavioral health specialist as part of the response team.

In a report entitled *EMS 3.0* produced by NASEMSO in 2016, the authors suggest that EMS should follow the trend of the Institute of Healthcare Improvement (IHI)’s aim to “improve the health of populations” as well as “improve the patient experience of care” and “reduce the per capita cost of health care.”⁸⁹ The paper goes on to focus on the concept of EMS 3.0 as a value proposition for the health care system using improved patient outcomes and reduction of costs as performance measures for success. An extensive study of 803 articles written about community paramedicine between 2005 and 2018 was published in 2019 and concluded that most MIH-CP initiatives attempt to provide a more comprehensive preventative service aimed at reducing unnecessary transports to emergency departments.⁹⁰ This same study acknowledged that MIH-CP efforts are typically not integrated into a broader health and human services strategy; however, it offered no recommendations for better coordination among public health and safety partners. Such a strategy could identify risks proactively to prevent the conditions that lead to the need for additional services.

⁸⁷ Stefan Boes et al., “How to Capture the Individual and Societal Impacts of Syndemics: The Lived Experience of COVID-19,” *BMJ Global Health* 6, no. 10 (2021): e006735, <https://doi.org/10.1136/bmjgh-2021-006735>.

⁸⁸ “Fatal Force: Police Shootings Database,” *Washington Post*, accessed July 31, 2022, <https://www.washingtonpost.com/graphics/investigations/police-shootings-database/>.

⁸⁹ “EMS 3.0: Realizing the Value of EMS in Our Nation’s Health Care Transformation,” National Association of State EMS Officials, accessed April 18, 2021, <https://nasemso.org/wp-content/uploads/EMS-3.0-Initiative-Paper-Final-for-Association-Endorsement-and-Leadership-Participation-19Ap.pdf>.

⁹⁰ Tuija Rasku et al., “The Core Components of Community Paramedicine—Integrated Care in Primary Care Setting: A Scoping Review,” *Scandinavian Journal of Caring Sciences* 33, no. 3 (2019): 508–21, <https://doi.org/10.1111/scs.12659>.

D. MOBILE INTEGRATED HEALTHCARE-COMMUNITY PARAMEDICINE CASE STUDIES

The following evaluation of five MIH-CP programs from around the United States highlights the diversity of approaches to this rapidly emerging healthcare model. These programs were selected for their innovation, approach to program design, recognition among industry peers, and availability of information about their programs. The study was guided by three questions:

1. What type of assessment or tools were used to establish the goals and objectives of the program?
2. How are health outcomes measured?
3. What level of health change opportunity is addressed with this program?
(Where in the stream is this program?)

1. Los Angeles Fire Department’s Mobile Integrated Health Care Unit

The Los Angeles Fire Department (LAFD) is the second largest municipal EMS agency in the United States.⁹¹ Over five years, from 2015 to 2020, the LAFD evolved its EMS system from a traditional model transporting all patients to an emergency department. Now, the LAFD provides a range of options, including transport to alternate care destinations and telehealth options initiated by the 911 center or field units, that do not require patients to leave their homes. Connecting patients to health care using a virtual platform, when the issue can be handled virtually, prevents unnecessary time and effort on the part of the patient as well as the medical unit.⁹²

a. What type of assessment or tools were used to establish the goals and objectives of the program?

Operating a big system has the distinct advantage of access to large data sets and a sophisticated data system, which has allowed LAFD to conduct an in-depth analysis of

⁹¹ Stephen Sanko and Marc Eckstein, “Mobile Integrated Health Care in Los Angeles: Upstream Solutions to Mitigate the Covid-19 Pandemic,” *NEJM Catalyst Innovations in Care Delivery* 2, no. 2 (2021), <https://doi.org/10.1056/CAT.20.0383>.

⁹² Sanko and Eckstein.

their historical incident data from 2012–2016. This analysis revealed a 400 percent increase over five years in frequent utilizers of the 911 system and an overall increase of 4–8 percent each year in the number of EMS incidents due to inadequate healthcare services for patients who were chronically ill, dealing with substance abuse, or experiencing mental health crises. The analysis also revealed an increase in the cost per call for both the patient and the LAFD to operate.⁹³

The EMS Bureau of LAFD is led by its Medical Director and Commander, Mark Eckstein, a medical doctor who started his medical career as a New York City paramedic. He has been with the LAFD for 23 years following his emergency medicine residency and in 2007 earned a master’s degree in public health with a concentration in homeland security. Dr. Eckstein was responsible for the redesign of the LAFD’s EMS Bureau and services including pioneering a public-private partnership for LAFD’s MIH unit. The partnership includes the major hospital networks as well as public health and human services agencies in the area. This partnership led to the tiered system of services and specialty units in operation today. It also provided an opportunity to conduct monthly case reviews and sessions to cross-train MIH providers in public health trends and evidence-based practices.⁹⁴

b. How are health outcomes measured?

Health outcomes within the LAFD EMS system are measured using a combination of data points such as patient determination, level of care provided, acuity, and patient satisfaction.⁹⁵ By implementing a tiered system of response including dispatch-initiated and field-initiated telemedicine, the care provided overall more appropriately aligns with the acuity of the patient. An internal study of patient satisfaction with services and costs, comparing the LAFD’s traditional model of EMS versus MIH-CP, revealed that patient

⁹³ Sanko and Eckstein.

⁹⁴ Sanko and Eckstein.

⁹⁵ Sanko and Eckstein.

satisfaction with the MIH-CP model increased by 25 percent and the costs were reduced by approximately 60 percent.⁹⁶

A summary of data and improved outcomes led to the LAFD's selection for participation in a pilot program with the Centers for Medicare and Medicaid Services known as the Emergency Triage, Treat, and Transport (ET3) Model. The ET3 Model is a program that allows EMS to collect payment using alternative models of care and intervention.⁹⁷

c. What level of health change opportunity is addressed with this program? (Where in the stream is this program?)

In addition to being able to provide telemedicine options for the initial 911 patient contact, the LAFD has been piloting follow-up phone calls within 24 hours of the initial call to conduct a welfare check and to ask about the patient's experience with the novel care system. The variety of patient care models allows the LAFD to provide less invasive and expensive care for their patients. It also provides connections to partner services outside of the EMS system, such as the "Housing for Health" office, which provides permanent housing to homeless individuals.⁹⁸ The next steps identified for the LAFD EMS program include developing partnerships to resolve an ongoing challenge of patient/client database integration. LAFD EMS has also identified the need to engage hospital administrators, insurance providers, public health, and EMS medical directors to create more sustainability for these new models of care. In describing the value added by these models during the pandemic, Eckstein wrote that "although little attention has been paid to EMS in the past, the current pandemic has made it abundantly clear that the next frontier

⁹⁶ Sanko and Eckstein.

⁹⁷ "Emergency Triage, Treat, and Transport (ET3) Model," Centers for Medicare and Medicaid Services, accessed August 28, 2021, <https://innovation.cms.gov/innovation-models/et3>.

⁹⁸ "Housing for Health: Assessing the Cross-Sector Impacts of Providing Permanent Supportive Housing to Homeless High Utilizers of Health Care Services," Systems for Action, accessed August 28, 2021, <https://systemsforaction.org/projects/housing-health-assessing-cross-sector-impacts-providing-permanent-supportive-housing-homeless-high>.

in managing acute, unscheduled care will require collaborating with pre-hospital experts to unlock the upstream value of outpatient navigation.”⁹⁹

In summary, LAFD has a robust system with a lot of resources and the ability to partner with specific alternative services; however, it is unclear if this model is scalable for smaller communities. The biggest takeaway from the LAFD model is the value of embracing services as an iterative process and involving many diverse partners.

2. Colorado Springs Fire Department’s Community Assistance, Referral and Education Services

In researching the various MIH-CP programs around the country recognized for their contribution to the growing trend, the Colorado Springs Fire Department (CSFD) stood out as the only system that has worked with their respective public health agency in the development of their program. In 2012, the CSFD created a Community and Public Health Division. The division initially launched a program called Community Assistance, Referral and Education Services (CARES) but has since grown several pilot programs within CARES and now views CARES as an intensive navigation umbrella that allows them to create targeted, scalable programs like their Aging in Place Program (APP), an elderly support program, their Community Response Team, a mobile mental health unit and the Homeless Outreach Program (HOP).¹⁰⁰

a. What type of assessment or tools were used to establish the goals and objectives of the program?

Each program was developed using an assessment customized to the program to measure relevant data about the individual pre- and post-contact with the program. An example is the self-sufficiency assessment that is conducted for each elderly client that participates in the APP. Each of the program assessments has defined goals and objectives with scaled metrics to enable tracking of progression or regression in the program. The

⁹⁹ Sanko and Eckstein, “Mobile Integrated Health Care in Los Angeles.”

¹⁰⁰ “Community and Public Health (CARES),” City of Colorado Springs, accessed September 21, 2022, <https://coloradosprings.gov/fire-department/page/community-and-public-health-cares>.

HOP conducts a housing assessment that includes medical, behavioral, financial, and social components as part of the intake for the program.¹⁰¹

b. How are health outcomes measured?

When a patient enters one of the programs, they sign a consent to be tracked for 12 months. The first six months are an initial intensive period of intervention where a “navigator” is assigned, and additional services are engaged to assess the patient and help develop collaborative solutions with the patient. One element of their program that stands out is the use of a software platform that integrates databases for EMS, law enforcement, healthcare, public health, and behavioral health services allowing all of the services to view a complete picture of the patient when a contact is made. A “community health record” is created for each patient which allows all members of the person’s support team to view their progress. This collaborative system allows for more comprehensive data and outcome analysis.¹⁰²

c. What level of health change opportunity is addressed with this program? (Where in the stream is this program?)

Much like other MIH-CP programs, CARES targets specific health issues and applies a proactive preventative model of care. Getting to the root causes of problems requires collaboration and sharing of information. By creating a holistic community health record across the different disciplines, a complete picture including a patient’s social determinants of health can be tracked and monitored. The CSFD is an active member of the Community Health Partnership, which is a regional multi-disciplinary team of professionals committed to addressing complex social problems in their area. Working with this group regionally, coupled with the shared case management software, are steps in the right direction to get further upstream. The use of assessments pre- and post-contact allows the CSFD to track their effectiveness at the individual level as well as at the program

¹⁰¹ Colorado Springs Fire Department, *2019 Annual Report: Community & Public Health* (Colorado Springs: Colorado Springs Fire Department, 2019), https://coloradosprings.gov/sites/default/files/inline-images/2019_commpubhealth_yearly_report.pdf.

¹⁰² City of Colorado Springs, “Community and Public Health (CARES).”

level, and it demonstrates their commitment to continuous improvement. The CSFD has two medical directors: one primary doctor for the providers within the general operations division of the department, and a secondary or assistant director who oversees the Community and Public Health division. It appears that at least one if not both of the doctors currently holding these positions have been experienced public health practitioners with a master's degree in public health.

There are two distinct innovations of this program that stand out: the integration of public health doctors and the use of a collaborative case management software platform. Including doctors with a background in public health in the vision work enabled a more holistic result. The use of a collaborative software platform connects otherwise disjointed systems. Also, it is worth noting that this program falls under Colorado's Office of EMS which has a regulatory mechanism for community paramedicine endorsements; however, Community Assistance and Education Services are unregulated.¹⁰³

3. Acadian Health and Ambulance Services

Acadian Services is an employee-owned, accredited agency that has been providing emergency healthcare services through its ambulance division for five decades. While not a fire-based EMS system this program was selected for inclusion in this analysis for its longevity in EMS service delivery. This program was originally designed to reach rural or urban patients who are either too far away, unwilling, or unlikely to seek healthcare services and subsequently live in poor health. Established in 1971, Acadian is one of the largest ambulance service providers in the United States and is often annually ranked in the top five.¹⁰⁴ Their service area includes the majority of the State of Louisiana as well as a large portion of Texas as well as a few counties in Mississippi and Tennessee with both ground and air ambulance facilities.¹⁰⁵

¹⁰³ Colorado Springs Fire Department, *2019 Annual Report*.

¹⁰⁴ "Partners We Serve," Acadian Health, accessed July 31, 2022, <https://acadian.com/ahpartners/>.

¹⁰⁵ "Why Choose Acadian," Acadian Health, accessed July 31, 2022, <https://acadian.com/health/>.

a. *What type of assessment or tools were used to establish the goals and objectives of the program?*

The Acadian Health model is centered around partnerships with the major healthcare providers including accountable care organizations, hospitals, hospice providers, and skilled nursing facilities. By serving as “clinical extenders” for patients with chronic or acute conditions, Acadian Health’s goals include reduction in costs for at-risk populations, providing care at home to prevent hospitalization, and improved patient and provider satisfaction.¹⁰⁶

b. *How are health outcomes measured?*

Acadian Health’s program has been designed as a value-based proposition to optimize the limited healthcare resources in the impoverished areas served. The outcomes highlighted in a news story from their website include shortened lengths of stay at hospitals, reduced emergency department utilization, and lower costs of care for non-life-threatening conditions.¹⁰⁷ Richard Belle, Operations Director for Acadian Health, credits the pandemic with the proliferation of at-home care models through telehealth platforms and trained clinical extenders. He goes on to explain that in the past three years their teams have treated “approximately 3,000 sick but stable patients in their homes, resulting in a savings of approximately \$5 million a year by safely treating 98% of actionable cases in the home.”¹⁰⁸

c. *What level of health change opportunity is addressed with this program? (Where in the stream is this program?)*

This program focuses on keeping patients in their homes and providing a connection to the patient’s care teams to supply “real-time feedback . . . related to patient living conditions, diet and other social determinants of risk.”¹⁰⁹ Because this service

¹⁰⁶ Acadian Health.

¹⁰⁷ Acadian Health, “At-Home Acute Care Reduces Unnecessary Emergency Department Visits,” Globe Newswire, April 6, 2022, <https://www.globenewswire.com/news-release/2022/04/06/2417936/0/en/At-Home-Acute-Care-Reduces-Unnecessary-Emergency-Department-Visits.html>.

¹⁰⁸ Acadian Health.

¹⁰⁹ Acadian Health.

delivery system is directly tied to the healthcare system across an expansive geographic area, the agency has effectively shifted the continuum of care out of the hospital and brought the health change opportunity further upstream than most programs. As an extension of the patient’s physician network and healthcare team, Acadian Health offers ongoing support and engagement with patients to effect behavioral change and directly address the SDOH.¹¹⁰

4. Northwell Health System—Center for Emergency Medical Services Community Paramedicine Program

Northwell Health is the 14th largest healthcare system spanning the New York Metropolitan area with 23 hospitals and 830 outpatient clinics. Northwell operates the Center for Emergency Medical Services which is one of the largest hospital-based ambulance systems in the United States covering over 1,800 square miles with a variety of service delivery models.¹¹¹ Also not a fire-based EMS system this program was selected for inclusion in this analysis because it is the only ambulance agency in New York State to be dually accredited by the Commission on Accreditation of Ambulance Services as well as the International Academies of Emergency Dispatch, an achievement that speaks to its commitment to continuous improvement and excellence. One of the service models offered by Northwell is their community paramedicine program in which the paramedics operate as “physician extenders.”¹¹²

a. What type of assessment or tools were used to establish the goals and objectives of the program?

Northwell expanded an existing inter-facility transport system, developing an emergency response system that can integrate into New York City’s emergency response system during surge periods when the Fire Department of New York’s EMS units are busy or Northwell units are closer. Given this objective, studying the historical call data to

¹¹⁰ Acadian Health, “Partners We Serve.”

¹¹¹ “About CEMS,” Northwell Health, accessed August 21, 2021, <https://www.northwell.edu/center-for-emergency-medical-services>.

¹¹² Northwell Health.

determine peak call volume periods and thus the periods of operation for their MIH-CP program became a primary objective for the program.¹¹³

b. How are health outcomes measured?

Data collected within the Northwell MIH-CP program includes a host of system output data such as medication given (frequency, type, amount), treatment provided, number of transports to emergency departments, and number of readmissions avoided. Also collected are operational statistics such as response times, time on the scene, and the call disposition. A patient satisfaction survey is distributed, and qualitative data is collected from that. Through their quality assurance program, specific data points about patient care are tracked and reviewed for all patient contacts and aggregate data is monitored for trends. There is no indication from any of their program materials that neither short nor long-term health outcomes are measured or tracked.¹¹⁴

c. What level of health change opportunity is addressed with this program? (Where in the stream is this program?)

Given that this program exists within the framework of a healthcare system with a medical education center, it might be expected to be more advanced in available resources to address a patient's SDOH. However, there is little indication that any action is taken to address patients' structural and social issues. There is one data point collected as part of the "expanded secondary assessment," listed as "environmental/living conditions," which could potentially be used to identify and improve a specific SDOH.¹¹⁵

5. Baltimore City Fire Department Mobile Integrated Healthcare—Community Paramedicine

Established in 2018, this program is a partnership between the University of Maryland Medical Center, the University of Maryland's Baltimore campus, and the Baltimore City Fire Department. While still in its infancy as a pilot initiative, the Baltimore

¹¹³ Northwell Health.

¹¹⁴ "Communications Center," Northwell Health, accessed September 19, 2022, <https://www.northwell.edu/center-for-emergency-medical-services/communications-center>.

¹¹⁵ Northwell Health, "About CEMS."

City Fire Department MIH-CP program has identified “improved coordination of medical, behavioral and social services” and “improved patient care by offering ways patients can better manage their health” as two initial goals.¹¹⁶ The program is divided into two main functional areas. One, called Transitional Health Support, provides continuity of care for high acuity patients being discharged from the medical center. The second program is called Minor Definitive Care Now and provides care for low-acuity patients who are triaged by the 911 system.

a. What type of assessment or tools were used to establish the goals and objectives of the program?

The Transitional Health Support program’s objectives include reducing readmission rates for the 30 days following discharge, improving care coordination across a full spectrum of medical and social services, and avoiding the use of the emergency response system by providing intensive preventative care. The Minor Definitive Care Now program strives to keep life-saving EMS resources available for higher acuity patients by taking care of the lower acuity 911 incidents. It does not appear that any type of needs assessment was conducted other than the identification of an increase in both types of services.¹¹⁷

b. How are health outcomes measured?

Health outcomes within the Baltimore City Fire Department MIH-CP program have been measured against the program’s stated objectives, such as reducing readmission rates, contrasting this data with patients not enrolled in the program. The program is tracking several output measures to highlight efficiencies gained, such as the total time spent with patients and emergency department wait times. There do not appear to be specific health

¹¹⁶ “Mobile Integrated Health—Community Paramedicine Program Launches to Advance Healthcare in West Baltimore,” University of Maryland Medical Center, February 5, 2019, <https://www.umms.org/ummc/news/2019/mobile-integrated-health>.

¹¹⁷ University of Maryland Medical Center.

outcomes that are being measured; however, both programs are also using patient satisfaction surveys to track qualitative measures.¹¹⁸

*c. What level of health change opportunity is addressed with this program?
(Where in the stream is this program?)*

In the second term of the pilot program, the scope of care provided was expanded to include visits to enrolled patients by community health and social workers.¹¹⁹ These providers are used to identify social and human services that can be provided to patients, such as housing and meal vouchers for more nutritious foods. Following the second term of the program several next steps were identified including the need to conduct research and seek expert assistance to build a more robust data management system.¹²⁰ Such a system would enable the development of more outcome measures and improve effectiveness and efficiency.

E. SUMMARY—KEY FINDINGS

The MIH-CP service delivery model is a relatively new concept with no associated national standard and therefore the development of new programs varies greatly. All the programs reviewed in this chapter demonstrated understanding of the need to integrate with social or human services support, but the extent of direct integration with the public health field varied. For the LAFD and CSFD programs, having an operating medical director who not only is a medical doctor with expertise in emergency medicine but also has a master of public health (MPH) degree with public health expertise has helped bridge the gap between public health and public safety.

There is a lack of good aggregate data or a centralized database of MIH-CP programs, making it difficult to use lessons learned from these programs to guide the structuring of future programs and to identify key metrics to track. Traditional EMS data is focused only on patient outcomes of the most critically ill. Limited data or research exists

¹¹⁸ University of Maryland Medical Center.

¹¹⁹ University of Maryland Medical Center.

¹²⁰ University of Maryland Medical Center.

about access to health care and other support services related to patient outcomes. Without a set of metrics or standards to measure outcomes it is difficult to determine effectiveness beyond patient satisfaction and reduction of costs overall. Further assessment and outcome data are needed to be able to assist public health to identify and address macro-level issues.

THIS PAGE INTENTIONALLY LEFT BLANK

IV. RESEARCH AND COMPARATIVE ANALYSIS: ASSESSMENT AND EVALUATION TOOLS

As identified in Chapter III, more effective integration of public health and public safety will require data to better inform the development of new programs and evaluate existing ones. This chapter is a comparative analysis of various health and risk assessments used by public health professionals to inform the work that they do. Understanding how each tool was developed, which stakeholders provided input, and how the information is used provides a basis for identifying opportunities for integration with public safety, specifically EMS.

A complementary analysis was initially planned for comparable assessment tools used by fire and EMS professionals; however, given the relative infancy of the MIH-CP concept and its limited emergence at the local level to address targeted needs, as yet there is no comprehensive assessment tool for fire and EMS in use. As discussed in Chapter III, most data used to inform the design of programs are based on historical EMS data and therefore only address symptoms of what is often a larger need or problem. This chapter includes an analysis of two national evaluations of EMS systems to understand and inform future growth.

The research into various assessment and evaluation tools, selected for their relative importance to public health or fire/EMS, was shaped by the following questions:

1. How was outreach conducted and/or what stakeholders were included in the development of the tool?
2. How were the metrics to assess or evaluate selected?
3. How is the information that is gathered used?
4. What level of health change opportunity is addressed with this tool?
(Where in the stream is this program?)

A. CENTER FOR DISEASE CONTROL’S SOCIAL VULNERABILITY INDEX

The only context in which public health and public safety collaboration is formally practiced and expected is during times of major crises such as disasters, pandemics, or other public health crises. The CDC has defined social vulnerability as “the resilience of communities when confronted by external stresses on human health;” however, this definition is used in the limited context of disasters or disease outbreaks.¹²¹

1. How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?

The Social Vulnerability Index (SVI) was created in 2011 by the Geospatial Research, Analysis, and Services Program (GRASP) in coordination with the CDC and the Agency for Toxic Substances and Disease Registry. The team that developed the SVI included five members with backgrounds in public health, technology, geospatial analysis, and other social science skills. Today, there are over 85 members of the team within GRASP who continue to maintain and update the data.¹²²

2. How Were the Metrics to Assess or Evaluate Selected?

Using 15 different data points from the U.S. Census data, the SVI can be used by all levels of government (local, state, and federal) as the source data can be examined down to the census tract. In 2021, the Office of Minority Health within HHS partnered with GRASP to launch an extension to the SVI entitled the Minority Health SVI which includes additional specific factors for race and ethnicity.¹²³ The American Community Survey, conducted by the U.S. Census, is the primary source of data for the SVI among many other tools that rely on the data. In 2020 amidst the pandemic, the Census Bureau announced it

¹²¹ “At A Glance: CDC/ATSDR Social Vulnerability Index,” Agency for Toxic Substances and Disease Registry, accessed September 21, 2022, https://www.atsdr.cdc.gov/placeandhealth/svi/at-a-glance_svi.html.

¹²² “Getting to Know GRASP,” Agency for Toxic Substances and Disease Registry, accessed September 21, 2022, https://www.atsdr.cdc.gov/placeandhealth/getting_to_know_grasp.html.

¹²³ Agency for Toxic Substances and Disease Registry, “CDC/ATSDR Social Vulnerability Index.”

would not be releasing its annual data citing challenges associated with data collection and the potential for inaccuracy due to the pandemic.¹²⁴

3. How Is the Information that Is Gathered Used?

The SVI is used by emergency planners, public health officials, state and local health departments, and non-profits to guide disaster operations in times of emergency as well as to inform community-based health promotion initiatives in non-emergency times. The SVI groups the data into four themed areas: socioeconomic status, household composition, race/ethnicity/language, and housing/transportation. The SVI maps the data geo-spatially and provides an interactive tool by which communities can check their relative vulnerability to major disasters and events. The maps can also be used for preparedness activities such as determining how many supplies would be needed, and the best way to evacuate people or areas in need of emergency shelters.¹²⁵ A study published in May of 2021 examined the association between COVID-19 case-fatality risk (CFR) and the SVI using national COVID-19 case data from the start of the pandemic thru February 3, 2021. The study determined that there is a significant relationship between CFR and SVI and recommended using the SVI to “guide prioritization of vaccines to communities most impacted by structural injustices.”¹²⁶

4. What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)

This tool could be used anywhere on the continuum of health change opportunities and lends itself well to being used as an upstream tool to proactively identify areas for targeted health outreach to prevent or improve poor health outcomes. However, the bulk of research available describes its use predominantly during the preparedness or mitigation

¹²⁴ “Why the 2020 American Community Survey Is Different and Why It Matters,” Population Reference Bureau, accessed August 29, 2022, <https://www.prb.org/articles/why-the-2020-american-community-survey-is-different-and-why-it-matters/>.

¹²⁵ “CDC’s Social Vulnerability Index (SVI),” Centers for Disease Control and Prevention, accessed September 21, 2022, <https://svi.cdc.gov/Documents/FactSheet/SVIFactSheet.pdf>.

¹²⁶ Jamie Song et al., “Injustices in Pandemic Vulnerability: A Spatial-Statistical Analysis of the CDC Social Vulnerability Index and COVID-19 Outcomes in the U.S.,” medRxiv, May 30, 2021, <https://doi.org/10.1101/2021.05.27.21257889>.

phases of a major emergency or disaster. It has also been used during the recovery phase and retrospectively to evaluate public health efforts post-disaster, most recently with COVID-19.¹²⁷ This type of need led to the Minority Health SVI expansion following the early phases of the COVID-19 response. While the expansion of the tool is still relatively new, it appears that more proactive future use of the SVI will be supported, including suggested strategic uses that are all upstream.¹²⁸

One criticism of the SVI suggests that its use is limited for small area analysis because it is based on census tract data at the county level.¹²⁹ The Minority Health SVI acknowledges that “county-level measures of vulnerability do not necessarily reflect the experiences of all individuals living in the county.”¹³⁰ Another criticism of the SVI is the likelihood that it is affected by “non-response bias,” which occurs when a specific demographic collectively does not respond or responds at significantly lower levels; for example, immigrants may not respond out of fear of deportation.¹³¹

B. NATIONAL HEALTH SECURITY PREPAREDNESS INDEX

The National Health Security Preparedness Index (NHSPI) was developed in 2012 by the CDC to create a methodology for measuring the nation’s ability to prepare for, respond to, and recover from disasters and major emergencies that have health implications. The index has four overarching goals: to enhance public awareness of national preparedness and capabilities; to encourage coordination and collaboration among different stakeholders; to inform planning, policy development, and quality improvement

¹²⁷ Song et al.

¹²⁸ Rebecca Mak, Minh Wendt, and Juliet Bui, “Using the Minority Health Social Vulnerability Index to Drive Equitable Public Health Efforts,” *Department of Health and Human Services, Office of Minority Health* (blog), August 23, 2021, <https://minorityhealth.hhs.gov/Blog/BlogPost.aspx?BlogID=3288>.

¹²⁹ Renuka Tipirneni and Paula Lantz, “Comparison of Social Vulnerability Index and Area Deprivation Index Assessing COVID-19 Outcomes,” University of Michigan Institute for Healthcare Policy and Innovation, June 11, 2021, <https://ihpi.umich.edu/news/comparison-social-vulnerability-index-and-area-deprivation-index-assessing-covid-19-outcomes>.

¹³⁰ “National Minority Mental Health Awareness Month,” Department of Health and Human Services, Office of Minority Health, accessed August 28, 2022, <https://www.minorityhealth.hhs.gov/minority-mental-health>.

¹³¹ Tipirneni and Lantz, “Social Vulnerability Index and Area Deprivation Index.”

of preparedness efforts; and to guide future research to improve preparedness and health security.¹³² The NHSPI creates a composite index score for each of the 50 states, as well as the nation as a whole. These scores are based on 130 measures grouped into six overarching domains and rely on data from 64 sources.

1. How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?

The NHSPI has been updated almost annually and engagement of various stakeholders has increased dramatically since its creation in 2013. In 2015, the Robert Wood Johnson Foundation took over responsibility from the CDC for publishing and maintaining the index. A research methodology workgroup was convened to decide which data points to include and to generally build the index.¹³³ Most of the original members of the workgroup were and continue to be public health or medical doctors and/or homeland security practitioners. There were no representatives from local public safety, fire, or EMS organizations despite their involvement in frontline response to such an event. One local-government emergency manager was included in the workgroup who has a background in public health as well as EMS. In personal communication with her, she identified that the biggest limitation in developing a national index like the NHSPI was the need for data that “translated across states so source data needed to be something standardized.”¹³⁴

This local-government emergency manager went on to say that, by default, the data included in the index was limited to existing data that had already been collected for other uses. She applauded the NHSPI effort as an “attempt to break down silos” referring to the coordination between public health and emergency management.¹³⁵ She described a process for workgroup member selection whereby the major national organizations in

¹³² National Health Security Preparedness Index Program Office, *Methodology for the 2019 Release: National Health Security Preparedness Index* (Lexington, KY: National Health Security Preparedness Index Program Office, 2019), https://nhspi.org/wp-content/uploads/2019/05/NHSPI_2019_Methodology.pdf.

¹³³ National Health Security Preparedness Index Program Office.

¹³⁴ Local-government emergency manager (identity withheld), personal communication, August 18, 2021.

¹³⁵ Local-government emergency manager.

public health and medicine were invited to send a representative and noted that there were a series of meetings to ensure the right people were included. She further described the engagement during the development phase of the index as each stakeholder lobbying for what they were most passionate about for inclusion. She characterized the exclusion of certain stakeholders, such as public safety, as an oversight stemming from a lack of strategic intentionality for inclusion. She also acknowledged a design flaw: too much emphasis was placed on metropolitan areas. The idea driving this emphasis was that gains from better prepared metropolitan areas would extend to surrounding, more rural areas. In actuality, she noted that the rural areas have fewer resources and may require an entirely different approach.

2. How Were the Metrics to Assess or Evaluate Selected?

Since the release of the initial index in 2013, significant research and analysis have followed to refine the index methodology and ensure the validity and reliability of the measures. Additionally, ongoing solicitation of new and modified measures as well as assessment of the availability, quality, and completeness of the data continues to this day. The NHSPI website has a mechanism for submitting suggestions to “shape the future of the index” and invites participation in webinars and other opportunities to engage, including a recent solicitation to apply to be on a local index advisory panel.¹³⁶

The latest version of the NHSPI was released in 2021. The original index contained six domains of health security activity which still provide the overall conceptual framework of the index however the subdomains have been expanded and refined since its inception. The domains with their respective subdomains can be found in Figure 2.

¹³⁶ “About National Health Security Preparedness Index,” National Health Security Preparedness Index Program Office, accessed August 28, 2022, <https://nhspi.org/about/>.

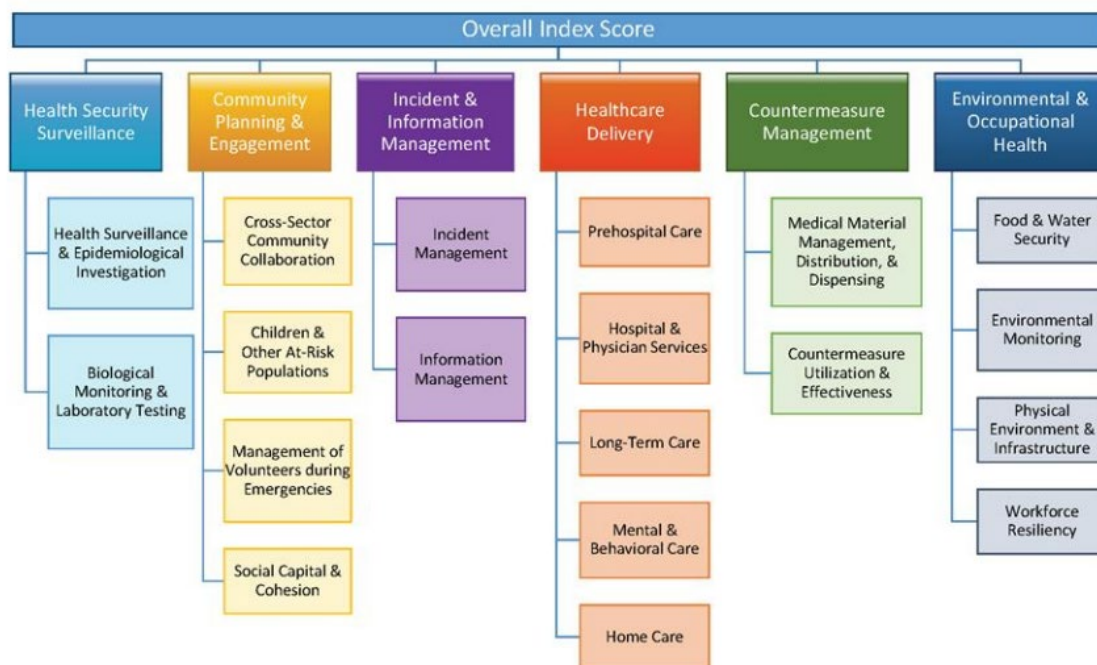


Figure 2. NHSPI 2021 Index Release Domains and Subdomains¹³⁷

In studying the domains and subdomains, the most immediate connection to fire and EMS is “Pre-hospital Care” identified as one of the subdomains within the “Healthcare Delivery” domain. A case could be made that there are other areas with a connection to fire and EMS within the “Incident & Information Management” and “Community Planning & Engagement” domains as well; however, this research focused primarily on the connection to “Healthcare Delivery.”¹³⁸

A comprehensive review of the index was conducted by going through each domain to search for the inclusion of public safety, fire, or EMS references related to the metrics assessed or sources of data. Domain 2 and Domain 4 were each found to contain a public safety reference. Domain 2, Community Planning & Engagement Coordination, includes Cross-Sector/Community Collaboration as Subdomain 2.1. Within the list of measures in Subdomain 2.1, the index includes the “percent of emergency medical service agencies in

¹³⁷ Source: National Health Security Preparedness Index Program Office, *Methodology for the 2019 Release*, 5.

¹³⁸ National Health Security Preparedness Index Program Office.

the state that participate in health care preparedness coalitions supported through the federal Hospital Preparedness Program of the Office of the Assistant Secretary for Preparedness and Response.”¹³⁹ This measure attempts to assess coordination between EMS and other sectors of response. While this measure is a way to gauge official linkages, it does not address the how or why underlying these connections. Participation in health care preparedness coalitions is completely voluntary and therefore this data point does not reflect the challenges associated with participation in preparedness coalitions and whether any unofficial outreach or linkages exist.

Domain 4, Healthcare Delivery, includes Pre-hospital Care as Subdomain 4.1. The corresponding list of measures includes the “number of EMTs and Paramedics per 100,000 population in the state.”¹⁴⁰ There are several limitations with this data point including underreporting as it is not mandatory to report this data. Also, the data does not distinguish whether or not the certified individuals are practicing, and/or how frequently; therefore, it does not reflect the true amount of care provided by pre-hospital care providers.

An additional measure collected in Domain 4 is the “percent of local EMS agencies that submit National EMS Information System compliant data to the state.”¹⁴¹ This is one of the few areas of the index that capture local-level data, but one of the limitations is that there is no consistent documentation or benchmarking. Interestingly, another limitation is that this data is not linked to any local data from emergency departments, police reports, or hospital datasets.¹⁴² Without a connection to other data sources such as patient data reported by emergency departments, it is difficult to understand the impact of pre-hospital care or get a full picture of patient outcomes.

¹³⁹ National Health Security Preparedness Index Program Office, *Measures List for 2019 Release* (Lexington, KY: National Health Security Preparedness Index Program Office, 2019), 8, https://nhspi.org/wp-content/uploads/2019/05/NHSPI_2019_Measures.pdf.

¹⁴⁰ National Health Security Preparedness Index Program Office, 13.

¹⁴¹ National Health Security Preparedness Index Program Office, 14.

¹⁴² “National Health Security Preparedness Index (NHSPI),” Robert Wood Johnson Foundation, accessed November 10, 2019, <https://www.rwjf.org/en/how-we-work/grants-explorer/featured-programs/national-health-security-preparedness-index.html>.

The research for this thesis did not include mental and behavioral health services, but it is worth noting that Subdomain 4.4, Mental & Behavioral Healthcare, contained three different metrics that indicate a significant gap in mental health services in this country and major structural issues/limitations with the current service delivery model. Pre-hospital EMS services respond to psychiatric emergencies daily and it appears that there is no standard definition of emergency psychiatric services and/or benchmarks for quality of services.

Subdomain 4.5, Home Care, contains only three metrics: flu shots given by home health, timely patient care by the home health team, and the number of home health and personal care aides per 1,000 population. As community paramedicine programs continue to grow, a case could be made for the inclusion of CP services within this subdomain.

3. How Is the Information that Is Gathered Used?

The NHSPI appears to be used primarily to further awareness of the need for increased health security preparedness at a strategic level.¹⁴³ Because it uses data from 64 well-established sources across a spectrum of sectors, it “provides a broad, multi-sectoral, and multi-dimensional view of preparedness” and can engage various stakeholders as intended.¹⁴⁴

4. What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)

The general assessment of the index, as compared to its stated goal of being used to measure national preparedness and ability to respond to and recover from major health emergencies and disasters, is that it has limited useful applications. The biggest limitation of the index is that it relies on a collection of existing data points, none of which were specifically designed and intended to be used as part of this index. In other words, the data

¹⁴³ Glen Mays, “Beyond the Numbers: Strategic Uses of the Index to Engage Communities and Shape Policies,” National Health Security Preparedness Index Program Office, March 19, 2019, <https://nhspi.org/blog/beyond-the-numbers-strategic-uses-of-the-index-to-engage-communities-and-shape-policies/>.

¹⁴⁴ “Nation’s Ability to Manage Health Emergencies Rises,” National Health Security Preparedness Index Program Office, accessed August 28, 2022, <https://nhspi.org/nations-ability-to-manage-health-emergencies-rises/>.

included is simply data that was already being collected for other purposes and in general provides limited value. Also, most of the data are only collected at the state level, not by city/county, and therefore are of limited value to inform future policy, prevention, or service delivery models at the city/county level.¹⁴⁵

When the 2021 version of the NHSPI was released, Glen Mays, the director of NHSPI, stated that the “COVID-19 pandemic provided a test of the health security and emergency preparedness systems around the country.”¹⁴⁶ He went on to describe the “stress test” of the healthcare and public healthcare systems and areas for improvement based on how we responded and performed as a nation in terms of our health preparedness and security. The incident management domain was one of the areas tested the most by COVID-19 and it proved its strength relative to the magnitude of the event, though a need for improved coordination between public health, health care, and emergency management was noted.¹⁴⁷ The other domain that was heavily tested during the pandemic was surveillance, which was hampered by supply chain issues that severely impacted testing capabilities. Mays stated, “COVID exposed the complexities of our laboratory system which involves not just public health labs but their interface with commercial and academic labs and the supply chains and staffing that they depend on.”¹⁴⁸

C. COMMUNITY HEALTH NEEDS ASSESSMENTS

According to the American Hospital Association, there are 6,090 hospitals in the United States, almost 80 percent of which are non-profit or government operated.¹⁴⁹ The Patient Protection and Affordable Care Act (ACA) of 2010 requires all tax-exempt, non-

¹⁴⁵ National Health Security Preparedness Index Program Office.

¹⁴⁶ Glen Mays and Eric Holdeman, “NHSPI Now: NHSPI’s Glen Mays & Eric Holdeman,” June 25, 2020, National Health Security Preparedness Index Program Office, video, 14:25, <https://nhspi.org/story/nhspi-now-glen-mays-eric-holdeman/>.

¹⁴⁷ Mays and Holdeman.

¹⁴⁸ Mays and Holdeman.

¹⁴⁹ “Fast Facts on U.S. Hospitals, 2021,” American Hospital Association, accessed August 25, 2021, <https://www.aha.org/statistics/fast-facts-us-hospitals>.

profit hospitals to complete a CHNA, including an associated implementation strategy, every three years for each location in their health care system.¹⁵⁰

1. How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?

As a requirement of the Internal Revenue Service, step three of the defined five-step development process to complete the CHNA states that the hospital will “solicit and take into account input received from persons who represent the broad interests of that community, including those with special knowledge of or expertise in public health.”¹⁵¹ Specifically, the input requires the inclusion of at least one public health official “with knowledge, information, or expertise relevant to the health needs of the community,” “members of medically underserved, low-income, and minority populations” served by the hospital, and any “written comments” that were received when the last CHNA was published.¹⁵² There is a list of possible additional sources that could be sought for input and the Internal Revenue Service recommends soliciting input from any source that could address concerns presented as written comments to previously published versions of the CHNA. Most of the additional sources recommended are organizations that have established relationships with the hospital such as health insurance providers, labor and workforce representatives and healthcare consumer advocate groups. “Local government officials” are also included on the list as a generic suggestion but no specific mention is made of public safety or pre-hospital provider input.¹⁵³

¹⁵⁰ Patient Protection and Affordable Care Act, Pub. L. No. 111–148, 124 Stat. 119 (2010), <https://www.congress.gov/bill/111th-congress/house-bill/3590/text>; “Requirements for 501(c)(3) Hospitals under the Affordable Care Act—Section 501(r),” Internal Revenue Service, accessed September 20, 2022, <https://www.irs.gov/charities-non-profits/charitable-organizations/requirements-for-501c3-hospitals-under-the-affordable-care-act-section-501r>.

¹⁵¹ “Community Health Needs Assessment for Charitable Hospital Organizations—Section 501(r)(3),” Internal Revenue Service, accessed August 25, 2021, <https://www.irs.gov/charities-non-profits/community-health-needs-assessment-for-charitable-hospital-organizations-section-501r3>.

¹⁵² Internal Revenue Service.

¹⁵³ Internal Revenue Service.

2. How Were the Metrics to Assess or Evaluate Selected?

The ACA does not define a specific standard for metrics that must be used to complete a CHNA; however, the CDC provides guidance as well as suggested sources for data and benchmark selection.¹⁵⁴ The CDC recommends the use of both primary or first-hand data such as surveys, interviews, and listening sessions as well as secondary data that has already been collected and is valid, reliable, and relevant to the specific needs of the community served. The CDC’s “Public Health Professionals Gateway” further provides a publicly available compilation of sources of community-level indicators, including those that have been benchmarked against other localities.¹⁵⁵

3. How Is the Information that Is Gathered Used?

Completion of the CHNA must also include an implementation strategy report. This report is intended to inform action plans to address health discrepancies identified as a result of the comprehensive assessment. As is the case with other community health improvement processes, the implementation strategy of CHNAs “[tends] to be less developed than the assessment and priority setting.”¹⁵⁶ How the information is used varies widely depending on how the implementation strategy is formatted and how the performance measures are developed.

4. What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)

The CHNA has the potential to be transformational in terms of the healthcare system’s position on the “upstream” continuum. This tool is designed to reorient the healthcare system to identify the drivers of poor health and create improvement strategies to address them. It is also the first formal mandate to require a linkage between hospitals and community partner organizations. Given the sheer volume of hospitals required to

¹⁵⁴ “Public Health Professionals Gateway: Data & Benchmarks,” Centers for Disease Control and Prevention, accessed September 21, 2022, <https://www.cdc.gov/publichealthgateway/cha/data.html>.

¹⁵⁵ Centers for Disease Control and Prevention.

¹⁵⁶ Michael A. Stoto, Mary V. Davis, and Abby Atkins, “Beyond CHNAs: Performance Measurement for Community Health Improvement,” *eGEMS* 7, no. 1 (2019): 45, <https://doi.org/10.5334/egems.312>.

complete a CHNA and the hospitals' ability to seek input from a wide range of stakeholders, there is a very real opportunity to create a finished product that identifies issues further upstream as well as an implementation strategy that has the potential to meaningfully impact a community. Unfortunately, the requirements for input are so broadly defined that the inclusion of key stakeholders such as emergency service providers may be overlooked. Reviewing a sample of CHNAs completed in 2019 from leading healthcare institutions (including the Cleveland Clinic Main Campus, Kaiser Permanente San Francisco, and Massachusetts General Hospital) revealed that methodologies varied widely in the identification of stakeholders, data sources, and formatting of their final report and implementation strategies demonstrating a lack of standardization of the assessment.¹⁵⁷

It is worth noting that some regional and state health departments have voluntarily chosen to use the CHNA as a tool more broadly in the public health setting. An example of this is a CHNA conducted by Maryland's Washington County Health Department to better align the efforts of the healthcare and public health systems.¹⁵⁸ The steering committee completing the CHNA used both qualitative and quantitative methods for data collection and analysis, conducting many different targeted community interviews and focus groups over three years. Their quantitative analysis relied heavily on a variety of existing secondary data sources from the CDC, Substance Abuse and Mental Health Services Administration, and Robert Wood Johnson Foundation, to name a few. Their primary data came from a health needs survey that was widely distributed to the community and resulted in a representative sample of 1,514 responses from Washington County adults. Targeted focus group interviews were conducted for various specific health concerns

¹⁵⁷ Cleveland Clinic, *Community Health Needs Assessment 2019* (Cleveland: Cleveland Clinic, 2019), <https://my.clevelandclinic.org/-/scassets/files/org/about/community-reports/chna/2019/2019-cleveland-clinic-main-campus-chna.pdf?la=en>; Massachusetts General Hospital, Center for Community Health Improvement, *2019 Community Health Needs Assessment Report* (Boston: Massachusetts General Hospital, Center for Community Health Improvement, 2019), <https://www.massgeneral.org/assets/mgh/pdf/community-health/cchi/20191016-chna-report.pdf>; "Community Health Needs Assessments," Kaiser Permanente, accessed September 20, 2022, <https://about.kaiserpermanente.org/community-health/about-community-health/community-health-needs-assessments>.

¹⁵⁸ Healthy Washington County, *FY2019 Community Health Needs Assessment* (Washington County, MD: Healthy Washington County, 2019), <https://washcohealth.org/wp-content/uploads/2019/05/FY2019-CHNA-Report-FINAL.pdf>.

(nutrition and physical activity, mental health, and substance abuse) as well as specific demographics including seniors' and men's health issues. Their published implementation strategy strikes a nice balance of providing high-level objectives with actionable outcome measures and references a data dashboard for visualization of the metrics and progress. The Washington County plan also assigns workgroups for each of the objectives with a variety of stakeholders to ensure accountability of implementation, an element missing in many plans.¹⁵⁹

The SVI, NHSPI, and Community Health Needs Assessment are widely used by healthcare and public health communities as foundational assessment tools. The following section examines two major evaluation tools of the national EMS system.

D. EMS SYSTEM EVALUATION

As noted in Chapter III, the EMS system in the United States is a fragmented system with statutory and regulatory oversight provided at local, state, and federal levels. As such, there is no centralized agency or organization responsible for ongoing monitoring or continuous improvement of the system. Fortunately, there are a few key organizations that seek to unite the field and strive to provide strategic foresight for the EMS system in the United States. Two of these organizations, NASEMSO and National Association of Emergency Medical Technicians (NAEMT), strive to improve the effectiveness of EMS systems nationally as well as to innovate in response to anticipated future healthcare needs throughout the country. Both organizations have been monitoring trends in EMS and have conducted respective evaluations of the national system within the last five years. Included below is an analysis of those evaluations to better understand the opportunity for improved collaboration with public health.

¹⁵⁹ Stoto, Davis, and Atkins, "Beyond CHNAS."

E. NASEMSO—2020 NATIONAL EMS ASSESSMENT

In 2020, NASEMSO with support from the NHTSA Office of EMS, published the *2020 National Emergency Medical Services Assessment*.¹⁶⁰ The work for this resource began in 2018, building on the original assessment produced in 2011.¹⁶¹ Within the 234-page summary report, there is limited reference or connection to public health aside from public health surveillance of outbreaks and terrorism.

1. How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?

Development of the 2020 assessment involved the completion of a survey comprised of 61 questions (with multiple sub-questions) sent to each of the state representatives in NASEMSO. Fifty-four of the 56 states and territories participated fully. Industry-adjacent technical experts were engaged in the development of specific sections. For example, representatives from the National Emergency Number Association and the Association of Public-Safety Communications Officials were approached for questions related to emergency medical dispatch.¹⁶²

2. How Were the Metrics to Assess or Evaluate Selected?

Most of the survey questions were repeated from the 2011 survey to provide the opportunity for comparative analysis. Some questions were updated to reflect current language and general terminology more closely. The assessment was organized using the same eight categories used in 2011, including organizations, professionals, communications, response, and patient care, information systems, workforce health and safety, funding, and disaster preparedness.¹⁶³

¹⁶⁰ “NASEMSO Releases 2020 National EMS Assessment,” National Association of State EMS Officials, April 9, 2020, <https://nasemso.org/news-events/news/news-item/nasemso-releases-2020-national-ems-assessment-2/>.

¹⁶¹ Federal Interagency Committee on Emergency Medical Services, *2011 National EMS Assessment* (Washington, DC: Department of Transportation, National Highway Traffic Safety Administration, 2012), https://www.ems.gov/pdf/2011/national_ems_assessment_final_draft_12202011.pdf.

¹⁶² National Association of State EMS Officials, “NASEMSO Releases 2020 National EMS Assessment.”

¹⁶³ National Association of State EMS Officials.

Once the survey was updated it was distributed for review by NASEMSO leadership as well as several partner associations such as the Pediatric Emergency Care Council for example. Five states were selected to participate in a pilot to evaluate the assessment and provide feedback to make it easier to complete.¹⁶⁴

3. How Is the Information that Is Gathered Used?

It is unclear how the information from the survey is used, other than to benchmark across states, analyze national and statewide trends, or support other research. In terms of national EMS systems-level analysis, what is evident from the data as compared to the 2011 survey is that, in 10 years, the EMS field has expanded significantly; the number of EMS agencies has risen 16.5 percent, the total number of vehicles has risen 8 percent, the number of EMS professionals has risen 27.5 percent, and the number of responses has grown by 16 percent. Interestingly, amidst all this growth the total percentage of increase in terms of the number of transports to facilities only increased 1 percent in 10 years.¹⁶⁵ This relative decline in transports and increase in specialty ground care and community paramedicine programs suggests a shift in the industry toward a different model of care.

4. What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)

The assessment survey asked questions about “Community Paramedicine-Type Services” and acknowledged that CP “helps meet unmet health needs in communities,” though most of the questions were related to the governance and state regulation of CP programs.¹⁶⁶ The survey revealed that 48 states offer CP programs and 32 of those have state regulations in place. Most of the states with regulations in place described them as new legislation related to the authority and statewide governance for CP programs. Several states described being in the process of formalizing standards, protocols, and CP curricula.

¹⁶⁴ National Association of State EMS Officials.

¹⁶⁵ Greg Mears, “2020 NASEMSO Survey Reflects Evolution of EMS Industry,” *ZOLL Data Systems* (blog), July 1, 2020, <https://www.zolldata.com/blog/the-national-ems-assessment-10-years-later>.

¹⁶⁶ National Association of State EMS Officials, “NASEMSO Releases 2020 National EMS Assessment.”

One state (Virginia) answered yes to the question of whether their CP programs are regulated by the state and responded that “some programs hold Home Healthcare Agency” licenses as well.¹⁶⁷

One of the “Response and Patient Care” questions was about the ability of units in the field that routinely receive electronic patient information “from another healthcare entity.”¹⁶⁸ Only 33 percent of the states with CP programs reported this capability. A question about data linkage and sharing capabilities asked specifically about the ability to report data to 10 different healthcare-related data systems for patient outcomes and dispositions but unfortunately, there was no linkage or reporting to any public health databases.

F. NAEMT’s MIH-CP—SECOND NATIONAL SURVEY RESULTS

In 2014, NAEMT conducted a national survey to better understand the status of emerging MIH-CP programs. The survey found that there were over 100 programs in existence across 33 states and several others that were in development.¹⁶⁹ In 2018, results from the second national survey were released, showing 129 programs captured by the survey.

1. How Was Outreach Conducted and/or What Stakeholders Were Included in the Development of the Tool?

NAEMT convened the “EMS 3.0 Committee” which was charged with researching the “new EMS value proposition” to evaluate the various service models in existence to understand their value. This working group was comprised of members from NAEMT, NASEMSO, the National Association of EMS Physicians, the National EMS Management Association, and the National Association of EMS Educators. This committee developed the survey with input from their respective associations. An extensive search was then conducted using multiple sources to identify EMS agencies with MIH-CP programs

¹⁶⁷ National Association of State EMS Officials.

¹⁶⁸ National Association of State EMS Officials.

¹⁶⁹ National Association of Emergency Medical Technicians, *2nd National Survey*.

yielding over 200 programs for distribution of the survey. Interestingly, there were other programs identified that met the very loose description of an MIH-CP program, but they declined to participate for fear of being exposed to emerging regulatory obstacles, such as licensing and oversight requirements in some states.¹⁷⁰

2. How Were the Metrics to Assess or Evaluate Selected?

Most of the questions within the survey were related to system or program design and service delivery. Recognizing that this model emerged out of a shifting need to fill a gap in services, the survey included questions about conducting community needs assessments to ensure the effectiveness of program design and service delivery. Most of the data sources used in the needs assessments were historical call data and population demographics. Interestingly, 50 percent of the programs reported the use of public health data as part of their needs assessment, signifying awareness of the importance of population health integration.¹⁷¹

In 2018, NASEMSO completed what was referred to as a “national EMS project of significance” and published a report entitled *Community Health Needs Assessments: Resources for Community Paramedicine & Mobile Integrated Healthcare*.¹⁷² The report describes the current approach to MIH-CP program development as an iterative process that starts small and is focused. It further explains that “gathering data on the impact of the service on identified health needs are essential to success” and encourages the use of a CHNA to inform the development of an MIH-CP program.¹⁷³

3. How Is the Information that Is Gathered Used?

Much like NASEMSO’s National EMS Assessment, this survey was initiated in response to the rapidly evolving field of EMS. Responding to the recent explosion of MIH-CP programs, the survey provides a snapshot of the current state of MIH-CP in the United

¹⁷⁰ National Association of State EMS Officials, “EMS 3.0.”

¹⁷¹ National Association of Emergency Medical Technicians, *2nd National Survey*.

¹⁷² National Association of State EMS Officials, *Community Health Needs Assessments*.

¹⁷³ National Association of State EMS Officials.

States and seeks to understand how and why these programs are emerging. Additionally, NAEMT used information from the survey to develop the “MIH-CP Program Toolkit,” an online source to assist other agencies in the exploration and development of new MIH-CP programs.¹⁷⁴

4. What Level of Health Change Opportunity Is Addressed with This Tool? (Where in the Stream Is This Program?)

Inherently the MIH-CP model of service delivery is more upstream than standard EMS practice, since most programs integrate other social and support services to improve the social determinants of health. The survey’s emphasis on the importance of conducting a community needs assessment demonstrates awareness of gaps in existing services in communities throughout this country.

The survey identified the main targeted areas for MIH-CP program development which include preventing hospital readmissions, reducing overuse or high utilization of EMS, chronic disease management, offering destinations other than emergency departments, and generalized home health and case management support. These areas suggest a gap in the healthcare system whereby MIH-CP serves as primary or home health care extenders. A key finding from more than half of the respondents identified public health agencies as the area of greatest need for increased partnership. This finding indicates a desire to understand and improve the connection between individual and community health needs.

Finally, the 2018 NAEMT MIH-CP survey recognized the expertise of the people operating MIH-CP programs and sought input in the form of advice for future programs. The top two themes of advice were to involve stakeholders as early as possible and to pursue every opportunity to “collaborate and integrate” with a wide variety of partners including public health leaders and agencies.¹⁷⁵

¹⁷⁴ “MIH-CP Program Toolkit,” National Association of Emergency Medical Technicians, accessed September 20, 2022, <http://naemt.org/resources/mih-cp/mih-cp-program-toolkit>.

¹⁷⁵ National Association of Emergency Medical Technicians, *2nd National Survey*.

G. SUMMARY OF KEY FINDINGS

While conducting the research, it became evident that results of risk assessments and evaluation tools overlap significantly by design and often by accident. Health risks must be assessed to determine where to direct efforts. Evaluating the effectiveness of said efforts using a systematic method designed for continuous improvement is equally important. These two processes, one prospective and the other retrospective in nature, are not always connected or aligned. A more efficient and effective system to improve health outcomes can be achieved by tying the two together and creating an intentional interdependency. There are a lot of tools out there with the potential to bridge gaps in how we care for our communities if used collaboratively. Unfortunately, many “lack clear, measurable objectives and evaluation plans.”¹⁷⁶

It is difficult to collect and share data without formal connections or standards for collection. This is evident in the process of determining which outcomes to measure, as seen through the analysis of the assessment models. The advantage of the different assessment models is that they can be customized by locality and use, but the variety of models and lack of standardization makes it hard to identify trends (both good and bad) and make recommendations for improvement that are measurable over time (long-term).

In 2018, NASEMSO completed what was referred to as a “national EMS project of significance” and published a report entitled *Community Health Needs Assessments: Resources for Community Paramedicine & Mobile Integrated Healthcare*.¹⁷⁷ The report describes the current approach to MIH-CP program development as an iterative process that starts small and is focused. It further explains that “gathering data on the impact of the service on identified health needs are essential to success” and encourages the use of a CHNA to inform the development of an MIH-CP program.¹⁷⁸

The 2020 NASEMSO EMS assessment provides a snapshot of the evolution of EMS toward a home health model with fewer hospital transports. This trend supports the

¹⁷⁶ Stoto, Davis, and Atkins, “Beyond CHNAS.”

¹⁷⁷ National Association of State EMS Officials, *Community Health Needs Assessments*.

¹⁷⁸ National Association of State EMS Officials.

demand for MIH-CP programs and suggests further creativity is needed to address the growing healthcare needs in this country. Community health improvement (CHI) processes need a common language and shared, agreed-upon measurements.

As the NAEMT MIH-CP survey revealed there is no single assessment specifically designed to support the creation of an MIH-CP program. In the absence of such an assessment, leaders of these programs should seek a variety of data sources and input and not rely solely on historical call data. A key takeaway from the survey revealed the need for more education about community needs assessment. This is an area of opportunity for the public health field. CHNAs may hold the key for use by fire/EMS in the creation of novel targeted MIH-CP programs. Additionally, involvement in the CHNA process would provide a more formal connection to public health thereby allowing fire/EMS to stay abreast of emerging trends and tools. An example of an emerging tool is the Population Level Analysis and Community Estimates (PLACES) Project, conducted by the CDC. PLACES evolved out of the 500 Cities Project from 2016–2019, which looked at 27 chronic disease markers at the census tract level and provided estimations of overall health for small areas. In 2020 the 500 Cities Project expanded to include 3,142 counties, hence the name change. PLACES may be worth considering in addition to the CHNA for MIH-CP program development.¹⁷⁹

In summary, the two common themes that emerged from the analysis of both the public health assessments as well as the evaluations of EMS today are the need for better data and more integration between public health and public safety. The need for better data may create an opportunity to drive further integration of fire/EMS within the public health system.

¹⁷⁹ “About PLACES,” Centers for Disease Control and Prevention, October 18, 2021, <https://www.cdc.gov/places/about/index.html>.

THIS PAGE INTENTIONALLY LEFT BLANK

V. CONCLUSION

This thesis sought to identify areas of opportunity for public safety and public health to be better integrated. The fire/EMS field is poised to seize this opportunity through emerging trends, such as the MIH-CP model, which provides a more upstream approach to service delivery. However, this shift will require intentionality and several key structural changes to maximize the effectiveness of the natural symbiotic relationship between the public health and healthcare fields.

In 1994, the HHS teamed up with the Robert Wood Johnson Foundation to sponsor a project led by the Institutes of Medicine to study the use of performance metrics to promote and improve public health. This project spanned two years and was the first comprehensive, truly collaborative effort by the public health and healthcare systems to acknowledge their shared responsibility for and contributions to “a community’s well-being.”¹⁸⁰ The project acknowledged the “schism” between the two fields and observed that collectively there were areas of study yet to be discovered. The project resulted in a CHI process involving steps for assessment, analysis, strategy formation, evaluation, and reassessment. Through a series of workshops, the group realized that various elements of the process were already being done, but this action was not as “holistically conceived, adequately resourced, thoroughly documented, and effective as our idealized vision of a possible future.”¹⁸¹

Unfortunately, almost 30 years later the same holds true for most CHI efforts including MIH-CP programs. These programs, predominantly run by local fire departments, are popping up all over the country at a record rate to fill gaps in healthcare and social services support. The following recommendations have been developed to transform existing interventions and inform future alternative response models to decrease health disparities and improve health outcomes throughout the United States.

¹⁸⁰ Institute of Medicine, *Improving Health in the Community*.

¹⁸¹ Institute of Medicine.

A. RECOMMENDATIONS

Many of the emerging MIH-CP programs do not prioritize collaboration with public health or seek to understand the upstream causes of social and structural issues as they develop their programs. However, as identified in Chapter III, several of the programs already in existence recognize the need for better integration between the public health and public safety fields.

Include Public Health–Trained Medical Directors In MIH-CP ProgramsOne recommendation is to seek multi-disciplinary physicians who are cross-trained in public health and emergency medicine to serve as operating medical directors, as successfully demonstrated by the LAFD. A study of dual MD (doctor of medicine)–MPH degree students in the United States published in 2021 found a “434% increase in the number of students pursuing an MD–MPH degree from 2010 to 2018,” suggesting the availability of operating medical directors with public health degrees is dramatically increasing.¹⁸² Interestingly, data for the study was collected in 2019, pre-COVID, and both MD and MPH programs continue to see increases in applicants, though the number of MD and MPH student positions has not kept pace with interest.¹⁸³

1. Realign National EMS Governance

A broader recommendation is for a national re-alignment of EMS governance and oversight under HHS to create the formal connection needed to structurally facilitate local-level connection. This integration could foster the development of a national training curriculum or content for inclusion in the national EMT course, which teaches EMTs about public health, what the SDOH are, and how to look for signs or symptoms of areas of concern related to the SDOH. Taken a step further, the EMS curriculum could be entirely

¹⁸² Jo Marie Reilly, Christine M. Plepys, and Michael R. Cousineau, “Dual MD–MPH Degree Students in the United States: Moving the Medical Workforce toward Population Health,” *Public Health Reports* 136, no. 5 (2021): 640–47, <https://doi.org/10.1177/0033354920978422>.

¹⁸³ Sydney Lake, “Will Earning an MPH Help Me Get into Med School?,” *Fortune*, April 25, 2022, <https://fortune.com/education/business/articles/2022/04/25/will-earning-a-masters-degree-in-public-health-help-me-get-into-med-school/>.

reframed to teach providers to think like public health practitioners and consider themselves part of the public health enterprise rather than the healthcare system.

2. Develop a Standard for Measurable Health Outcomes

Such an alignment would also facilitate the next recommendation, which is to establish a standard for clear measurable health outcomes for MIH-CP programs. Several benefits of this action include the ability to measure effectiveness, inform future program development, and share data across disciplines to achieve more comprehensive, truly integrated health care and case management.

3. Use Public Health Assessments and Evaluation Tools to Ensure a Cycle of Continuous Improvement

The final recommendation is to require a needs assessment be conducted with the assistance of public health officials to inform MIH-CP program design, to be repeated annually. Existing assessment tools are limited in their applicability, likely because there is no input from public safety in their design. It is recommended that public safety seek inclusion in the updates of each assessment tool discussed. Additionally, periodic program evaluations are needed to ensure stated goals and objectives are met and should be conducted in coordination with a wide range of stakeholders, including public health practitioners and the community served. The use of assessment and evaluation tools will create a cycle of continuous improvement.

Recognizing the factors that contribute to an individual's SDOH during the response phase of an emergency is too late. With a basic education of public health principles and concepts, public safety providers can serve as public health extenders well in advance of emergencies, leading to improved health outcomes and healthier communities.

B. SUGGESTIONS FOR FUTURE RESEARCH

This thesis focused on the integration of public health language and concepts to shape the future of alternative public safety response models to get further upstream and

make models more effective. Several suggestions for future research emerged from this thesis to further align public safety within the public health enterprise.

One such topic for future research builds upon the idea of creating a framework to measure SDOH that could be used by public safety professionals whenever there are calls for service or contacts with community members. These contacts could provide valuable data that is not collected to better understand the state or quality of life within communities. Further research is needed to identify a standardized set of data points and a mechanism for sharing information that would inform potential future upstream measures. In essence, it may be possible to design a social epidemic surveillance system using public safety to detect declines in key SDOH markers and ultimately prevent those declines and improve health outcomes.

As professional problem-solvers, first responders naturally seek to understand the problems they face and identify root causes to be more efficient and effective with the services they provide. The impact of the COVID-19 pandemic exposed population health inequities and insecurities of epic proportions. The impact of climate change on our nation's health among other major global threats will impact future emergencies yet to be identified. First responders equipped with the strategic training, tools, and infrastructure needed to anticipate and mitigate future emergencies can make a profound difference in the health outcomes and quality of life for the communities they serve and ultimately hold the key to our collective resilience.

LIST OF REFERENCES

- Acadian Health. “At-Home Acute Care Reduces Unnecessary Emergency Department Visits.” Globe Newswire, April 6, 2022. <https://www.globenewswire.com/news-release/2022/04/06/2417936/0/en/At-Home-Acute-Care-Reduces-Unnecessary-Emergency-Department-Visits.html>.
- . “Partners We Serve.” Accessed July 31, 2022. <https://acadian.com/ahpartners/>.
- . “Why Choose Acadian.” Accessed July 31, 2022. <https://acadian.com/health/>.
- Administration for Strategic Preparedness and Response. *National Health Security Strategy 2019–2022*. Washington, DC: Administration for Strategic Preparedness and Response, 2019.
- . “Regional Disaster Health Response System.” Accessed September 21, 2022. <https://www.phe.gov/Preparedness/planning/RDHRS/Pages/default.aspx>.
- Agency for Toxic Substances and Disease Registry. “At A Glance: CDC/ATSDR Social Vulnerability Index.” Accessed September 21, 2022. https://www.atsdr.cdc.gov/placeandhealth/svi/at-a-glance_svi.html.
- . “Getting to Know GRASP.” Accessed September 21, 2022. https://www.atsdr.cdc.gov/placeandhealth/getting_to_know_grasp.html.
- Allana, Amir, Walter Tavares, Andrew Pinto, and Kerry Kuluski. “Designing and Governing Responsive Local Care Systems—Insights from a Scoping Review of Paramedics in Integrated Models of Care.” *International Journal of Integrated Care* 22 (2022). <https://doi.org/10.5334/ijic.6418>.
- American Hospital Association. “Fast Facts on U.S. Hospitals, 2021.” Accessed August 25, 2021. <https://www.aha.org/statistics/fast-facts-us-hospitals>.
- American Public Health Association. “What Is Public Health?” Accessed August 24, 2022. <https://www.apha.org/What-is-Public-Health>.
- Baker, Michael D. “Social Networks and High Healthcare Utilization: Building Resilience through Analysis.” Master’s thesis, Naval Postgraduate School, 2016. <https://calhoun.nps.edu/handle/10945/50564>.
- Bennett, Nancy M., Marie T. Brown, and Theresa Green. “Addressing Social Determinants of Health (SDOH): Beyond the Clinic Walls.” American Medical Association Ed Hub, August 31, 2016. <https://edhub.ama-assn.org/steps-forward/module/2702762>.

- Biedrzycki, Paul A., and Raisa Koltun. "Integration of Social Determinants of Community Preparedness and Resiliency in 21st Century Emergency Management Planning." *Homeland Security Affairs* 8 (August 2012): 14.
- Boes, Stefan, Carla Sabariego, Jerome Bickenbach, and Gerold Stucki. "How to Capture the Individual and Societal Impacts of Syndemics: The Lived Experience of COVID-19." *BMJ Global Health* 6, no. 10 (2021): e006735. <https://doi.org/10.1136/bmjgh-2021-006735>.
- Carli, Lorraine. "This Is CRR: How the COVID-19 Pandemic Is a Study of Community Risk Reduction in Action." *NFPA Journal*, May 7, 2020. <http://www.nfpa.org/News-and-Research/Publications-and-media/NFPA-Journal/2020/May-June-2020/Columns/Outreach>.
- Center for Public Safety Excellence. "Accreditation Overview." Accessed August 15, 2021. <https://cpse.org/accreditation/>.
- . "Accredited Agencies." Accessed July 31, 2022. <https://www.cpsc.org/accreditation/accredited-agencies/>.
- . "CPSE Publishes Quality Improvement for the Fire and Emergency Services Book." November 5, 2020. <https://cpse.org/2020/11/05/cpsc-publishes-quality-improvement-for-the-fire-and-emergency-services-book/>.
- Centers for Disease Control and Prevention. "About PLACES." October 18, 2021. <https://www.cdc.gov/places/about/index.html>.
- . "About Social Determinants of Health (SDOH)." Accessed April 26, 2021. <https://www.cdc.gov/socialdeterminants/about.html>.
- . "CDC Nutrition, Physical Activity, and Obesity—Legislation." Accessed August 24, 2021. <https://chronicdata.cdc.gov/Nutrition-Physical-Activity-and-Obesity/CDC-Nutrition-Physical-Activity-and-Obesity-Legisl/nxst-x9p4>.
- . "CDC's Social Vulnerability Index (SVI)." Accessed September 21, 2022. <https://svi.cdc.gov/Documents/FactSheet/SVIFactSheet.pdf>.
- . "Center for Preparedness and Response." Accessed April 17, 2021. <https://www.cdc.gov/cpr/index.htm>.
- . "Mission, Role and Pledge." Accessed September 21, 2022. <https://www.cdc.gov/about/organization/mission.htm>.
- . "Public Health Professionals Gateway: Data & Benchmarks." Accessed September 21, 2022. <https://www.cdc.gov/publichealthgateway/cha/data.html>.

- Centers for Medicare and Medicaid Services. “Emergency Triage, Treat, and Transport (ET3) Model.” Accessed August 28, 2021. <https://innovation.cms.gov/innovation-models/et3>.
- Choi, Bryan Y., Charles Blumberg, and Kenneth Williams. “Mobile Integrated Health Care and Community Paramedicine: An Emerging Emergency Medical Services Concept.” *Annals of Emergency Medicine* 67, no. 3 (March 2016): 361–66. <https://doi.org/10.1016/j.annemergmed.2015.06.005>.
- City of Colorado Springs. “Community and Public Health (CARES).” Accessed September 21, 2022. <https://coloradosprings.gov/fire-department/page/community-and-public-health-cares>.
- Cleveland Clinic. *Community Health Needs Assessment 2019*. Cleveland: Cleveland Clinic, 2019. <https://my.clevelandclinic.org/-/scassets/files/org/about/community-reports/chna/2019/2019-cleveland-clinic-main-campus-chna.pdf?la=en>.
- Cole, Brian L., and Jonathan E. Fielding. “Health Impact Assessment: A Tool to Help Policy Makers Understand Health beyond Health Care.” *Annual Review of Public Health* 28, no. 1 (April 2007): 393–412. <https://doi.org/10.1146/annurev.publhealth.28.083006.131942>.
- Colorado Springs Fire Department. *2019 Annual Report: Community & Public Health*. Colorado Springs: Colorado Springs Fire Department, 2019. https://coloradosprings.gov/sites/default/files/inline-images/2019_commpubhealth_yearly_report.pdf.
- Department of Health and Human Services, Office of Minority Health. “National Minority Mental Health Awareness Month.” Accessed August 28, 2022. <https://www.minorityhealth.hhs.gov/minority-mental-health>.
- Department of Homeland Security. “Presidential Policy Directive 8: National Preparedness.” Accessed April 16, 2022. <https://www.dhs.gov/presidential-policy-directive-8-national-preparedness>.
- Drennan, Ian R., Katie N. Dainty, Paul Hoogeveen, Clare L. Atzema, Norm Barrette, Gillian Hawker, Jeffrey S. Hoch et al. “Expanding Paramedicine in the Community (EPIC): Study Protocol for a Randomized Controlled Trial.” *Trials* 15, no. 1 (2014): 473. <https://doi.org/10.1186/1745-6215-15-473>.
- EMS.gov. “Office of EMS.” Accessed August 28, 2021. <https://www.ems.gov/office-ofOEMS.html>.
- . “What Is EMS?” Accessed July 30, 2022. <https://www.ems.gov/whatisems.html>.

- Federal Interagency Committee on Emergency Medical Services. *2011 National EMS Assessment*. Washington, DC: Department of Transportation, National Highway Traffic Safety Administration, 2012. https://www.ems.gov/pdf/2011/national_ems_assessment_final_draft_12202011.pdf.
- Fish, Karen. *Let's Talk: Moving Upstream*. Antigonish, NS: National Collaborating Centre for Determinants of Health, St. Francis Xavier University, 2014. https://nccdh.ca/images/uploads/Moving_Upstream_Final_En.pdf.
- Glenn, Melody, Olivia Zoph, Kim Weidenaar, Leila Barraza, Warren Greco, Kylie Jenkins, Pooja Paode, and Jonathan Fisher. "State Regulation of Community Paramedicine Programs: A National Analysis." *Prehospital Emergency Care* 22, no. 2 (2018): 244–51. <https://doi.org/10.1080/10903127.2017.1371260>.
- Gravlee, Clarence C. "Systemic Racism, Chronic Health Inequities, and COVID-19: A Syndemic in the Making?" *American Journal of Human Biology* 32, no. 5 (2020): e23482. <https://doi.org/10.1002/ajhb.23482>.
- Harvard T. H. Chan School of Public Health. "Public Health and Medicine." Accessed September 21, 2022. <https://www.hsph.harvard.edu/about/public-health-and-medicine/>.
- Health Begins. "Levels of HRSN and SDH Integration Framework." Burbank, CA: Health Begins, April 2019. https://2hdp0l1trjr524kvdq3mg5sa-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/levels_of_hrsn_and_sdh_integration_framework.pdf.
- . "Upstream Communication Toolkit." Burbank, CA: Health Begins, May 2019. https://www.healthbegins.org/uploads/2/2/0/4/22040328/upstream_communications_toolkit_-_may_2019.pdf.
- Healthy People 2030. "Social Determinants of Health Literature Summaries." Accessed April 11, 2021. <https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries>.
- Healthy Washington County. *FY2019 Community Health Needs Assessment*. Washington County, MD: Healthy Washington County, 2019. <https://washcohealth.org/wp-content/uploads/2019/05/FY2019-CHNA-Report-FINAL.pdf>.
- Iezzoni, Lisa I., Stephen C. Dorner, and Toyin Ajayi. "Community Paramedicine—Addressing Questions as Programs Expand." *New England Journal of Medicine* 374, no. 12 (2016): 1107–109. <https://doi.org/10.1056/NEJMp1516100>.
- Institute of Medicine. *Improving Health in the Community: A Role for Performance Monitoring*. Washington, DC: National Academies Press, 1997. <https://doi.org/10.17226/5298>.

- . *Informing the Future: Critical Issues in Health*. 5th ed. Washington, DC: National Academies Press, 2009. <https://doi.org/10.17226/12709>.
- Internal Revenue Service. “Community Health Needs Assessment for Charitable Hospital Organizations—Section 501(r)(3).” Accessed August 25, 2021. <https://www.irs.gov/charities-non-profits/community-health-needs-assessment-for-charitable-hospital-organizations-section-501r3>.
- . “Requirements for 501(c)(3) Hospitals under the Affordable Care Act—Section 501(r).” Accessed September 20, 2022. <https://www.irs.gov/charities-non-profits/charitable-organizations/requirements-for-501c3-hospitals-under-the-affordable-care-act-section-501r>.
- Johnson Foundation at Wingspread. *Wingspread VI: Statements of National Significance to the United States Fire and Emergency Services*. Racine, WI: Johnson Foundation at Wingspread, 2016. <https://strategicfire.org/wp-content/uploads/2017/02/Wingspread-Report-2016-1.pdf>.
- Jones, Jason. “Non-Emergency Utilization of EMS: Contributing Factors and Strategies to Promote Effective Care with Appropriate Resources.” Master’s capstone, University of Nebraska Medical Center, 2020. https://digitalcommons.unmc.edu/coph_slce/128.
- Kaiser Permanente. “Community Health Needs Assessments.” Accessed September 20, 2022. <https://about.kaiserpermanente.org/community-health/about-community-health/community-health-needs-assessments>.
- Kim, Meeri. “The Impact of COVID-19 on Vulnerable Populations.” *Lindau Nobel Laureate Meetings* (blog), July 1, 2020. <https://www.lindau-nobel.org/blog-the-impact-of-covid-19-on-vulnerable-populations/>.
- Lake, Sydney. “Will Earning an MPH Help Me Get into Med School?” *Fortune*, April 25, 2022. <https://fortune.com/education/business/articles/2022/04/25/will-earning-a-masters-degree-in-public-health-help-me-get-into-med-school/>.
- Mak, Rebecca, Minh Wendt, and Juliet Bui. “Using the Minority Health Social Vulnerability Index to Drive Equitable Public Health Efforts.” *Department of Health and Human Services, Office of Minority Health* (blog), August 23, 2021. <https://minorityhealth.hhs.gov/Blog/BlogPost.aspx?BlogID=3288>.
- Manatt, Phelps & Phillips, LLP. “CMS Promotes Community Paramedicine in Medicare and Medicaid.” JD Supra, September 19, 2019. <https://www.jdsupra.com/legalnews/cms-promotes-community-paramedicine-in-98139/>.

- Massachusetts General Hospital, Center for Community Health Improvement. *2019 Community Health Needs Assessment Report*. Boston: Massachusetts General Hospital, Center for Community Health Improvement, 2019. <https://www.massgeneral.org/assets/mgh/pdf/community-health/cchi/20191016-chna-report.pdf>.
- Mays, Glen. “Beyond the Numbers: Strategic Uses of the Index to Engage Communities and Shape Policies.” National Health Security Preparedness Index Program Office, March 19, 2019. <https://nhspi.org/blog/beyond-the-numbers-strategic-uses-of-the-index-to-engage-communities-and-shape-policies/>.
- Mays, Glen, and Eric Holdeman. “NHSPI Now: NHSPI’s Glen Mays & Eric Holdeman.” June 25, 2020. National Health Security Preparedness Index Program Office. Video, 14:25. <https://nhspi.org/story/nhspi-now-glen-mays-eric-holdeman/>.
- McCoy, Tyler B. “Optimize or Die: Implementing Dynamic and Innovative Deployment Models for Fire Departments.” Master’s thesis, Naval Postgraduate School, 2019. <https://calhoun.nps.edu/handle/10945/64024>.
- McKinlay, John B. “A Case for Refocusing Upstream: The Political Economy of Illness.” *IAPHS Occasional Classics*, no. 1 (2019). <https://iaphs.org/wp-content/uploads/2019/11/IAPHS-McKinlay-Article.pdf>.
- Mears, Greg. “2020 NASEMSO Survey Reflects Evolution of EMS Industry.” *ZOLL Data Systems* (blog), July 1, 2020. <https://www.zolldata.com/blog/the-national-ems-assessment-10-years-later>.
- National Academy of Medicine. “About the National Academy of Medicine.” Accessed July 30, 2022. <https://nam.edu/about-the-nam/>.
- National Academy of Sciences and National Research Council. *Accidental Death and Disability: The Neglected Disease of Modern Society*. Washington, DC: National Academies Press, 1966. <https://doi.org/10.17226/9978>.
- National Association of Emergency Medical Technicians. “MIH-CP Program Toolkit.” Accessed September 20, 2022. <http://naemt.org/resources/mih-cp/mih-cp-program-toolkit>.
- . *Mobile Integrated Healthcare and Community Paramedicine (MIH-CP) 2nd National Survey*. Clinton, MS: National Association of Emergency Medical Technicians, 2018. http://www.naemt.org/docs/default-source/2017-publication-docs/mih-cp-survey-2018-04-12-2018-web-links-1.pdf?Status=Temp&sfvrsn=a741cb92_2.

- National Association of State EMS Officials. *Community Health Needs Assessments: Resources for Community Paramedicine & Mobile Integrated Healthcare*. Deliverable for Condition 10–57. Falls Church, VA: National Association of State EMS Officials, October 2018. <https://nasemsso.org/wp-content/uploads/NASEMSO-NEPS-10-57-CHNA-Resources-for-CP-MIH-Update-October-2018.pdf>.
- . “EMS 3.0: Realizing the Value of EMS in Our Nation’s Health Care Transformation.” Accessed April 18, 2021. <https://nasemsso.org/wp-content/uploads/EMS-3.0-Initiative-Paper-Final-for-Association-Endorsement-and-Leadership-Participation-19Ap.pdf>.
- . “NASEMSO Releases 2020 National EMS Assessment.” April 9, 2020. <https://nasemsso.org/news-events/news/news-item/nasemsso-releases-2020-national-ems-assessment-2/>.
- . “Overview.” Accessed March 14, 2021. <https://nasemsso.org/about/overview/>.
- . *2020 National Emergency Medical Services Assessment*. Falls Church, VA: National Association of State EMS Officials, 2020. https://nasemsso.org/wp-content/uploads/2020-National-EMS-Assessment_Reduced-File-Size.pdf.
- National Emergency Medical Services Information System. “EMS Data Cube.” Accessed August 19, 2022. <https://rp.nemsis.org/reportportal/design/view.aspx>.
- National Emergency Number Association. “9-1-1 Statistics.” Accessed November 7, 2021. <https://www.nena.org/page/911Statistics>.
- National Fire Protection Association. “Fire Department Calls.” Accessed April 17, 2021. <https://www.nfpa.org/News-and-Research/Data-research-and-tools/Emergency-Responders/Fire-department-calls>.
- . “Fire Prevention Week.” Accessed September 19, 2022. <https://www.nfpa.org/Events/Events/Fire-Prevention-Week/About>.
- . “NFPA Announces Launch of CRAIG 1300, an All-New Community Risk Assessment Insight Generator That Helps Identify, Assess, and Mitigate Public Safety Risks.” July 21, 2021. <https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/News-releases/2021/NFPA-announces-launch-of-CRAIG-1300-an-all-new-Community-Risk-Assessment-Insight-Generator>.
- . *Standard on Community Risk Assessment and Community Risk Reduction Plan Development*. NFPA 1300. Quincy, MA: National Fire Protection Association, 2020. <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1300>.

- National Health Security Preparedness Index Program Office. “About National Health Security Preparedness Index.” Accessed August 28, 2022, <https://nhspi.org/about/>.
- . *Measures List for 2019 Release*. Lexington, KY: National Health Security Preparedness Index Program Office, 2019. https://nhspi.org/wp-content/uploads/2019/05/NHSPI_2019_Measures.pdf.
- . *Methodology for the 2019 Release: National Health Security Preparedness Index*. Lexington, KY: National Health Security Preparedness Index Program Office, 2019. https://nhspi.org/wp-content/uploads/2019/05/NHSPI_2019_Methodology.pdf.
- . “Nation’s Ability to Manage Health Emergencies Rises.” Accessed August 28, 2022. <https://nhspi.org/nations-ability-to-manage-health-emergencies-rises/>.
- National Highway Traffic Safety Administration. *Emergency Medical Services Agenda for the Future*. Washington, DC: National Highway Traffic Safety Administration, 2010. https://www.ems.gov/pdf/advancing-ems-systems/Provider-Resources/EMS_Agenda_For_The_Future_2010.pdf.
- . *EMS Agenda 2050: A People-Centered Vision for the Future of Emergency Medical Services*. Report No. DOT HS 812 664. Washington, DC: National Highway Traffic Safety Administration, 2019.
- Northwell Health. “About CEMS.” Accessed August 21, 2021. <https://www.northwell.edu/center-for-emergency-medical-services>.
- . “Communications Center.” Accessed September 19, 2022. <https://www.northwell.edu/center-for-emergency-medical-services/communications-center>.
- Oberkircher, Katie. “Social Determinants of Health Surface in U.S. Policy Agenda.” *Leader’s Edge Magazine*, August 16, 2019. <https://www.leadersedge.com/healthcare/social-determinants-of-health-surface-in-u-s-policy-agenda>.
- Population Reference Bureau. “Why the 2020 American Community Survey Is Different and Why It Matters.” Accessed August 29, 2022. <https://www.prb.org/articles/why-the-2020-american-community-survey-is-different-and-why-it-matters/>.
- Powers, Joe, and Ben May. “Taking the Long View.” *Firefighter Nation*, March 27, 2021. <https://www.firefighternation.com/firerescue/taking-the-long-view/>.
- Public Health National Center for Innovations and de Beaumont Foundation. “The 10 Essential Public Health Services.” 2020. <https://www.apha.org/-/media/Files/PDF/factsheets/EPHS.ashx>.

- Ranganathan, Sreenivasan. *Fire Based Mobile Integrated Healthcare and Community Paramedicine (MIH & CP)—Data and Resources*. Quincy, MA: Fire Protection Research Foundation, 2016. <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Emergency-responders/RFFireBasedMobileIntegratedHealthcareCommunityParamedicineDataResources.ashx>.
- Rasku, Tuija, Marja Kaunonen, Elizabeth Thyer, Eija Paavilainen, and Katja Joronen. “The Core Components of Community Paramedicine—Integrated Care in Primary Care Setting: A Scoping Review.” *Scandinavian Journal of Caring Sciences* 33, no. 3 (2019): 508–21. <https://doi.org/10.1111/scs.12659>.
- Reilly, Jo Marie, Christine M. Plepys, and Michael R. Cousineau. “Dual MD–MPH Degree Students in the United States: Moving the Medical Workforce toward Population Health.” *Public Health Reports* 136, no. 5 (2021): 640–47. <https://doi.org/10.1177/0033354920978422>.
- Richter, Matthias, and Nico Dragano. “Micro, Macro, but What about Meso? The Institutional Context of Health Inequalities.” *International Journal of Public Health* 63, no. 2 (March 1, 2018): 163–64. <https://doi.org/10.1007/s00038-017-1064-4>.
- Robert Wood Johnson Foundation. “National Health Security Preparedness Index (NHSPI).” Accessed November 10, 2019. <https://www.rwjf.org/en/how-we-work/grants-explorer/featured-programs/national-health-security-preparedness-index.html>.
- Rural Health Information Hub. “Community Paramedicine.” Accessed December 14, 2019. <https://www.ruralhealthinfo.org/topics/community-paramedicine>.
- Sanko, Stephen, and Marc Eckstein. “Mobile Integrated Health Care in Los Angeles: Upstream Solutions to Mitigate the Covid-19 Pandemic.” *NEJM Catalyst Innovations in Care Delivery* 2, no. 2 (2021). <https://doi.org/10.1056/CAT.20.0383>.
- Singh, Gopal K., Gem P. Daus, Michelle Allender, Christine T. Ramey, Elijah K. Martin, Chris Perry, Andrew A. De Los Reyes, and Ivy P. Vedamuthu. “Social Determinants of Health in the United States: Addressing Major Health Inequality Trends for the Nation, 1935–2016.” *International Journal of MCH and AIDS* 6, no. 2 (2017): 139–64. <https://doi.org/10.21106/ijma.236>.
- Song, Jamie, Eugenia South, Sara Solomon, and Douglas Wiebe. “Injustices in Pandemic Vulnerability: A Spatial-Statistical Analysis of the CDC Social Vulnerability Index and COVID-19 Outcomes in the U.S.” medRxiv, May 30, 2021. <https://doi.org/10.1101/2021.05.27.21257889>.

- Stoto, Michael A., Mary V. Davis, and Abby Atkins. "Beyond CHNAS: Performance Measurement for Community Health Improvement." *eGEMs* 7, no. 1 (2019). <https://doi.org/10.5334/egems.312>.
- Stouffer, John A. "Community Risk Reduction." In *Community Risk Reduction Planning*. Warrenton, VA: Vision 20/20, n.d. <http://riskreduction.strategicfire.org/introduction/community-risk-reduction/>.
- Systems for Action. "Housing for Health: Assessing the Cross-Sector Impacts of Providing Permanent Supportive Housing to Homeless High Utilizers of Health Care Services." Accessed August 28, 2021. <https://systemsforaction.org/projects/housing-health-assessing-cross-sector-impacts-providing-permanent-supportive-housing-homeless-high>.
- Tipirneni, Renuka, and Paula Lantz. "Comparison of Social Vulnerability Index and Area Deprivation Index Assessing COVID-19 Outcomes." University of Michigan Institute for Healthcare Policy and Innovation, June 11, 2021. <https://ihpi.umich.edu/news/comparison-social-vulnerability-index-and-area-deprivation-index-assessing-covid-19-outcomes>.
- University of Maryland Medical Center. "Mobile Integrated Health—Community Paramedicine Program Launches to Advance Healthcare in West Baltimore." February 5, 2019. <https://www.umms.org/ummc/news/2019/mobile-integrated-health>.
- U.S. Fire Administration. "National Fire Department Registry Summary." January 2021. <https://www.usfa.fema.gov/downloads/pdf/registry-summary-2021.pdf>.
- . "U.S. Fire Statistics." August 26, 2021. <https://www.usfa.fema.gov/data/statistics/index.html>.
- Vision 20/20. "Community Risk Reduction: A Fire Service Context." Accessed April 18, 2021. <https://strategicfire.org/wp-content/uploads/2015/04/V2020-CRR-Review-Model-8-12-14.pdf>.
- . "CRR—An Overview." Accessed April 17, 2021. <https://strategicfire.org/community-risk-reduction/crr-an-overview/>.
- Washington Post*. "Fatal Force: Police Shootings Database." Accessed July 31, 2022. <https://www.washingtonpost.com/graphics/investigations/police-shootings-database/>.
- World Health Organization. "Social Determinants of Health." Accessed January 5, 2020. http://www.who.int/social_determinants/en/.

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
Ft. Belvoir, Virginia
2. Dudley Knox Library
Naval Postgraduate School
Monterey, California