EXAMINING THE IMPACT OF STATE-MANDATED INSURANCE BENEFITS AND REIMBURSEMENT PROVISIONS ON ACCESS TO DIABETES SELF-MANAGEMENT EDUCATION AND TRAINING (DSME/T)

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DEDICATION

"Semper fidelis"

- United States Marine Corps

I dedicate this work to you, Granddaddy. I wish you were here to see me finally reach the finish line. You will always be the voice in my head pushing me towards excellence and the reminder to always remain steadfast even in the face of adversity. I love you dearly and miss you every single day.

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Brittany L. Brown-Podgorski

EXAMINING THE IMPACT OF STATE-MANDATED INSURANCE BENEFITS AND REIMBURSEMENT PROVISIONS ON ACCESS TO DIABETES SELF-MANAGEMENT EDUCATION AND TRAINING (DSME/T)

With an estimated 30.2 million diagnosed and undiagnosed cases among adults (and another 84 million at risk), diabetes mellitus is one of the most prevalent chronic conditions and a leading cause of mortality in the US. Diabetes self-management education and training (DSME/T) is a recognized standard of care and provides patients with the requisite knowledge and skills to properly manage the condition, improve long-term health outcomes, and reduce health care expenditures. Yet, DSME/T is greatly underutilized. Health insurance coverage that does not include benefits for DSME/T effectively imposes barriers to access for patients in need of the service. Many states have adopted laws and regulations requiring public and/or private insurers in their market to provide benefits for DSME/T; however, these requirements vary by state. It is unclear if these policies effectively improve access to DSME/T services. This dissertation seeks to rigorously assess the impact of state-mandated benefits and reimbursement provisions on access to DSME/T among adult patients with diabetes. The first analysis utilizes a unique combination of legal and programmatic data to quantify changes in the supply of DSME/T resources after the adoption of state-mandated benefits (potential access). The second analysis merges legal data with the Medical Expenditure Panel Survey (MEPS) from 2008 to 2016 to examine the impact of state mandates and reimbursement provisions on patient utilization of DSME/T (realized access). Lastly, the final analysis utilizes electronic health record data (2010-2016) from a safety net population to determine if patients' evaluated need for DSME/T predicts the likelihood of receiving a DSME/T referral during a provider encounter (equitable access). Using novel data sources and a sophisticated policy analysis technique, this study provides a rigorous assessment of the impact of decades of state policies designed to improve access to care.

Joshua R. Vest, PhD, Chair

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LIST OF ABBREVIATIONS

A1C -- Glycated Hemoglobin Level

AADE -- American Association of Diabetes Educators

ACA -- Affordable Care Act

AHRF -- Area Health Resource Files

BMI -- Body Mass Index

BP -- Blood Pressure

CI -- Confidence Interval

DM -- Diabetes Mellitus

DSME/S -- Diabetes Self-Management Education and Support

DSME/T -- Diabetes Self-Management Education and Training

ED -- Emergency Department

EHR -- Electronic Health Records

HIE -- Health Information Exchange

HPSA -- Health Provider Shortage Area

HRSA -- Health Resources and Services Administration

INPC -- Indiana Network for Patient Care

MEPS -- Medical Expenditures Panel Survey

NCBDE -- National Certification Board for Diabetes Educators

PSP -- Policy Surveillance Program at Temple University

QOL -- Quality of Life

SES -- Socioeconomic Status

T2DM -- Type 2 Diabetes Mellitus

US -- United States

USCB -- United States Census Bureau

USDSS -- United States Diabetes Surveillance System

CHAPTER ONE

LAYING THE GROUNDWORK

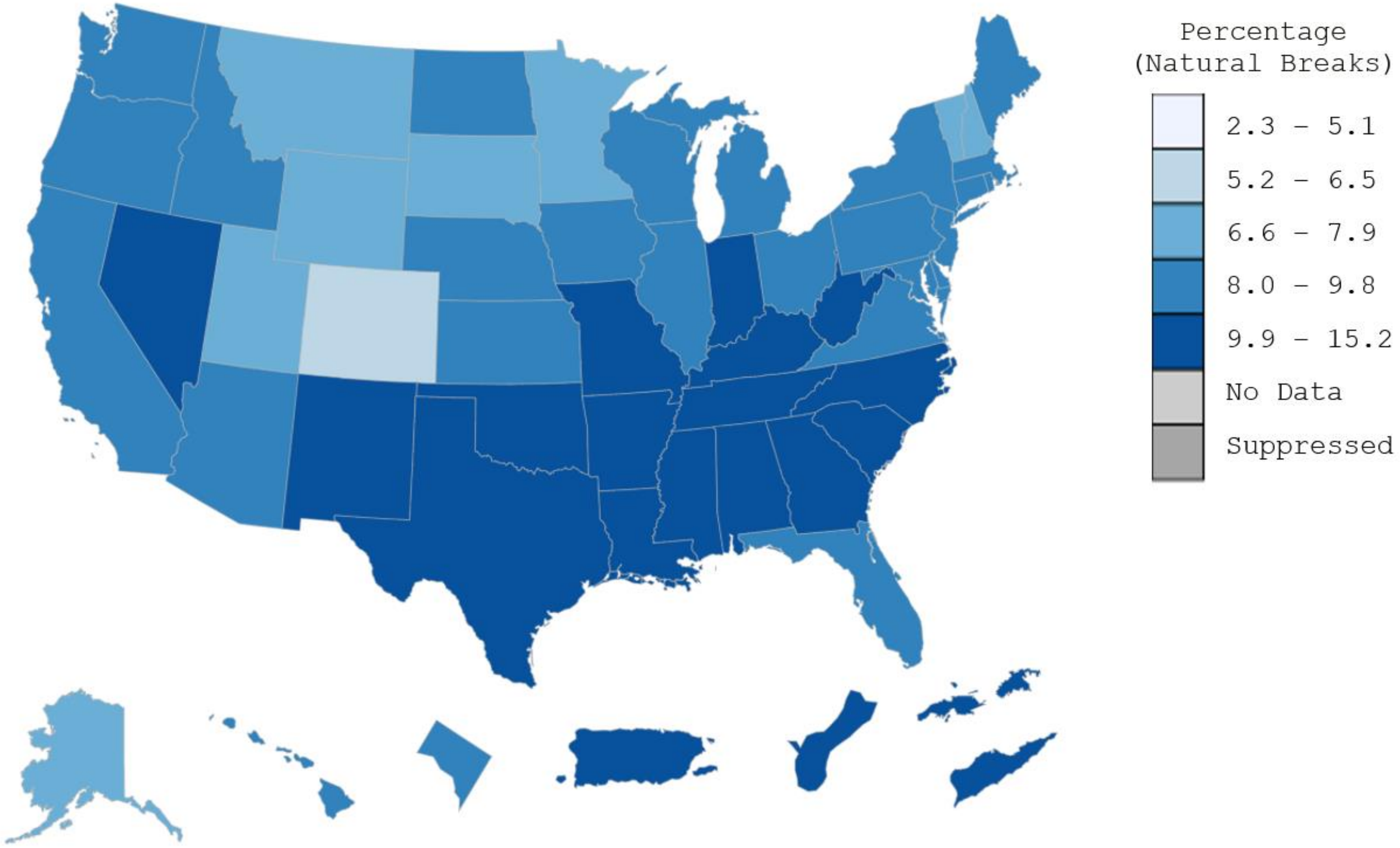
Introduction

Access to care has been a central issue and implicit goal of health policy over the past two several decades.(Aday, 1976; Davis, 1991a; Penchansky & Thomas, 1981) Health policies that shape financing of care (i.e., health insurance laws and mandates) are the most commonly used levers used by policymakers to improve access.(Aday & Andersen, 1974a; Aday, 1976; Ricketts & Goldsmith, 2005) Type 2 diabetes mellitus (T2DM), the focus of this dissertation, requires extensive patient engagement, self-management, and access to preventative services to reduce the likelihood of life-threatening complications.(AADE, n.d.; American Diabetes Association (ADA), 2018; Beck et al., 2017; Powers et al., 2017) Diabetes self-management education and training (DSME/T), a patient-centered, goal-oriented course, teaches patients with diabetes how to successfully incorporate critical self-care behaviors into their daily lives.(AADE, 2003; American Diabetes Association (ADA), 2018; Beck et al., 2017; Powers et al., 2017; Tomky et al., 2008) However, lack of health insurance coverage is a known barrier to DSME/T, particularly among low-income adults.(Nam, Chesla, Stotts, Kroon, & Janson, 2011; Peyrot & Rubin, 2008; Powers et al., 2017; Shaw, Killeen, Sullivan, & Bowman, 2011) This has prompted federal and state policymakers to adopt laws and regulations that extend health insurance coverage to diabetes-related care, including DSME/T.(NCSL, 2016; Policy Surveillance Program, 2016) The following dissertation explores the current landscape of these policy levers, examines their impact on access to DSME/T, and discusses the implications of these findings in the context of the significant public health burden diabetes imposes on the United States.

Burden of Diabetes in the US

Diabetes mellitus is one of the most prevalent chronic conditions and a leading cause of mortality in the US.(Centers for Disease Control and Prevention (CDC), 2017; Dwyer-Lindgren, Mackenbach, van Lenthe, Flaxman, & Mokdad, 2016; Leung, Carlsson, Colditz, & Chang, 2017) An estimated 30.2 million adults (age ≥18 years) have diabetes mellitus; of those, approximately 24% have not been formally diagnosed with the condition.(Centers for Disease Control and Prevention (CDC), 2017) Older adults, specifically those over the age of 44, have the greatest prevalence.(Centers for Disease Control and Prevention (CDC), 2017) As the population continues to age over the next two to three decades, the prevalence of diabetes mellitus is expected to markedly increase.(Boyle, Thompson, Gregg, Barker, & Williamson, 2010; Rowley, Bezold, Arikan, Byrne, & Krohe, 2017) Indeed, greater than half of all newly diagnosed cases are adults between the ages of 45 and 64.(Centers for Disease Control and Prevention (CDC), 2017) With nearly 84 million adults with prediabetes, a significant portion of the adult population in the US is considered at high risk for developing diabetes mellitus.(Centers for Disease Control and Prevention (CDC), 2017) An estimated 15-30% of those will develop the condition within five years.(Centers for Disease Control and Prevention (CDC), 2018) Problematically, a large proportion of adults with diabetes and prediabetes (1:4 and 9:10, respectively) are unaware of their status.(Centers for Disease Control and Prevention (CDC), 2017, 2018) As such, the Healthy People 2020 initiative designates diabetes as a priority condition in the US.(Office of Disease Prevention and Health Promotion (ODPHP), n.d.) However, the prevalence of diabetes varies significantly from state to state (Figure 1).(Centers for Disease Control and Prevention (CDC), 2017, 2018)

Figure 1. *Prevalence of Diagnosed Diabetes, 2016*[i]



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[i] Source: United States Diabetes Surveillance System (USDSS), 2016

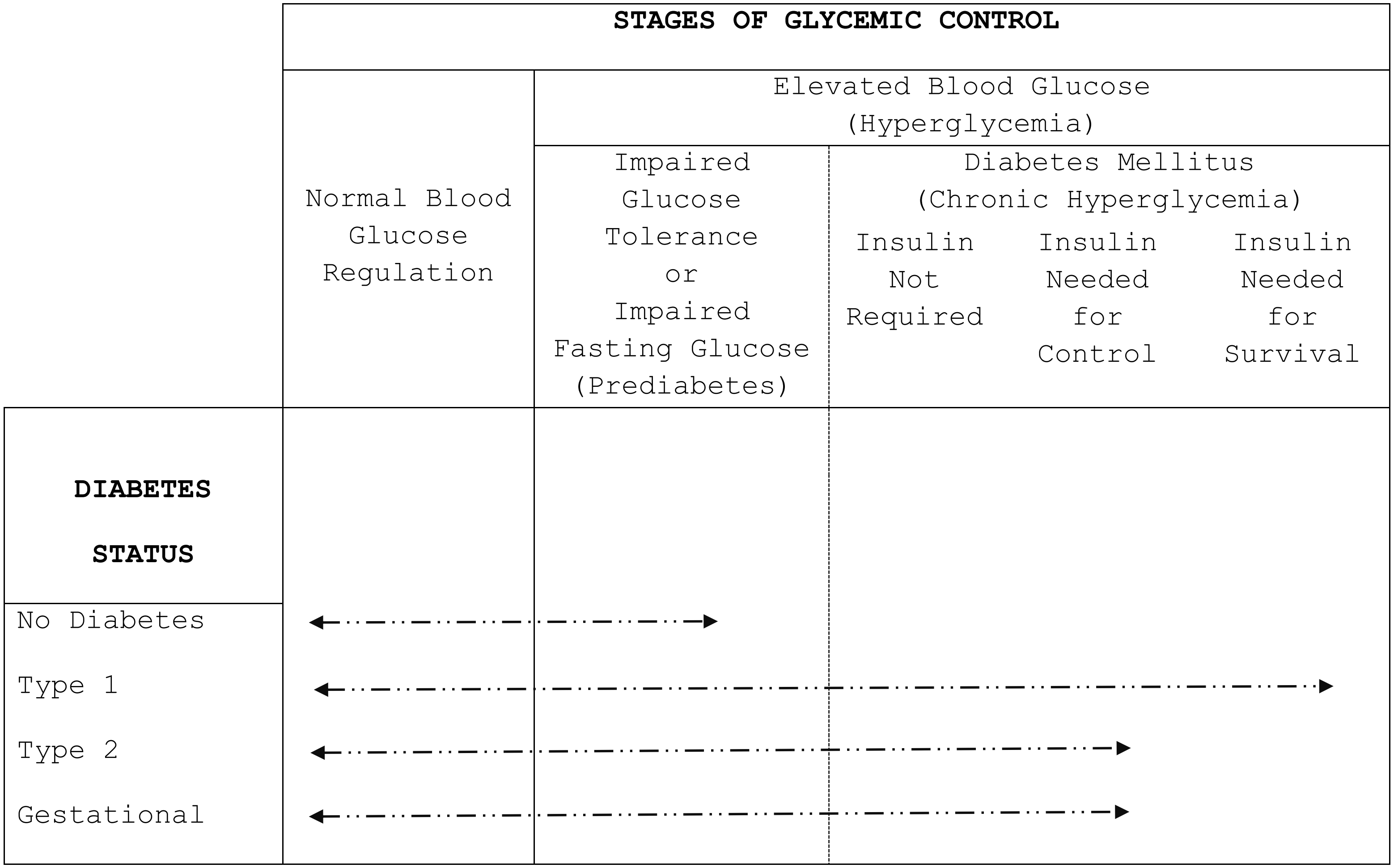
The burden of diabetes mellitus is disproportionately higher for vulnerable populations.(Centers for Disease Control and Prevention (CDC), 2017, 2018; Fisher-Hoch, Vatcheva, Rahbar, & McCormick, 2015; Peek, Cargill, & Huang, 2007) Racial/ethnic minority status and indicators of low socioeconomic status (SES), such as educational attainment, are positively associated with the likelihood of a diabetes mellitus diagnosis.(Centers for Disease Control and Prevention (CDC), 2017, 2018; Karter et al., 2002; Osborn, de Groot, & Wagner, 2013; Peek et al., 2007; Saydah & Lochner, 2010) Native American/ Alaskan Natives are more than twice as likely as non-Hispanic whites to develop diabetes.(Centers for Disease Control and Prevention (CDC), 2017, 2018; Office of Minority Health (OMH), 2016b) Similarly, non-Hispanic African Americans and Hispanic/Latinos are nearly twice as likely as non-Hispanic Whites to develop diabetes.(Centers for Disease Control and Prevention (CDC), 2017, 2018, Office of Minority Health (OMH), 2016a, 2016d) Among the US Asian and Pacific Islander population, the prevalence of diabetes is slightly higher than non-Hispanic Whites.(Office of Minority Health (OMH), 2016c) With respect to SES, individuals with lower educational attainment and lower household income are significantly more likely to develop diabetes.(Centers for Disease Control and Prevention (CDC), 2017, 2018; Link & McKinlay, 2009; Robbins, Vaccarino, Zhang, & Kasl, 2005)

Type 2 Diabetes Mellitus and Glycemic Control

Type 2 diabetes mellitus (T2DM) is a function of insulin resistance and inadequate response to demand for insulin secretion.(Alberti & Zimmet, 1998; American Diabetes Association (ADA), 2018; ADA, 2009) Notably, these processes can elevate fasting glucose levels or impair glucose tolerance without meeting the standard criteria for a diabetes diagnosis.(ADA, 2009) T2DM is characterized by persistent impairment of glucose regulation and, when left untreated and uncontrolled, elevated blood glucose levels (i.e., hyperglycemia).(Alberti & Zimmet, 1998; American Diabetes Association (ADA), 2018; ADA, 2009) Chronic hyperglycemia is most commonly determined by the glycated hemoglobin (A1c) blood glucose test, which provides a patient's average blood glucose levels over a three-month period.(ADA, 2009) A1c levels ranging from 5.7–6.9% indicate a high risk for developing diabetes (prediabetes) and levels that exceed the 7.0% threshold are indicative of uncontrolled diabetes mellitus.(American Diabetes Association (ADA), 2018) Figure 2 displays the characteristic progression of glycemia relative to diagnosis thresholds.

Prolonged periods of hyperglycemia related to diabetes can result in a number of complications, including non-healing skin wounds and infections, nerve damage in the limbs and extremities, damage to blood vessels in the retinas, and kidney and other organ damage.(Alberti & Zimmet, 1998; American Diabetes Association (ADA), 2018; Centers for Disease Control and Prevention (CDC), 2017) Moreover, patients with uncontrolled diabetes mellitus are at increased risk for chronic comorbidities, such as cardiovascular and renal disease, and premature mortality from any cause.(American Diabetes Association (ADA), 2018; Centers for Disease Control and Prevention (CDC), 2017, 2018) These conditions and complications have lasting effects on long-term health outcomes, health-related quality of life, physical functioning, and productivity; all of which directly (and indirectly) impact the individual and their community.(Alberti & Zimmet, 1998; American Diabetes Association (ADA), 2018; Centers for Disease Control and Prevention (CDC), 2017; Coffey et al., 2002; Gregg et al., 2000; Jacobson, de Groot, & Samson, 1994; Lavigne, Phelps, Mushlin, & Lednar, 2003; Ng, Jacobs, & Johnson, 2001; Rubin & Peyrot, 1999; Vijan, Hayward, & Langa, 2004)

Figure 2. *Disorders of Glycemia: Etiologic Types and Stages (Adapted)*(ADA, 2009)



The association between glycemic control and risk of complications among patients with diabetes has been identified and well documented in the peer-reviewed literature.(Benhalima, Song, et al., 2011; Benhalima, Wilmot, et al., 2011; Clark & Lee, 1995; Krishnamurti & Steffes, 2001; Nathan, 1993; Selvin et al., 2004; Stolar, 2010) Indeed, chronic hyperglycemia is a “primary predictor” of a patient’s risk of diabetes-related complications,(Krishnamurti & Steffes, 2001) such as microvascular and macrovascular damage, (Fowler, 2011; Klein, Klein, & Moss, 1996; Stolar, 2010; Viigimaa et al., 2019) cardiovascular disease,(Kelly et al., 2009; Selvin et al., 2004) and, in some cases, diabetes-related mortality.(Stranders et al., 2004; Umpierrez et al., 2002) Due to the nature of diabetes-related complications, patients with poor glycemic control often require emergency care (inpatient and outpatient) to stabilize their blood glucose and treat the resulting complications.(Amaize & Mistry, 2016; Egede, 2004; Josephsen & Rusnak, 2006; Menchine, Wiechmann, Peters, & Arora, 2012; Washington, Andrews, & Mutter, 2010; Yan et al., 2017) This is especially true for patients with multiple, co-occurring chronic conditions, who are more likely than their counterparts to require hospital admissions and emergency department (ED) visits.(Pei-Jung Lin, David M. Kent, Aaron Winn, Joshua T. Cohen, & and Peter J. Neumann, 2015)

DM-Related Complications and High Cost Utilization

Acute and/or chronic complications associated with poor glycemic control often result in recurrent ED visits among patients with diabetes.(Amaize & Mistry, 2016; Egede, 2004; Josephsen & Rusnak, 2006; Menchine et al., 2012; Washington et al., 2010; Yan et al., 2017) In fact, despite the fact that per capita ED utilization has remained steady, diabetes-related ED visits among US adults have significantly increased over time.(Menchine et al., 2012; Wang, Geiss, Williams, & Gregg, 2015) As of 2013, it is estimated that nearly 10% of all ED visits among adults are related to diabetes.(Washington, Andrews, & Mutter, 2013) Diabetes-related ED utilization is most common among adults over the age of 65, females, Blacks, Hispanics, low income populations, individuals residing in rural communities, and individuals with co-occurring conditions.(Egede, 2004; Menchine et al., 2012; Pei-Jung Lin et al., 2015; Washington et al., 2013) Recurrent ED visits within 30 days are common among patients with extremely poor glycemic control.(Yan et al., 2017) Moreover, diabetes-related ED visits requiring hospital admission are nearly three times higher (42%) than

ED visits among adults without diabetes.(Washington et al., 2013)

Hospitalization among patients with diabetes is also significantly higher than those without the condition.(Schneider et al., 2016) Nearly a fifth of all hospitalizations in the US are diabetes-related;(Centers for Disease Control and Prevention (CDC), 2017; Fraze, Jiang, & Burgess, 2010) and approximately a third of discharged patients with diabetes will be readmitted for the condition within a year.(Jiang, Stryer, Friedman, & Andrews, 2003) Readmissions account for more than half of all hospitalizations among patients with diabetes.(Dungan & Dungan, 2012; Fraze et al., 2010; Jiang et al., 2003) Moreover, patients' A1c levels predict hospital admission, length of stay, and associated costs.(Menzin et al., 2010) Patients with A1c ≥ 7.0% have significantly higher rates of hospitalization compared with patients without diabetes or patients with controlled diabetes (3.1 times higher and 1.5 times higher, respectively).(Schneider et al., 2016) Compared with other patients, hospital stays for patients with uncontrolled diabetes are longer (5.3 days vs. 4.4 days) and more costly ($10,937 vs. $8,746).(Fraze et al., 2010)

Economic Cost of Diabetes

Diabetes is one of the most costly chronic diseases to manage and treat.(Leung et al., 2017) The burden of diabetes in the US is underscored by the "staggering" and "astounding" national cost of the disease,(American Diabetes Association, 2018; Dall et al., 2019) which has drastically increased over time.(American Diabetes Association, 2013, 2018, Dall et al., 2019, 2014; Herman, 2013; Zhuo et al., 2014, 2015) As of 2017, the estimated total direct and indirect cost of diabetes was $327 billion.(American Diabetes Association, 2018; Centers for Disease Control and Prevention (CDC), 2017) More than two-thirds (72.5%) of this cost is attributable to direct healthcare expenditures.(American Diabetes Association, 2018) To date, approximately 25% of all US healthcare expenditures are diabetes-related; one out of every $4 healthcare dollars is spent on diabetes care.(American Diabetes Association, 2018) The largest proportion of these expenditures include inpatient stays, ED visits, and prescription medications.(American Diabetes Association, 2013, 2018, Dall et al., 2019, 2014, Zhuo et al., 2014, 2015) Moreover, health care spending for patients with diabetes is more than double that of those without diabetes;(American Diabetes Association, 2018) and the condition increases per capita lifetime health care expenditures.(Zhuo et al., 2014, 2015)

The economic burden of diabetes is even greater when indirect costs are considered.(American Diabetes Association, 2013, 2018, Dall et al., 2019, 2014) Diabetes negatively impacts patients' overall quality of life (QOL) and physical functioning(Coffey et al., 2002; Gregg et al., 2000; Jacobson et al., 1994; Ng et al., 2001; Rubin & Peyrot, 1999); however, most indirect economic costs are typically incurred by employers.(American Diabetes Association, 2013, 2018; Asay, Roy, Lang, Payne, & Howard, 2016) These costs include absenteeism ($3.3 billion), loss of productivity due to physical impairment or inability to work ($26.9 billion), and loss of productive capacity due to diabetes-related mortality ($19.9 billion).(American Diabetes Association, 2018) Interestingly, the costs associated with absenteeism and loss of productivity decreased over time following the enactment of the Affordable Care Act, highlighting the importance of insurance coverage for diabetes management.(American Diabetes Association, 2013, 2018; Herman, 2013)

Diabetes is widely considered the "prototype of an ambulatory care sensitive condition" because diabetes-related ED visits and hospitalizations are largely preventable and successful management generally requires only patient self-care and regular primary care.(American Diabetes Association (ADA), 2018; Asao et al., 2014; Booth & Hux, 2003; Menchine et al., 2012; Oster & Bindman, 2003; Washington et al., 2013) Problematically, fewer than half of all diagnosed patients with diabetes sustain the recommended blood glucose (A1c) levels.(Office of Disease Prevention and Health Promotion (ODPHP), n.d.) This suggests that the vast majority of patients with diabetes not only have poor access to primary care services but lack the resources necessary to adhere to treatment, change health behaviors, and successfully manage the condition.

Diabetes Self-Management Education and Training

National standards of care for diabetes emphasize the critical role of patient engagement and self-care behaviors to manage diabetes and prevent the onset of complications.(American Diabetes Association (ADA), 2018; Beck et al., 2017; Powers et al., 2017; Tomky et al., 2008) In fact, most of the care associated with diabetes is self-managed by the patient, which necessitates participation in an evidence-based diabetes education program to acquire the tools for self-management.(Emerson, 2006; Funnell & Anderson, 2003; Shrivastava, Shrivastava, & Ramasamy, 2013) Diabetes self-management education and training (DSME/T), a nationally recognized education model, provides patients with the requisite knowledge and skills to properly manage the condition and successfully maintain self-care behaviors over the course of their lifetime.(American Diabetes Association (ADA), 2018; Beck et al., 2017; Powers et al., 2017; Tomky et al., 2008) DSME/T incorporates the patient's day-to-day needs and environment into ongoing learning about nutrition, exercise, monitoring, and medication.(American Association of Diabetes Educators, 2009; American Diabetes Association (ADA), 2018; Beck et al., 2017; Funnell & Anderson, 2003; Powers et al., 2017; Tomky et al., 2008) Rather than emphasizing a structured curriculum and set content areas, DSME/T is patient-centered and action-oriented and emphasizes health behavior changes. Classes focus on the seven self-care behaviors identified as essential for improving outcomes among patients with diabetes – [1] healthy eating, [2] physical activity, [3] blood sugar monitoring, [4] taking medication, [5] problem solving, [6] reducing risks, and [7] healthy coping. (American Association of Diabetes Educators, 2009; American Diabetes Association (ADA), 2018; Beck et al., 2017; Funnell & Anderson, 2003; Powers et al., 2017; Tomky et al., 2008)

Previous research suggests that receipt of DSME/T is associated with improved self-efficacy and self-care,(Wooley & Kinner, 2016) reduced the onset and/or worsening of diabetes-related complications,(Beck et al., 2017; Powers et al., 2017) improved overall quality of life (American Diabetes Association (ADA), 2018; Beck et al., 2017; Cochran & Conn, 2008; Cooke et al., 2013; Deakin, McShane, Cade, & Williams, 2005; Powers et al., 2017; Trento et al., 2004) and health outcomes, (Chrvala, Sherr, & Lipman, 2016; Norris, Engelgau, & Narayan, 2001; Norris et al., 2002) decreased health care utilization,(Johnson, Richards, & Churilla, 2015a) and reduced personal healthcare spending.(Duncan et al., 2009; Stetson et al., 2011) Moreover, DSME/T participants are more likely to receive key clinical care services, such as A1c tests and immunizations, in a timely manner. (Johnson, Richards, & Churilla, 2015b) With respect to self-care behaviors, DSME/T facilitates health behavior change and is associated with improved diet and nutrition,(Beck et al., 2017; Norris et al., 2001; Powell, Glover, Probst, & Laditka, 2005b; Powers et al., 2017) physical activity,(Beck et al., 2017; Norris et al., 2001; Powell et al., 2005b; Powers et al., 2017) weight loss,(Beck et al., 2017; Powell et al., 2005b; Powers et al., 2017; Yuan et al., 2014) and coping with stress and depression that often accompanies the "work of being a patient with diabetes".(Beck et al., 2017; de Groot, Golden, & Wagner, 2016; Powers et al., 2017; Russell, Suh, & Safford, 2005)

Despite its recognition as an essential component of diabetes care and well-documented benefits, DSME/T is underutilized.(American Diabetes Association (ADA), 2018; Beck et al., 2017; Centers for Disease Control and Prevention (CDC), 2017, 2018; Duncan et al., 2009; Emerson et al., 2007; Kolb & Lipman, 2015; Li et al., 2014; Office of Disease Prevention and Health Promotion (ODPHP), n.d.; Powell, Glover, Probst, & Laditka, 2005a; Powers et al., 2017; Shaw et al., 2011; Strawbridge, Lloyd, Meadow, Riley, & Howell, 2015) Just over half (58%) of all adults with diabetes report ever receiving formal DSME/T.(Centers for Disease Control and Prevention (CDC), 2018; Office of Disease Prevention and Health Promotion (ODPHP), n.d.) Patients who are older (age ≥ 65),(Rhee et al., 2005) minority,(Gucciardi, Chan, Manuel, & Sidani, 2013) uninsured,(Shaw et al., 2011) and/or publicly insured (Powell et al., 2005b; Shaw et al., 2011; Strawbridge et al., 2015) have the lowest utilization, suggesting barriers to DSME/T among these populations. Barriers to DSME/T include, but are not limited to, general lack of access,(American Diabetes Association (ADA), 2018; Beck et al., 2017; Powers et al., 2017) geographical location / program setting,(American Diabetes Association (ADA), 2018; Emerson, 2006; Emerson et al., 2007; Peyrot & Rubin, 2008; Peyrot, Rubin, Funnell, & Siminerio, 2009; Powers et al.,

2017) provider attitudes toward and awareness of DSME/T programs,(Emerson, 2006; Emerson et al., 2007; Peyrot & Rubin, 2008; Peyrot et al., 2009) lack of provider referrals,(American Diabetes Association (ADA), 2018; Beck et al., 2017; Nam et al., 2011; Peyrot & Rubin, 2008; Peyrot et al., 2009; Powers et al., 2017) patient attitudes and perceptions,(American Diabetes Association (ADA), 2018; Emerson, 2006; Emerson et al., 2007; Nam et al., 2011; Peyrot & Rubin, 2008; Powers et al., 2017) and financial constraints (patients and providers).(Peyrot & Rubin, 2008) Insurance reimbursement is considered the most significant barrier to DSME/T, because it impacts factors related to both patients and providers.(American Diabetes Association (ADA), 2018; Carpenter, Fisher, & Greene, 2012; Emerson, 2006; Peyrot & Rubin, 2008; Powell et al., 2005b; Powers et al., 2017; Shaw et al., 2011; Smith, Winterbauer, & Kolbe, 2017)

Insurance as a Facilitator of Access to Diabetes Care

Insurance coverage offers patients with diabetes the "enabling resources"(Aday & Andersen, 1974b; Andersen, 1995; Phillips, Morrison, Andersen, & Aday, 1998) needed to access care in general,(Gold et al., 2012; Hu, Shi, Rane, Zhu, & Chen, 2014) as well as specialty services like DSME/T.(Nam et al., 2011; Powers et al., 2017) Uninsured patients with diabetes and those who have a lapse in health insurance coverage are significantly less likely to receive recommended preventative services during primary care visits.(Bailey et al., 2015; Gold et al., 2012; Gold, DeVoe, Shah, & Chauvie, 2009) For example, uninsured and underinsured patients with diabetes are less likely to receive recommended A1c screening and immunizations, even when receiving care from federally qualified health centers (FQHCs), which typically provide health care regardless of insurance status.(Gold et al., 2012, 2009) Moreover, it is common practice for underinsured patients with diabetes to skip daily medications and blood glucose testing.(Kwan, Razzaq, Leiter, Lillie, & Hux, 2008) Notably, the quality of diabetes-related primary care is not predicted by insurance type; publicly- and privately- insured patients with diabetes receive the same overall quality of care.(Lee, Liang, & Shi, 2016) These findings suggest that policies that expand health insurance coverage for low-income patients with diabetes not only play a crucial role in improving general access to quality health care(Bailey et al., 2015; Gold et al., 2009; Hu et al., 2014; Lee et al., 2016) but facilitate patient self-care behaviors.(Kwan et al., 2008)

Historically, public and private insurers include coverage and benefits for basic diabetes care visits, services, and supplies but limit (or exclude) benefits for

DSME/T;(Carpenter et al., 2012; Powell et al., 2005b; Shaw et al., 2011; Stetson et al., 2011) thus requiring patients to purchase DSME/T coverage as an additional benefit or pay for the service out-of-pocket. This is particularly true for insurance products that only meet the Affordable Care Act (ACA)'s minimal "essential health benefits" requirements.(111th United States Congress, 2010)

To facilitate access to services like DSME/T, several states have adopted insurance mandates that define minimum required coverage and benefits for diabetes-related care, including DSME/T.(NCSL, 2016; Policy Surveillance Program, 2016) Currently, forty-four states and the District of Columbia require private insurers and fifteen states require Medicaid to cover DSME/T.(Policy Surveillance Program, 2016) Table 1 lists mandated benefits laws by state. These statutes have developed over a period of 20 years (1996 to 2016) and are varied and far-reaching. Reimbursement provisions within these mandates define which events trigger benefits of DSME/T reimbursement, such as a new diagnosis, change in health status, or general need for reeducation.(Policy Surveillance Program, 2016) Reimbursement provisions also define which providers can order and provide DSME/T, in which settings reimbursable DSME/T programs can be held, and establishes criteria for reimbursable services (e.g., telehealth).(Policy

Surveillance Program, 2016) However, whether these mandates and reimbursement provisions have effectively improved the access to DSME/T is unknown.

Table 1. State Insurance Mandates for DSME/T(Policy Surveillance Program, 2016)

State	Adopted a Law?	Effective Year of Law	Insurers Subject to Law	
			Private	Medicaid
Alabama		N/A		
Alaska	X	2002	X	
Arizona		N/A		
Arkansas	X	1998	X	
California	X	2003	X	
Colorado	X	2014	X	
Connecticut	X	2000	X	
Delaware		N/A		
District of Columbia	X	2004	X	
Florida	X	2015	X	
Georgia	X	2011	X	
Hawaii	X	2002	X	
Idaho	X	2012		X
Illinois	X	2012	X	
Indiana	X	1998	X	X
Iowa	X	2016	X	X
Kansas	X	1998	X	
Kentucky	X	2015	X	
Louisiana	X	2013	X	X
Maine	X	2013	X	X
Maryland	X	2013	X	X
Massachusetts	X	2000	X	X
Michigan	X	2016	X	
Minnesota	X	2013	X	X
Mississippi	X	2015		X

Table 1. State Insurance Mandates for DSME/T (continued)

State	Adopted a Law?	Effective Year of Law	Insurers Subject to Law	
			Private	Medicaid
Missouri		N/A		
Montana	X	2016	X	
Nebraska	X	1999	X	
Nevada	X	2014	X	
New Hampshire	X	1998	X	
New Jersey	X	1997	X	
New Mexico	X	1998	X	
New York	X	2016	X	X
North Carolina	X	1998	X	
North Dakota		N/A		
Ohio		N/A		
Oklahoma	X	2010	X	
Oregon	X	2014	X	
Pennsylvania	X	2001	X	
Rhode Island	X	2002	X	
South Carolina	X	2012	X	
South Dakota	X	2015	X	X
Tennessee	X	1997	X	
Texas	X	2015	X	
Utah	X	2015	X	X
Vermont	X	2012	X	X
Virginia	X	2014	X	
Washington	X	2016		X
West Virginia	X	1996	X	
Wisconsin	X	2015	X	
Wyoming	X	2016	X	

Gaps in the Literature

Experts argue that requiring insurance benefits for chronic care services is a viable policy solution to ensure equal access to services.(Carpenter et al., 2012; Lee et al., 2016) Since the McCarran-Ferguson Act of 1945 established the statutory framework for regulating health insurance,(79th United States Congress, 1945) mandated health benefit laws (or state-mandated benefit laws when enacted at the state level) have played a central role in health care reform.(Laugesen, Paul, Luft, Aubry, & Ganiats, 2006; Monahan, 2009) These mandates require public and private insurers to provide or offer benefits for specified conditions, services, medications, or supplies.(Laugesen et al., 2006; Monahan, 2009) As such, the effectiveness of these mandates has been of interest to health services and policy researchers, especially since the passage of the Affordable Care Act.(111th United States Congress, 2010) Numerous studies have measured the impact of state-mandated benefits on access to care for mental health,(Bao & Sturm, 2004; Klick & Markowitz, 2006; Sturm, 2000) behavioral health,(Chatterji, Decker, & Markowitz, 2015) reproductive health,(M. P. Bitler, 2005; M. Bitler & Schmidt, 2006; Bundorf, Henne, & Baker, 2007; Jain, Harlow, & Hornstein, 2002; Mulligan, 2015) cancer screenings,(M. P. Bitler & Carpenter, 2016, 2017; Cokkinides, Bandi, Shah, Virgo, & Ward, 2011; Hamman & Kapinos, 2015) and tobacco cessation.(Greene, Sacks, & McMenamin, 2014) At the federal level, several studies have measured the impact of coverage mandates included in the ACA(111th United States Congress, 2010) on access and utilization.(Akosa Antwi, Moriya, & Simon, 2015; Antwi, Moriya, & Simon, 2013; Chen, Vargas-Bustamante, Mortensen, & Ortega, 2016; Hofer, Abraham, & Moscovice, 2011; Sommers, Baicker, & Epstein, 2012; Sommers, Buchmueller, Decker, Carey, & Kronick, 2013; Vujicic, Yarbrough, & Nasseh, 2014) However, this evidence is mixed.

Very few studies have examined the impact of mandated benefits on diabetes-related outcomes.(Grecu & Spector, 2014; Klick & Stratmann, 2007; Li, Zhang, Barker, & Hartsfield, 2010; Li, Zhang, & Narayan, 2008) The 1997 expansion of Medicare benefits to include glucose monitors and DSME/T improved daily glucose monitoring among older adults;(Li et al., 2008) and state-mandated benefits for diabetes reduced adverse pregnancy outcomes, such as low-birth weight and premature delivery.(Grecu & Spector, 2014) By contrast, the presence of state-mandated benefits for diabetes-related care appears to have little to no impact on access to diabetes care(Li et al., 2010) and worsens diabetes-related outcomes.(Klick & Stratmann, 2007) However, all of these studies suggest that the magnitude of the impact of these mandates on positive outcomes was greater among higher income patient populations. Further, these analyses focused on the presence (or absence) of the mandates of interest. To date, no studies have explored state insurance mandates for DSME/T specifically, or the impact of reimbursement provisions outlined in the mandates. The impact of state-mandated benefits and reimbursement provisions for DSME/T on access to DSME/T is unknown.

Current Study

Because “access” is a multidimensional construct, (Aday & Andersen, 1974b, 1978; Aday, 1976; Andersen, 1995; Davis, 1991b; Penchansky & Thomas, 1981; Ricketts & Goldsmith, 2005) this dissertation triangulates findings from three disparate analyses to rigorously assess the impact of state insurance mandates and reimbursement provisions on multiple measures of access to DSME/T among adult patients with diabetes. The central research question is:

> Do state insurance mandates and reimbursement provisions improve access to DSME/T for patients with diabetes?

Hypotheses and approaches to investigate this question are grounded in the Access to Medical Care Framework,(Aday & Andersen, 1974b) the Behavioral Model of Health Care

Utilization, (Andersen, 1995; Phillips et al., 1998) and the Model for Public Health Law Research;(Burris et al., 2010) and further informed by several established frameworks and conceptualizations for measuring access to care.(Aday & Andersen, 1978; Aday, 1976; Bice, Eichhorn, & Fox, 1972; Chriqui, O'Connor, & Chaloupka, 2011; Davis, 1991a; Fein, 1972; Macinko & Silver, 2012; Penchansky & Thomas, 1981; Ricketts & Goldsmith, 2005)

The Access to Medical Care Framework (see Figure 3) provides a holistic and theoretical depiction of how health policies shape observable factors at multiple levels which, in turn, influence the multidimensional concept of access.(Aday & Andersen, 1974b) The Behavioral Model of Health Care Utilization (see Figure 4), by contrast, offers a narrower focus on the characteristics of the target population.(Andersen, 1995) The Model for Public Health Law Research (see Figure 5) demonstrates the pathways by which laws impact population health outcomes.(Burris et al., 2010) The current study adapts and merges the constructs and relationships from these frameworks into a single conceptual model to depict the influence of state insurance mandates on multiple measures of access to DSME/T (see Figure 6). This model predicts that the adoption of state insurance mandates and reimbursement provisions (i.e., changes to the external environment via policy change) will result in expanded insurance coverage to include DSME/T (i.e., e*nabling resources* needed to gain entry into the health system), thus, improving access to the service.(Aday & Andersen, 1974b, 1978; Andersen & Aday, 1978; Andersen, 1995) Analysis 1 examines potential access by measuring the influence of state insurance mandates on the availability[ii] of DSME/T resources before and after states' adoption of insurance mandates and reimbursement provisions for DSME/T.(Aday & Andersen, 1974b; Andersen, 1995) Analysis 2 explores realized access by measuring the impact of the state mandates on utilization of DSME/T before and after adoption.(Aday & Andersen, 1978; Andersen & Aday, 1978; Andersen, 1995) Finally, patient need for a service is identified as a critical factor when measuring access.(Aday, 1976; Andersen, 1995; Davis, 1991b) Therefore, Analysis 3 explores whether patient need influences access in the context of a state mandate that allows physicians to prescribe DSME/T based on clinical guidelines.

[ii] Availability is defined as the relationship between the supply of healthcare resources and patient need and demand.(Penchansky & Thomas, 1981) It can be measured as the supply of providers and facilities,(Bice et al., 1972) their geographic location,(Fein, 1972) and/or their capacity to provide care and services.(Donabedian, 1973)

Original Contribution

The impact of decades of state policy interventions to address one of the nation’s leading public health burdens through better use of the standard of care is unknown. This dissertation is a significant contribution to the existing body of knowledge because it examines multiple and differing state-level insurance benefit mandates to determine their impact on DSME/T access. This dissertation extends the evidence base for diabetes care services by leveraging a newly created, validated state-level legal dataset(Policy Surveillance Program, 2016) and applying a sophisticated and policy-relevant measurement approach. While described elsewhere, these data have yet to be applied to diabetes research. Moreover, this dissertation employs an innovative measurement approach that is more informative than conventional policy analysis to explore the impact of specific provisions within multiple states’ insurance mandates for DSME/T on outcomes.(Anderson, Tremper, Thomas, & Wagenaar, 2012; Burris et al., 2010) This dissertation builds upon prior policy research on state-level diabetes insurance mandates, which measure impact using only the presence or absence of a policy,(Carpenter et al., 2012; Li et al., 2010) by measuring granular policy variations over time. (Anderson et al., 2012; Burris et al., 2010) These findings will be of interest to policymakers, healthcare providers and administrators, and researchers from multiple disciplines, including health services research, who are interested in understanding the dynamics of insurance benefit mandates and chronic disease management, particularly in the age of health care reform.

Figure 3. Access to Medical Care Framework(Aday & Andersen, 1974b)

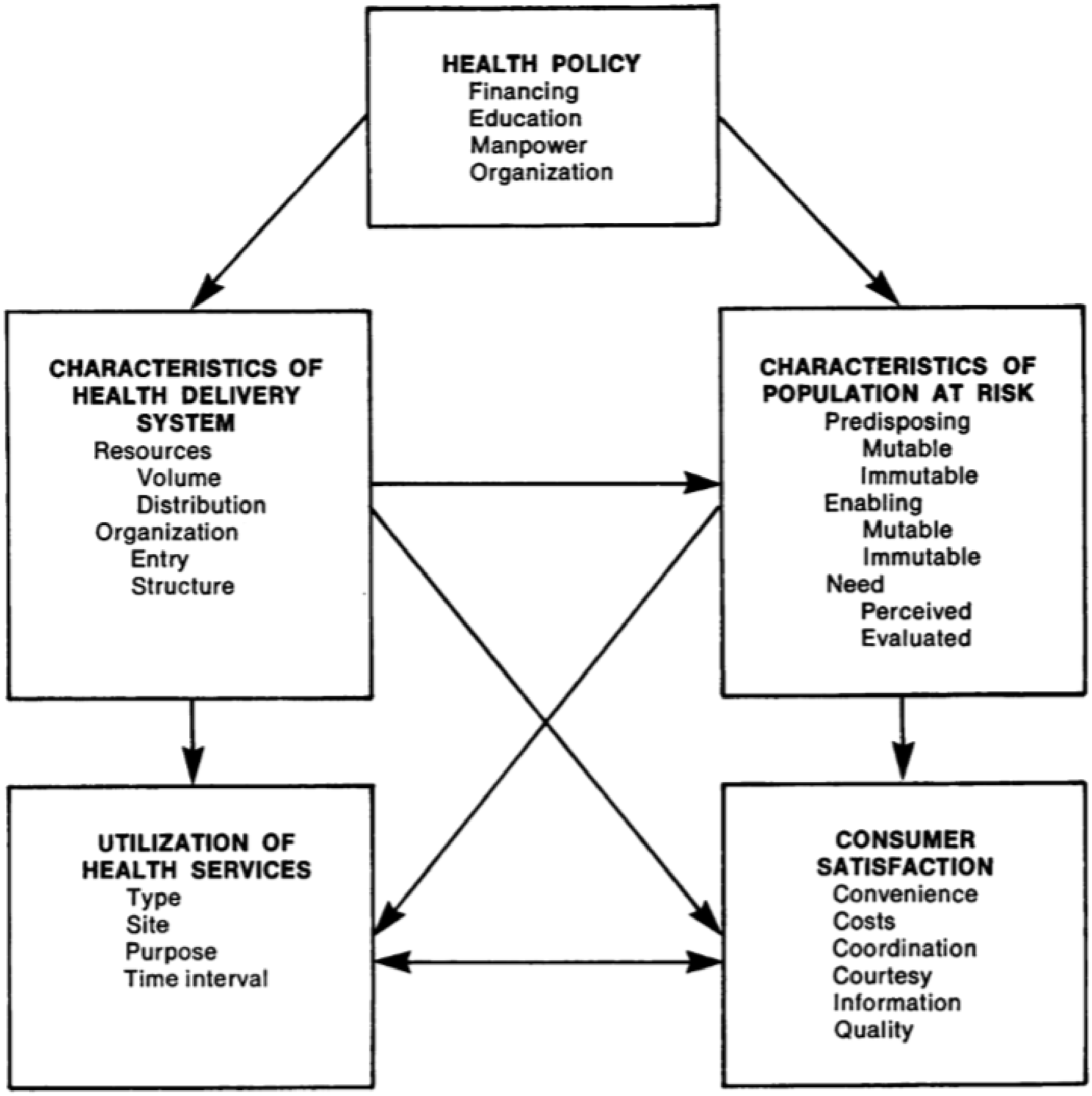


Figure 4. Behavioral Model of Health Care Utilization(Andersen, 1995; Phillips et al., 1998)

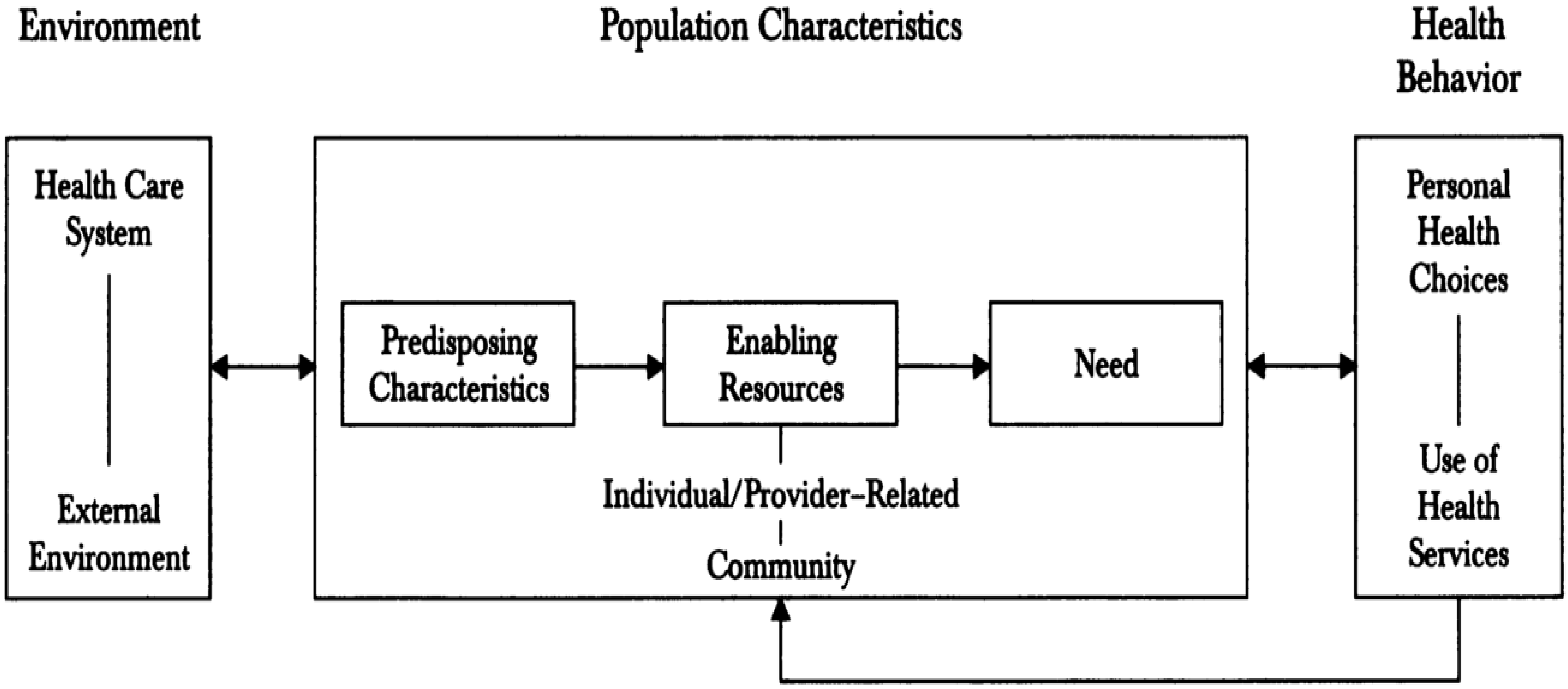


Figure 5. Model for Public Health Law Research(Burris et al., 2010)

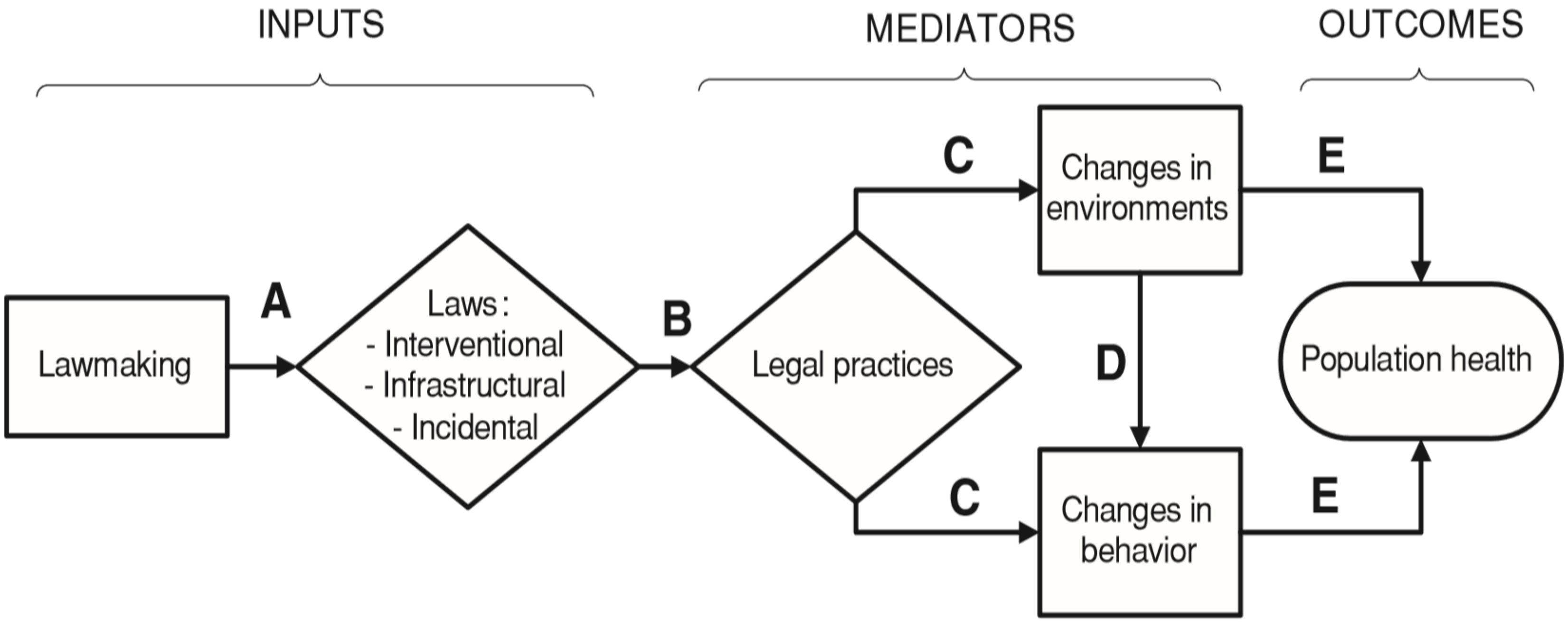
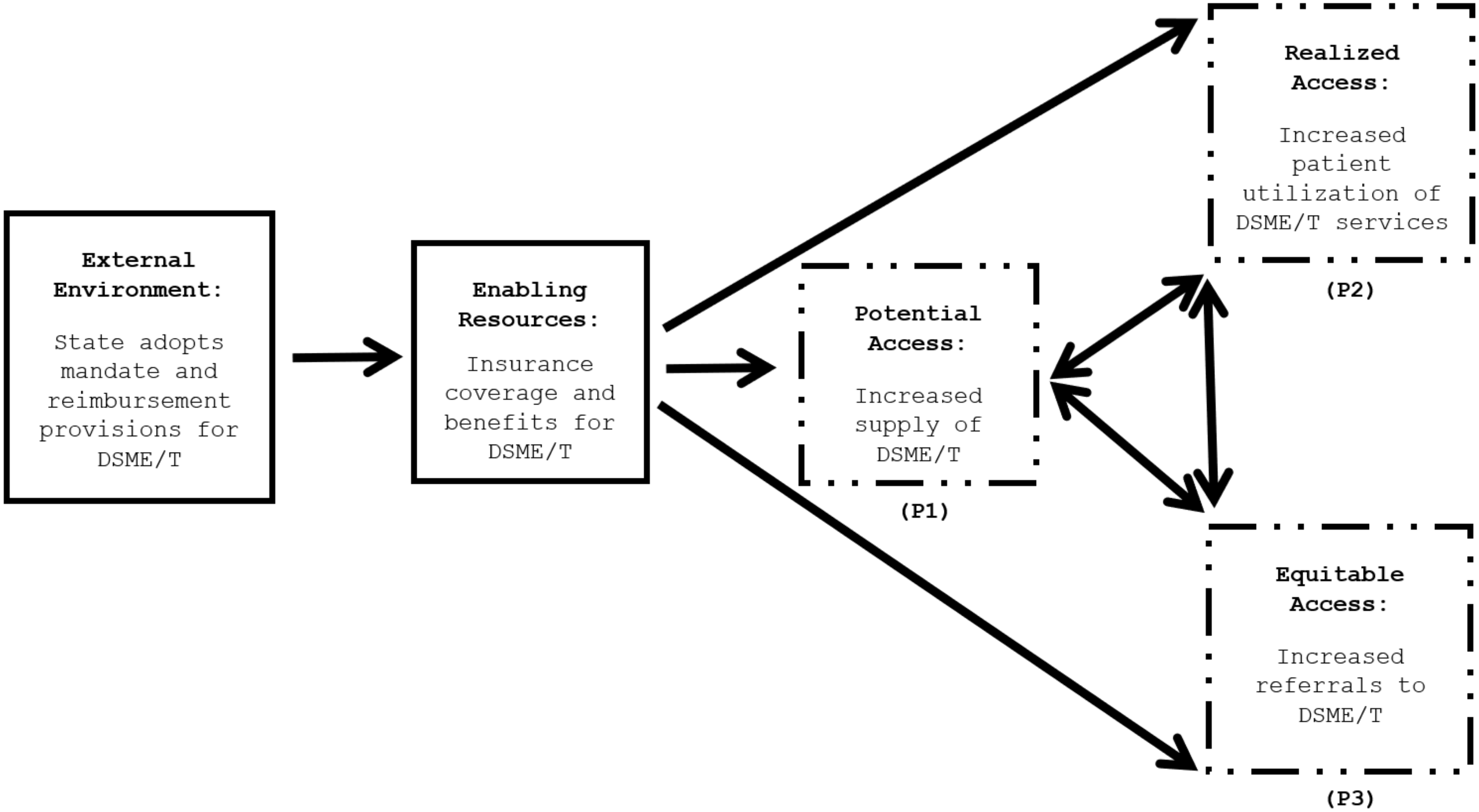


Figure 6. Conceptual Model



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CHAPTER TWO

EXPANDING POTENTIAL ACCESS TO DSME/T WITH STATE-MANDATED COVERAGE?

Background

Uncontrolled diabetes can lead to serious and life-threatening complications that require costly healthcare utilization.(Amaize & Mistry, 2016; Egede, 2004; Josephsen & Rusnak, 2006; Menchine, Wiechmann, Peters, & Arora, 2012; Washington, Andrews, & Mutter, 2010; Yan et al., 2017) Because most of the care associated with diabetes is self-managed,(Emerson, 2006; Funnell & Anderson, 2003; Shrivastava, Shrivastava, & Ramasamy, 2013) experts recommend that all patients with, or at risk for developing, the condition participate in diabetes self-management education and training (DSME/T).(Beck et al., 2017; Powers et al., 2017) DSME/T employs one-on-one and group instruction with physicians, nurses, dietitians, pharmacists, and other trained health professionals to equip patients with the skills necessary for proper self-care.(Beck et al., 2017; Powers et al., 2017) Importantly, DSME/T is associated with improved outcomes(Chrvala, Sherr, & Lipman, 2016; Duncan et al., 2009; Johnson, Richards, & Churilla, 2015; Norris, Engelgau, & Narayan, 2001; Stetson et al., 2011) and reduced health expenditures.(Karter et al., 2002; Link & McKinlay, 2009; Osborn, de Groot, & Wagner, 2013; Peek, Cargill, & Huang, 2007; Robbins, Thatcher, Webb, & Valdmanis, 2008; Saydah & Lochner, 2010) However, very few patients with diabetes receive DSME/T in the first year after diagnosis regardless of insurance status.(Duncan et al., 2009; Kolb & Lipman, 2015; Li et al., 2014; Powell, Glover, Probst, & Laditka, 2005; Powers et al., 2017; Shaw, Killeen, Sullivan, & Bowman, 2011; Strawbridge, Lloyd, Meadow, Riley, & Howell, 2015) A significant barrier to patient receipt of DSME/T is a lack of access to programs and providers.(Emerson, 2006; Peyrot & Rubin, 2008; Peyrot, Rubin, Funnell, & Siminerio, 2009; Shaw et al., 2011)

The limited availability of DSME/T programs and providers may be due to insurance benefits and reimbursement rates.(Piccinino et al., 2017) Specifically, DSME/T is not a nationally defined benefit for Medicaid beneficiaries,(Medicaid.gov, n.d.) nor has it historically been a common feature of most private insurance plans.(Carpenter, Fisher, & Greene, 2012; Powell et al., 2005; Shaw et al., 2011; Stetson et al., 2011) As a result, coverage for DSME/T has varied over time and across states. While DSME/T is reimbursable under Medicare Part B,(CMS, 2018) providers contend reimbursement rates are too low to offset the costs of the service.(Peyrot & Rubin, 2008; Peyrot et al., 2009; Shaw et al., 2011) Insufficient financing, whether due to low reimbursement or outright exclusion from defined benefits, may limit organizations' ability to: hire the appropriate staff, enroll more patients, provide the recommended hours of DSME/T to patients, offset the cost of program accreditation, or to sustain programs during periods of low enrollment.(Butcher et al., 2011; Emerson et al., 2007; Peyrot & Rubin, 2008; Peyrot et al., 2009; Powell, Glover, Probst, & Laditka, 2004; Powell et al., 2005; Shaw et al., 2011) The absence of mandated coverage or low reimbursement may particularly limit access in non-metropolitan areas where DSME/T programs are scarce.(Powell et al., 2004; Rutledge, Masalovich, Blacher, & Saunders, 2017)

In order to improve access, numerous states have opted to define DSME/T services as a mandatory insurance benefit and tailor provisions establishing guidelines for program and provider reimbursement. The nature and scope of these state-level policies vary. For example, many states have defined DSME/T as a mandatory benefit for private insurers, but not for Medicaid.(NCSL, 2016; Policy Surveillance Program, 2016) Likewise, reimbursement provisions define which providers can order and provide DSME/T, in which settings reimbursable DSME/T programs can be housed, and which program features are required elements of reimbursable programs.(NCSL, 2016;

Policy Surveillance Program, 2016) These policies are increasingly more common, with 45 states having adopted some form of DSME/T regulation between 1996 and 2016.(NCSL, 2016; Policy Surveillance Program, 2016)

Critically, whether or not these state-level policies are actually achieving the intended goal of greater potential access to DSME/T has not been determined. This study first explores the impact of state-level DSME/T mandated benefits and reimbursement provisions in terms of their effect on the supply of DSME/T programs and certified providers after adoption. Additionally, in light of the variation in state policies, this study explores which provisions influence the availability of DSME/T resources. Identifying the impact of specific provisions is particularly relevant for the health of vulnerable and underrepresented populations given that most states have not implemented DSME/T mandates for public insurance programs.

Methods

This analysis utilized a fixed-effects modeling strategy to compare the supply of DSME/T resources in states that adopted reimbursement mandates with states that did not.

Data Sources

This study used a unique combination of legal and programmatic data sources. The primary data source was Temple

University’s Policy Surveillance Program (PSP) legal dataset, which is a publicly-available, validated collection of laws governing DSME/T reimbursement from all 50 states and the District of Columbia. These data include whether a state mandates health insurance benefits for DSME/T, the effective date of the law, and any provisions defining the criteria programs must meet in order to qualify for reimbursement from private insurers and/or Medicaid. The legal data were merged with two datasets describing the supply of DSME/T resources. The American Association of Diabetes Educators’ (AADE) accreditation database is a census of all accredited DSME/T programs nationwide. This database is updated annually and includes indicators of program location, date of accreditation, and program setting. The National Certification Board for Diabetes Educators (NCBDE) provides state-level counts of certified providers. We also merged data from the US Diabetes Surveillance System, the Health Resources and Services Administration (HRSA) Area Health Resource Files, and the United States Census Bureau to account for external factors that could influence the supply of and demand for DSME/T programs and providers in each state.

Sample

The sample consisted of an eight-year panel (2010 – 2017) of 44 states and the District of Columbia with mandated benefits for DSME/T and 6 states without a mandate (for a total of 408 state-year observations). To be included in the treatment group, states must have codified a reimbursement mandate that took effect on or before January 1, 2017.

Outcome Measures

Our primary outcome of interest was the state-level supply of DSME/T delivery resources, which is reflective of patients' potential access to services.(Aday & Andersen, 1974; Andersen & Aday, 1978; R M Andersen, McCutcheon, Aday, Chiu, & Bell, 1983; Andersen, 1995) Specifically, for each state-year we counted the number of accredited DSME/T programs, program sites, and certified DSME/T providers. These three measures reflect different, but related, aspects of the supply of DSME/T resources. A program is any entity that offers ongoing DSME/T classes and support services to address the patient's physical, social, emotional, and medical needs associated with managing diabetes.(Powers et al., 2017) A DSME/T program may offer classes and services at multiple physical locations, or program sites. DSME/T classes are typically delivered by health care professionals who are certified diabetes educators.(National Certification Board for Diabetes Educators, n.d.-b) Health care professionals eligible for this certification include licensed physicians, registered nurses, physician assistants, pharmacists, clinical psychologists, dietitians, occupational and physical therapists, and, in some cases, health educators.(National Certification Board for Diabetes Educators, n.d.-a)

We limited the analysis to only accredited programs/certified providers because: 1) the national standards for DSME/T recommends that providers refer patients to accredited programs/certified providers when they need education;(Beck et al., 2017; Powers et al., 2017) 2) accredited programs/certified providers are the de facto standard because Medicare only reimburses for AADE accredited programs;(CMS, 2018) and 3) no reliable census of unaccredited programs or non-certified providers exists. As of July 2017, there were 19,417 certified providers and 734 accredited DSME/T programs at 2,003 program sites. Accredited program sites were housed in a variety of health settings including hospitals/hospital-based outpatient centers, freestanding diabetes centers, community health clinics, pharmacies, and health departments.

Determinants of Interest

The primary determinant of interest was an indicator of whether the state-year observation occurred after the adoption of a reimbursement mandate for DSME/T. Our secondary determinants of interest reflected the variation within state-level mandates by creating a series of binary variables reflective of the “flexibility” within each state’s reimbursement provisions governing: the types of providers who can deliver DSME/T, certification and licensing requirements, diabetes knowledge requirements, compliance standards, and allowable delivery settings. Within each of these types of provisions, a state was categorized as having a “flexible” provision if no restrictions existed. Therefore, provisions that allowed any provider to deliver DSME/T, did not require DSME/T providers to meet knowledge and certification requirements, did not require DSME/T programs to comply with national or state standards, and those that permitted DSME/T delivery in multiple settings were flexible.

Model Covariates

From the US Diabetes Surveillance System, Area Health Resource Files, and US Census Bureau datasets, we obtained system- and population- level factors known to influence potential access to care:(Aday & Andersen, 1974; Andersen & Aday, 1978; Andersen et al., 1983; Andersen, 1995) annual population estimates, prevalence of type 2 diabetes, health provider shortage scores, and population insurance estimates. Models also controlled for the expansion of insurance coverage and benefits under the ACA.(111th United States Congress, 2010)

Analysis

Frequencies, percentages, and means of the above variables were used to describe the panel. To estimate the effect adoption of DSME/T mandates, we used a state fixed-effects regression to compare the change in DSME/T programs, sites, and providers over time. The following model was used:

$$Y_{st} = \alpha + \beta_1 Law_{st} + \beta_2 ACA_t + \beta_3 Medicaid_{st} + X_{st}\theta + X_s + T_t + \varepsilon_{st}$$

s is an indicator of state-level measurement and t is a time measure. Law_{st} is the time-varying measure of whether the state-year observation is after the adoption of a mandate. β_1 tested the likelihood of a significant change in the count of DSME/T programs, sites, or providers among states that adopted a mandate in a given state year. To fully account for the policy levers that might also influence the supply and demand for DSME resources, the model included dummy indicators to control for the enactment of the Affordable Care Act (ACA_t) and Medicaid expansion ($Medicaid_{st}$). X_{st} represents all other time-variant measures. X_s and T_t represent state and time fixed effects, respectively. Models used clustered robust standard errors.

The absence of a measurable impact can be attributable to a masked intermediary exposure vis-à-vis reimbursement provisions.(Anderson, Tremper, Thomas, & Wagenaar, 2012)

Therefore, we repeated the previously described analytic strategy but used the following model to estimate the effect of having flexible reimbursement provisions on the supply of DSME/T resources among adopting states over time:

$$Y_{st} = \alpha + \beta_1 Type_{st} + \beta_2 Cert_{st} + \beta_3 Know_{st} + \beta_4 Features_{st} + \beta_5 Setting_{st}$$
$$+ \beta_6 ACA_t + \beta_7 Medicaid_{st} + X_{st}\theta + X_s + T_t + \varepsilon_{st}$$

β_1, β_2, β_3, β_4 and β_5 test the association between states having flexible reimbursement provisions and the supply of DSME/T resources. $Type_{st}$ is the binary indicator of whether a state's reimbursement guidelines allowed any licensed health care provider to deliver DSME/T. $Qual_{st}$ is the binary indicator of whether a given state did not require DSME/T providers to be trained in DSME/T management or certified diabetes educators. $Features_{st}$ indicates whether a state's reimbursement guidelines do not require programs to comply with state or national standards. $Setting_s$ indicates the inclusion of guidelines allowing DSME/T to be delivered in multiple health care settings. The model also included state and year fixed effects.

Supplemental Analysis

Lastly, individual states may introduce mandates and reimbursement provisions for only Medicaid, private payers, or both. Because these represent important yet different patient populations, as supplemental analyses we repeated all regression models but stratified states based on whether adopted mandates applied to Medicaid, private insurers, or both. While the inclusion of this supplemental analysis provides additional context, the limited variability across states prevents us from using this as the primary modeling strategy. Our analysis of these secondary data was deemed not human subjects research by the institutional review board.

Results

The majority of states adopted some type of reimbursement mandate for DSME/T (Figure 7). Thirty-two states adopted a reimbursement mandate for either private insurers or Medicaid, and thirteen states adopted a mandate for both insurer types. Among states with mandates, the degree of flexibility around specific reimbursement guidelines was variable. For example, more than half of the states in our sample had a provision for Medicaid or private insurers allowing any provider to deliver DSME/T. Only five states offered this flexibility for both insurer types. A majority of states adopted flexible guidelines for provider qualifications and program features for both Medicaid and private insurance reimbursement. However, DSME/T delivery setting provisions most often limited reimbursable DSME/T to outpatient settings.

As of 2017, states without a reimbursement mandate had fewer, but not significantly fewer, DSME/T programs, sites, and certified providers (see Table 2). In addition, states with and without a mandate did not differ significantly in terms of T2DM prevalence, insurance rates, or health professional shortage scores. These descriptive statistics suggest no significant difference in need for diabetes services between our treatment and control groups.

Impact of Mandated Benefits for DSME/T

Controlling for all other factors, having state-mandated benefits for DSME/T did not have a significant impact on the supply of programs or program sites (see Table 3). However, states' adoption of a DSME/T mandate was associated with fewer certified providers ($\beta = -16.0$; $p=0.05$). States that expanded Medicaid were associated with an increase in the supply of certified DSME/T providers. With respect to federal legislation, the enactment of the ACA was associated with an increase in the supply of programs ($\beta = 1.5$; $p=0.01$), sites ($\beta = 4.4$; $p=0.009$), and providers ($\beta = 8.1$; $p=0.001$).

Impact of DSME/T Reimbursement Provisions

"Flexible" reimbursement provisions were inconsistently associated with changes in the supply of DSME/T providers, programs, or sites (see Table 4). For example, states without diabetes management knowledge or training requirements for providers (i.e. the more “flexible” provision) were associated with a significant increase in program sites (β= 60.4; p < 0.01) and providers (β= 119.0; p < 0.01). However, states with provisions that did not require providers to be certified diabetes educators had fewer programs (β= -7.1; p=0.01), program sites (β= -48.5; p < 0.01), and providers (β= -116.0; p < 0.01). In addition, states without requirements around compliance with state standards were associated with an increase in the number of certified providers (β= 23.0; p < 0.01); whereas states without requirements to meet national standards were not associated with a change in supply.

Supplemental Results

From 2010 to 2017, the supply of accredited DSME/T programs, program sites, and certified providers increased (see Table A-10). Pairwise comparisons between states without a mandate, states with a mandate for one insurer type, and states with a mandate affecting Medicaid and private insurers revealed statistically significant mean differences in accredited programs between states with a mandate affecting both insurers and either states without a mandate (3.44; p=0.02) or states with a mandate for only one insurer type

(3.19; $p=0.03$). There was no significant difference in the number of programs sites or providers among these groups.

Table A-11 displays the supplemental regression results. The adoption of a reimbursement mandate targeting both Medicaid and private insurers was associated with fewer certified providers ($\beta= -15.39$; $p=0.05$). There was no significant difference in the supply of programs or program sites among states with mandates for one or both insurer types. With respect to reimbursement guidelines, there were significantly fewer program sites ($\beta= -42.05$; $p < 0.01$) and certified providers ($\beta= -107.70$; $p < 0.01$) in states with no provider certification requirements for either Medicaid or private insurers. States with no certification requirements for both insurer types had significantly fewer program sites ($\beta= -35.38$; $p < 0.01$) and certified providers ($\beta= -92.8$; $p < 0.01$). Alternatively, states that did not require DSME/T providers to have knowledge or training in diabetes management for one or both insurer types had a larger supply of program sites and certified providers ($p <0.01$). None of the provisions were associated with the supply of programs.

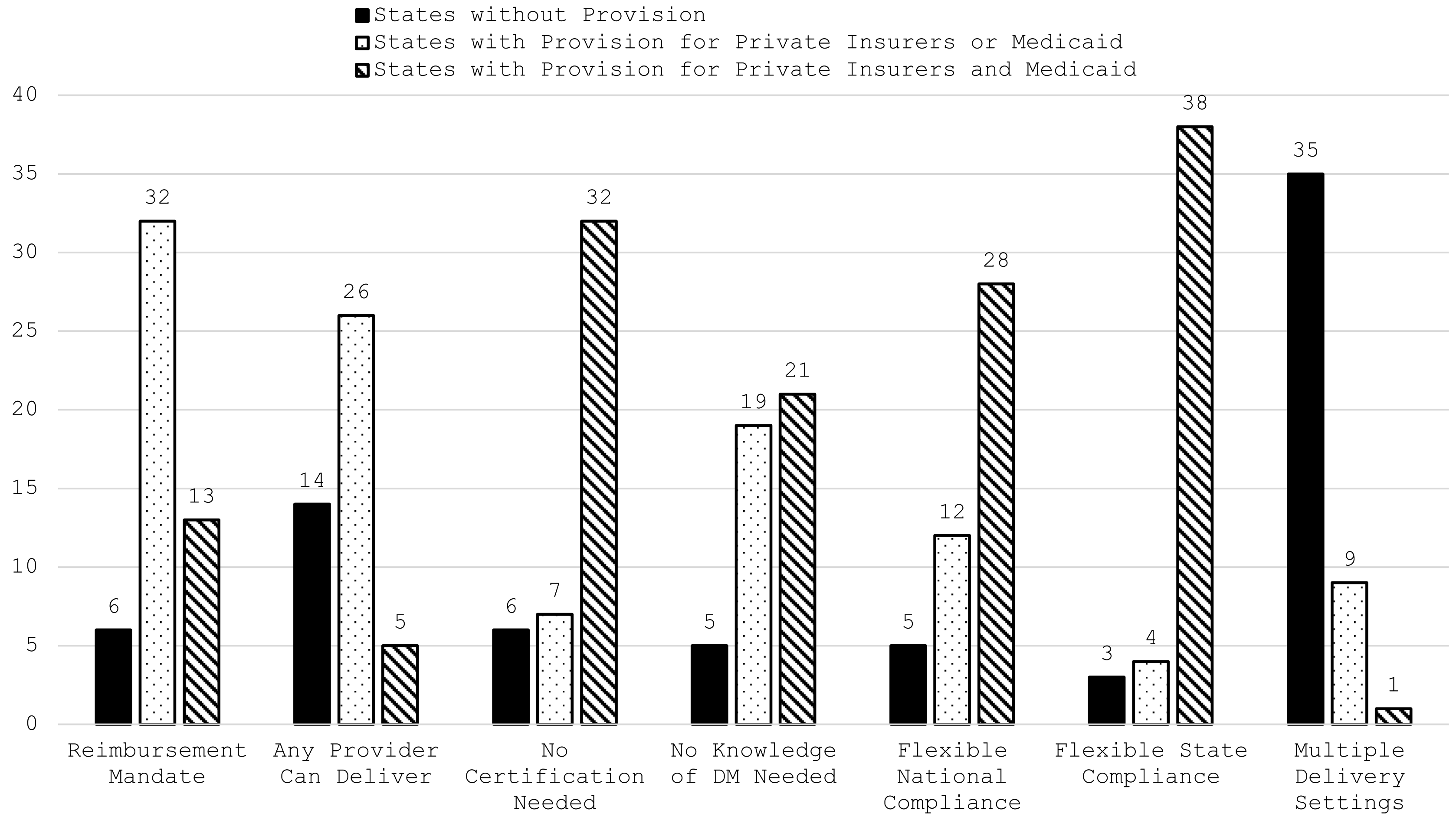

Figure 7. Count of US Jurisdictions by Mandate and Reimbursement Provision Type, 2017

Table 2. Descriptive Analysis of US Jurisdictions Included in the Sample, 2017 (n=51)

	No Mandate		With Mandate	
	Mean	Standard Deviation	Mean	Standard Deviation
DSME/T Programs	11.7	6.7	14.8	11.2
DSME/T Sites	25.7	17.0	41.1	36.3
DSME/T Providers	301.2	238.8	391.3	408.0
Prevalence of DM	10.5	1.3	9.5	1.7
Insured Rate	92.7	2.0	92.8	3.1
Private	70.5	5.9	69.4	5.4
Medicaid	18.7	4.5	20.6	5.1
HPSA Score	13.7	1.3	13.4	2.0
Primary Care	12.5	1.7	12.2	2.4
Mental Health Care	14.9	2.2	15.1	2.1

Notes:

* - $p \leq 0.05$

** - $p \leq 0.01$

Table 3. Characteristics Associated with the Supply of DSME/T Resources, 2010-2017

Variables of Interest	Accredited Programs			Program Sites			Certified Providers		
	β	C.I.		β	C.I.		β	C.I.	
		Lower	Upper		Lower	Upper		Lower	Upper
Adopted a DSME/T Mandate?									
No Mandate	[Reference]			[Reference]			[Reference]		
Adopted a Mandate	0.84	-1.0	2.7	2.2	-2.4	6.8	-16.0*	-32.1	0.0
ACA Provisions									
ACA Enactment	1.5 *	0.3	2.6	4.4 **	1.1	7.6	8.1 **	3.5	12.8
Pre-Existing / Individual Mandate	2.5 **	0.6	4.3	3.8	-1.3	8.8	8.8	-4.6	22.2
1st Dollar Prevention	0.9 **	0.4	1.3	1.4 **	0.4	2.5	2.3	-1.8	6.4
Medicaid Expansion	-0.6	-3.0	1.8	3.1	-3.6	9.9	21.4 **	5.8	36.9
Population Characteristics									
Prev. of DM	0.3	-0.9	1.4	-0.5	-3.4	2.4	-5.4	-10.9	0.03
% Any Insurance	0.3	-0.1	0.8	0.5	-1.1	2.1	-0.1	-4.1	3.9
HPSA Score, Overall	-0.7	-3.3	1.8	-0.1	-6.6	6.5	2.4	-6.4	11.1
HPSA Score, Primary Care	0.6	-1.3	2.4	0.6	-3.9	5.2	-0.8	-8.2	6.6
HPSA Score, Mental Health	0.02	-0.9	1.0	-0.4	-2.7	2.0	-3.1	-8.2	2.0

Notes:
* - $p \leq 0.05$
** - $p \leq 0.01$

Table 4. Reimbursement Provisions and Supply of DSME/T Resources, 2010-2017

Variables of Interest	Accredited Programs			Program Sites			Certified Providers		
	β	C.I.		β	C.I.		β	C.I.	
		Lower	Upper		Lower	Upper		Lower	Upper
Any Provider Can Deliver									
No	[Reference]			[Reference]			[Reference]		
Yes	1.6	-0.9	4.0	2.0	-5.4	9.4	-19.2	-42.9	4.6
Flexible Certification									
No	[Reference]			[Reference]			[Reference]		
Yes	-7.1 *	-12.5	-1.7	-48.5 **	-57.7	-39.4	-116.0**	-134.3	-95.6
Flexible Training									
No	[Reference]			[Reference]			[Reference]		
Yes	3.1	-8.4	14.6	60.4 **	37.9	82.9	119.0 **	88.5	149.5
Flexible National Compliance									
No	[Reference]			[Reference]			[Reference]		
Yes	0.6	-6.6	7.7	-10.0	-25.8	5.8	-9.1	-18.2	0.001
Flexible State Compliance									
No	[Reference]			[Reference]			[Reference]		
Yes	0.2	-5.6	6.0	7.4	-8.2	23.0	23.0 **	11.7	34.3
Multiple Delivery Settings									
No	[Reference]			[Reference]			[Reference]		
Yes	-1.5	-7.6	4.6	-5.5	-16.9	5.9	16.6	-9.4	42.6
Notes: * - $p \leq$ 0.05 ; ** - $p \leq$ 0.01									

Discussion

Consistent with the goals and foci of the Healthy People framework,(Office of Disease Prevention and Health Promotion (ODPHP), n.d.) the majority of states have now mandated health insurance benefits for DSME/T. However, these mandates did not significantly increase the states’ supply of DSME/T programs, providers, or sites as envisioned by policymakers. Furthermore, reduced or unchanged DSME/T resource availability after mandate adoption undermines the prevailing sentiment that lack of DSME/T access is the product of limited or no insurance benefits. Survey and qualitative research widely report that organizations’ ability to develop, expand, and sustain DSME/T programs is severely hampered by the absence of mandatory insurance benefits.(Butcher et al., 2011; Emerson et al., 2007; Peyrot & Rubin, 2008; Peyrot et al., 2009; Powell et al., 2004, 2005; Shaw et al., 2011) Our findings indicate that mandated benefits in and of themselves are not likely sufficient to increase potential access (i.e., availability) to DSME/T services. However, it is possible that while an effect could not be detected at the state level, reimbursement mandates could benefit some organizations but not others.

Unfortunately, moving beyond mandated benefits to specific reimbursement provisions provides only some, and potentially problematic, guidance for state policymakers. Generally, policymakers could expect that mandates with fewer restrictions on providers would encourage growth in DSME/T programs, providers, and sites. This, in fact, was the outcome for states that did not impose any requirements with meeting a state-established standard and for those that did not specify requirements for providers’ management knowledge or training. These seem to support arguments for more flexibility, and less proscriptive mandates.

A challenge, however, is that states with provisions eliminating certification requirements were associated with significantly fewer certified programs, sites, and providers. Certification requirements are subject to national standards of care and tend to be much more stringent than basic diabetes management knowledge or training requirements as well as state established standards. Specifically, national standards for DSME/T recommend each member of the DSME/T delivery team participate in at least 15 hours of diabetes-related continuing education annually; and recommends at least one member of the team be a certified diabetes educator (CDE) or hold the board certified-advanced diabetes management (BC-ADM) credential.(Beck et al., 2017; Powers et al., 2017)

Overall, these national guidelines are indeed the gold standard for DSME/T delivery.(Beck et al., 2017; Powers et al., 2017) Problematically, then, states with the flexible provisions may be improving the number of DSME/T providers as intended, but not increasing access to the highest quality services.

Notably, mandates that allowed any provider to deliver DSME/T did not have a significant impact on the supply of programs, sites, or providers. This could be due to the surge of legislation expanding the scope of practice for health care professionals, such as nurses and pharmacists, in response to increased demand under the ACA.(Dower, Moore, & Langelier, 2013) These shifts could inadvertently increase the supply of providers authorized to deliver patient education, such as DSME/T, again rendering mandated benefits unessential.

Lastly, our findings suggest that much of the growth in DSME/T was attributable to the enactment of the Affordable Care Act (ACA). This result is likely because the ACA increased the demand for health care services, particularly among patients with pre-existing chronic diseases such as diabetes.(Frogner, Spetz, Parente, & Oberlin, 2015) It is also possible that in response to the ACA's emphasis on chronic disease management, many private payers offered or included DSME/T benefits, thus rendering state mandates superfluous.

Limitations

First, this analysis explored potential access (i.e., availability) of DSME/T services and not realized access or receipt of services; however, programs that are not accredited may also be available in communities but simply lack the resources to obtain and maintain accreditation. ADA recognized programs also meet the same standards as the AADE accredited programs and are generally reimbursable. However, we were unable to access the annual program data from the ADA. Additionally, under the standards for DSME/T, providers who are not certified are able to deliver DSME/T as long as they meet continuing education requirements and are working under the direction of at least one CDE, but these professionals are not tracked by the NCBDE. All of these resources are not included in our state counts and, therefore prevent us from fully estimating how the supply of DSME/T resources has changed over time. Further, data limitations prevent us from capturing the potential capacity (number of patients that can be served) of programs and providers. This information would provide a richer estimate of potential access. However, we attempt to address this by modeling program sites and providers as well as programs to provide a better measure of potential access. Finally, the certified provider data does not include variables that indicate the geographic location or setting in which DSME/T is delivered. It is possible that these providers are staffed by accredited programs and that our outcomes are overstated.

Conclusion

In conclusion, our findings suggest that the adoption of reimbursement mandates for DSME/T has not improved state-level availability of DSME/T resources. Additionally, while certain “flexible” reimbursement provisions appear to improve potential access to DSME/T, these provisions may have unintended consequences by limiting the quality of DSME/T services accessible to patients. For state and federal policymakers interested in improving access to DSME/T among private and publicly insured patients, a mandate is insufficient. Instead, a more effective approach may be to tailor mandates and provisions to be less prescriptive and line with recommended guidelines for DSME/T delivery. Moreover, accrediting bodies, in collaboration with states’ community stakeholders, can leverage current trends in broader scope of practice laws for health care professionals in order to address barriers to certification and maintain DSME/T standards of care while fostering greater potential access to DSME/T services.

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CHAPTER THREE

REALIZED ACCESS TO DSME/T AFTER STATES MANDATE COVERAGE?

Background

Of the $327 billion in economic costs of diabetes, an estimated $237 billion (72.5%) is attributable to direct medical costs.(American Diabetes Association, 2018; Centers for Disease Control and Prevention (CDC), 2017; Dall et al., 2019) The largest proportion of these expenditures cover the costs of inpatient stays and emergency department (ED) visits associated with complications resulting from uncontrolled diabetes mellitus.(Amaize & Mistry, 2016; American Diabetes Association (ADA), 2018; American Diabetes Association, 2018; Centers for Disease Control and Prevention (CDC), 2017, 2018; Dall et al., 2019; Egede, 2004; Josephsen & Rusnak, 2006; Menchine, Wiechmann, Peters, & Arora, 2012; Washington, Andrews, & Mutter, 2013; Yan et al., 2017; Zhuo et al., 2014, 2015) Because diabetes self-management education and training (DSME/T) is associated with reduced high-cost health care utilization (e.g., inpatient stays and ED visits) and reduced overall health expenditures, national standards recommend that all patients with diabetes receive DSME/T.(Beck et al., 2018, 2017; Duncan et al., 2009; Johnson, Richards, & Churilla, 2015; Powers et al., 2017; Stetson et al., 2011) However, DSME/T is underutilized.(Centers for Disease Control and Prevention (CDC), 2017, 2018; Kolb & Lipman, 2015; Li et al., 2014; Office of Disease Prevention and Health Promotion (ODPHP), n.d.; Powers et al., 2017; Shaw, Killeen, Sullivan, & Bowman, 2011; Strawbridge, Lloyd, Meadow, Riley, & Howell, 2015)

The high out-of-pocket cost for the (perceived) low value of the service has been identified as a barrier to DSME/T utilization.(Nam, Chesla, Stotts, Kroon, & Janson, 2011; Peyrot & Rubin, 2008; Peyrot, Rubin, Funnell, & Siminerio, 2009; Powers et al., 2017; Shaw et al., 2011) Carpenter and colleagues suggest that expanding health insurance benefits to include DSME/T would increase utilization.(Carpenter, Fisher, & Greene, 2012) Several states have adopted legislation that designates DSME/T as a mandatory benefit for insured patients.(NCSL, 2016; Policy Surveillance Program, 2016) However, simply mandating insurance benefits may not be sufficient to improve utilization. In fact, utilization of DSME/T benefits remains low among Medicare enrollees, even after Medicare expanded coverage for DSME/T in 2000.(Duncan et al., 2009; Kolb & Lipman, 2015; Powell, Glover, Probst, & Laditka, 2005b; Powers et al., 2017; Strawbridge et al., 2015) Medicaid enrollees and privately insured patients have similarly low rates of utilization after diagnosis.(Li et al., 2014; Powers et al., 2017; Shaw et al., 2011)

Poor utilization among insured patients could vary state to state due to limitations imposed by reimbursement provisions under state insurance mandates.(NCSL, 2016; Policy Surveillance Program, 2016) Moreover, variation in these provisions could lead to improved utilization in some states, or for some insured patients, but not others. This analysis seeks to examine utilization of DSME/T (i.e., realized access) before and after the adoption of state-level mandated benefits and reimbursement provisions for DSME/T. Specifically, we are interested in how DSME/T utilization rates differ between patients in states with and without state-mandated benefits. Additionally, in light of the variation in state mandates, we explore which reimbursement provisions predict utilization of DSME/T.

Methods

This analysis utilized a repeated cross-sectional design (2008 to 2016) with a fixed-effects approach to compare DSME/T utilization rates among patients residing in states that mandate benefits for DSME/T with utilization rates in states without a similar mandate. This study was deemed not human subjects research.

Sample

The sample consisted of a nine-year panel of 39 states and the District of Columbia with mandated benefits for DSME/T and 5 states without a mandate (for a total of 396 state-year observations[iii]). To be included in the treatment group, states must have codified a reimbursement mandate that took effect on or before January 1, 2016.

Data Sources

A unique combination of secondary data included indicators of state-level insurance mandates and reimbursement provisions and DSME/T utilization. The primary data source was Temple University's Policy Surveillance Program (PSP) legal dataset, a publicly-available, validated collection of laws governing DSME/T reimbursement from all 50 states and the District of Columbia. The dataset identifies whether a state mandates health insurance benefits for DSME/T, the effective date of the law, and any provisions defining the criteria programs must meet in order to qualify for reimbursement from private insurers and/or Medicaid. DSME/T utilization rates were obtained from the Medical Expenditure Panel Survey (MEPS) restricted use data files

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[iii] States were excluded due to not being represented in MEPS each year of the study period.

from 2008 to 2016. MEPS surveys a nationally representative sample of US adults and their families to estimate health care utilization and spending (AHRQ, n.d.). MEPS also includes a supplementary module (Diabetes Care Survey) to collect in-depth information about diabetes diagnoses, general knowledge of diabetes-related complications, and medical care associated with diabetes management. Lastly, data from the Health Resources and Services Administration (HRSA) Area Health Resource Files, the American Association of Diabetes Educators' (AADE), and National Certification Board for Diabetes Educators (NCBDE) accounted for the state-level availability of resources.

Outcome Measures

The dependent variable of interest was the DSME/T utilization rates among adults with diabetes. The Diabetes Care Survey asks respondents "During the last 12 months, have you learned how to take care of your diabetes?" and uses branching logic to determine the method by which diabetes education was received. To ensure that we only captured patients who received reimbursable DSME/T, we limited to the primary mode of delivery that aligns with the recommendations provided in the National Standards for DSME/T(Beck et al., 2018, 2017): "taking a group class". The secondary outcome(s) of interest was the state-year utilization rate by insurer type: [1]private; and [2] Medicaid. Because the mandates of interest only target private insurers and/or Medicaid, analyzing the utilization for other insurer types and the uninsured was unnecessary.

Independent Variables

The primary determinant of interest was an indicator of whether the state-year observation occurred after the adoption of a reimbursement mandate for DSME/T. Our secondary determinants of interest accounted for the variation within state-level mandates by creating a series of binary variables reflective of the "flexibility" within each state's reimbursement provisions governing: triggers for insurance coverage of DSME/T, caps on coverage for DSME/T, settings in which DSME/T can be delivered, and the types of providers who can deliver DSME/T. Within each of these types of provisions, a state is categorized as having a "flexible" provision if no restrictions existed. Therefore, provisions that allowed any provider to order or deliver DSME/T, granted providers authority to determine which triggers warrant DSME/T, did not include a coverage cap, and those that permitted DSME/T delivery in multiple settings were considered flexible.

Model Covariates

Models controlled for health provider shortage scores, obtained from the Area Health Resources files, as well as accredited program and certified provider counts from the American Association of Diabetes Educators’ (AADE) and National Certification Board for Diabetes Educators (NCBDE). Models also controlled for the expansion of insurance coverage and benefits under the ACA, its provisions, and Medicaid expansion.(111th United States Congress, 2010)

Analysis

States with and without a mandate were characterized using frequencies, percentages, and means. To estimate the effect of the adoption of DSME/T mandates, we used a state-year fixed-effects regression to compare the change in DSME/T utilization over time. The following model was used for estimation:

$$Y_{st} = \alpha + \beta_1 Law_{st} + \beta_2 \mathrm{ACA}_{st} + \beta_3 \mathrm{Medicaid}_{st} + \beta_4 \mathrm{Prog}_{st}$$
$$+ \beta_5 \mathrm{Prov}_{st} + X_{st}\theta + X_s + T_t + \varepsilon_{st}$$

s is an indicator of state-level measurement and t is a time measure. Law_{st} is the time-varying measure of whether the state-year observation is after the adoption of a mandate. β_1 tests the likelihood of a significant change in the count of adults who received DSME/T among states that adopted a mandate in a given state year. To fully account for the policy levers that might also influence the outcome, the model included dummy indicators to control for the enactment of the

Affordable Care Act (ACA_t) and Medicaid expansion ($Medicaid_{st}$). $Prog_{st}$ indicates the number of accredited DSME/T program sites and $Prov_{st}$ indicates the number of certified DSME/T providers the time in a given state. X_{st} represents all other time-variant measures. Finally, X_s and T_t represent state and time fixed effects, respectively. Models were estimated using clustered robust standard errors.

We repeated the previously described analytic strategy with a series of indicators reflective of each possible flexible reimbursement provision. This allowed us to determine if specific provisions drive changes in utilization among adopting states. The following model was used to estimate the likelihood of DSME/T utilization:

$$Y_{st} = \alpha + \beta_1 Trigger_{st} + \beta_2 Cap_{st} + \beta_3 Setting_{st} + \beta_4 Deliver_{st} + \beta_5 Order_{st}$$

$$+ \beta_5 ACA_{st} + \beta_6 Medicaid_{st} + X_{st}\theta + X_s + T_t + \varepsilon_{st}$$

β_1, β_2, β_3, β_4 and β_5 test the association between states having flexible reimbursement provisions and DSME/T utilization. $Trigger_s$ is the binary indicator of whether the state allowed any event to trigger insurance coverage for DSME/T. Cap_{st} indicates whether the mandate does not include a coverage cap for DSME/T reimbursement. $Deliver_{st}$ and $Order_{st}$ are binary indicators of whether a state’s reimbursement guidelines allowed any licensed health care provider to deliver and refer patients to DSME/T. $Setting_s$ indicates the inclusion of guidelines allowing DSME/T to be delivered in multiple health care settings. The model also controlled for other health insurance legislation adopted during the study period (ACA_t and $Medicaid_{st}$) as well as state and year fixed-effects.

Sensitivity Analysis

Newly diagnosed patients with diabetes will be less equipped to manage the day-to-day demands of the condition than those who have had the condition for several years. Therefore, as a sensitivity check, we repeated our modeling strategy but limited the state-year sample to patients diagnosed with diabetes less than 2 years prior to the survey.

Results

DSME/T utilization increased over time in states with and without a mandate (Figure 8). As of 2016, the rate of DSME/T utilization was significantly higher among all adults with diabetes residing in states with a mandate (Figure 9). Similarly, DSME/T utilization was higher in adopting states versus non-adopting states among the privately insured, the newly diagnosed[iv], and patients who had been diagnosed at least 5 years prior to the survey. Among Medicaid

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[iv] No newly diagnosed notes in non-adopting states report receiving DSME/T in the year preceding the 2016 survey.

beneficiaries, utilization was higher in non-adopting states (9.2% vs. 6.4%).

With respect to other health-related factors that could influence DSME/T utilization, bivariate results indicate no statistically significant difference in health-related demand for DSME/T between our treatment and control groups (see Table A-12). The proportion of patients with a perceived health status of ‘fair’ or ‘poor’ was statistically similar between the two groups, as was the percentage of patients experiencing diabetes-related eye and kidney problems. Further, the average number of office-based visits and length of hospital stays was comparable between the groups.

Impact of Mandates and Provisions on DSME/T Utilization

State insurance mandates for DSME/T had no significant impact on utilization among all adults with diabetes, privately-insured adults with diabetes, and Medicaid-insured adults with diabetes (see Table 5). However, the impact of reimbursement provisions on the availability of resources varied among the groups (see Table 6).

All Adults with Diabetes. Controlling for all other state-level factors, we found no relationship between states adopting a mandate and DSME/T utilization among all adults with diabetes. Among adopting states, flexible reimbursement provisions were not associated with utilization rates.

However, DSME/T utilization was significantly higher among adopting states with greater shortages of primary care (β = 0.07; p = 0.03) and mental health providers (β = 0.06; p = 0.02).

Privately Insured Adults with Diabetes. Among those with private insurance, we found no statistically significant relationship between states' adoption of an insurance mandate and DSME/T utilization. In adopting states, a flexible coverage cap provision was associated with less utilization of DSME/T (β = -0.213; p = 0.02).

Medicaid Insured Adults with Diabetes. Lastly, adopting a mandate did not impact DSME/T utilization among Medicaid beneficiaries. Also, more certified DSME/T providers was associated with increased utilization (β = 0.001; p = 0.03). With respect to reimbursement provisions, if mandates did not limit coverage to specific triggers then utilization increased significantly (β = 0.75; p < 0.01). However, if the mandates included provisions that granted referral authority to all providers, DSME/T utilization was significantly lower (β = -0.48; p = 0.02). Again, health provider shortage scores for primary care providers was associated with greater utilization among adopting states.

Sensitivity Analysis Results: Newly Diagnosed

In an examination of the newly diagnosed, we found that the adoption of insurance mandates did not have a measurable impact on newly diagnosed patients’ utilization of DSME/T, irrespective of insurance payer (see Table A-13). However, among newly diagnosed Medicaid beneficiaries, a higher overall health provider shortage was associated with increased utilization. States’ reimbursement provisions did not appear to influence utilization among newly diagnosed patients.

Figure 8. Utilization Trends by Adoption Status, Unadjusted Rates, 2008 – 2016

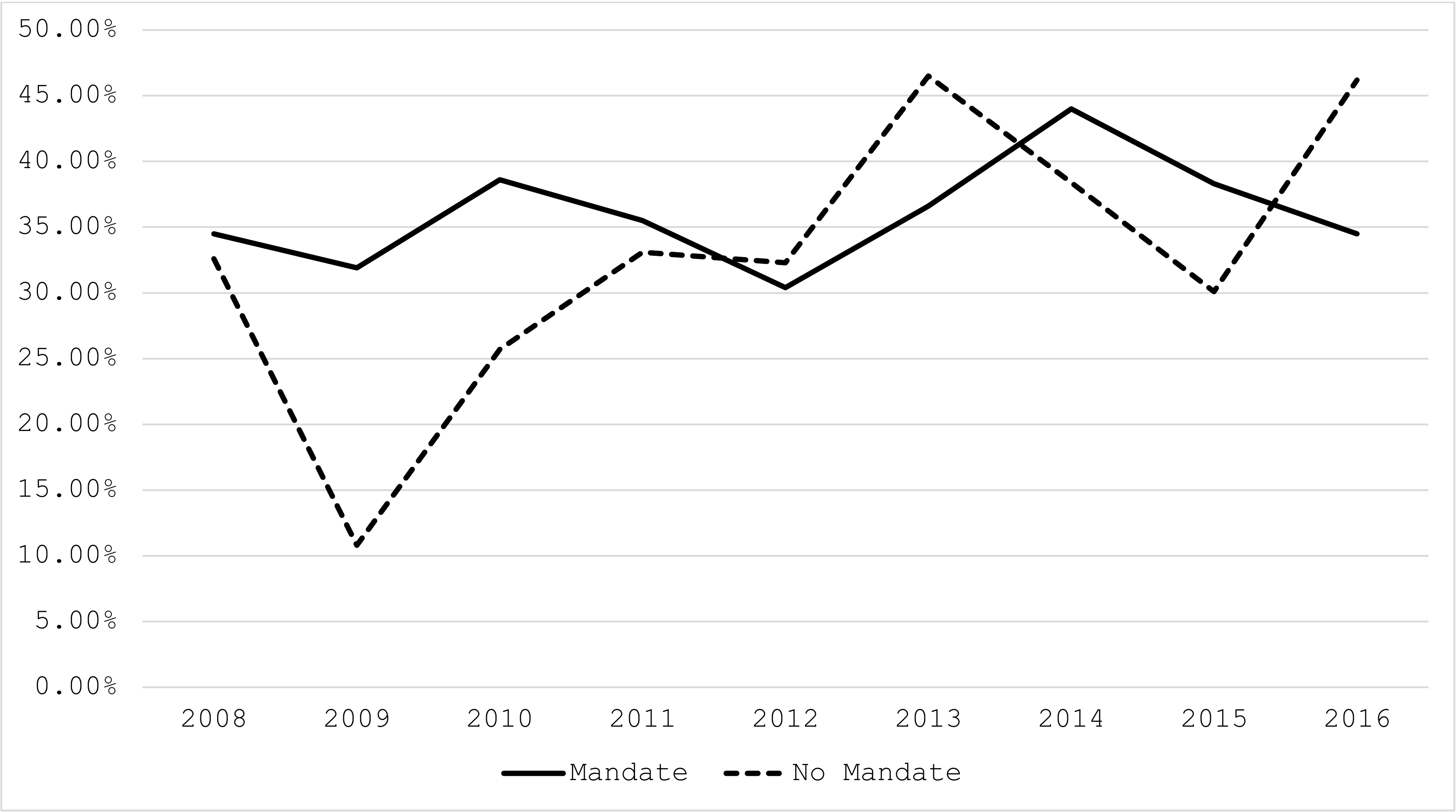

Figure 9. DSME/T Utilization Rates by Adoption Status, Adjusted Rates, 2016

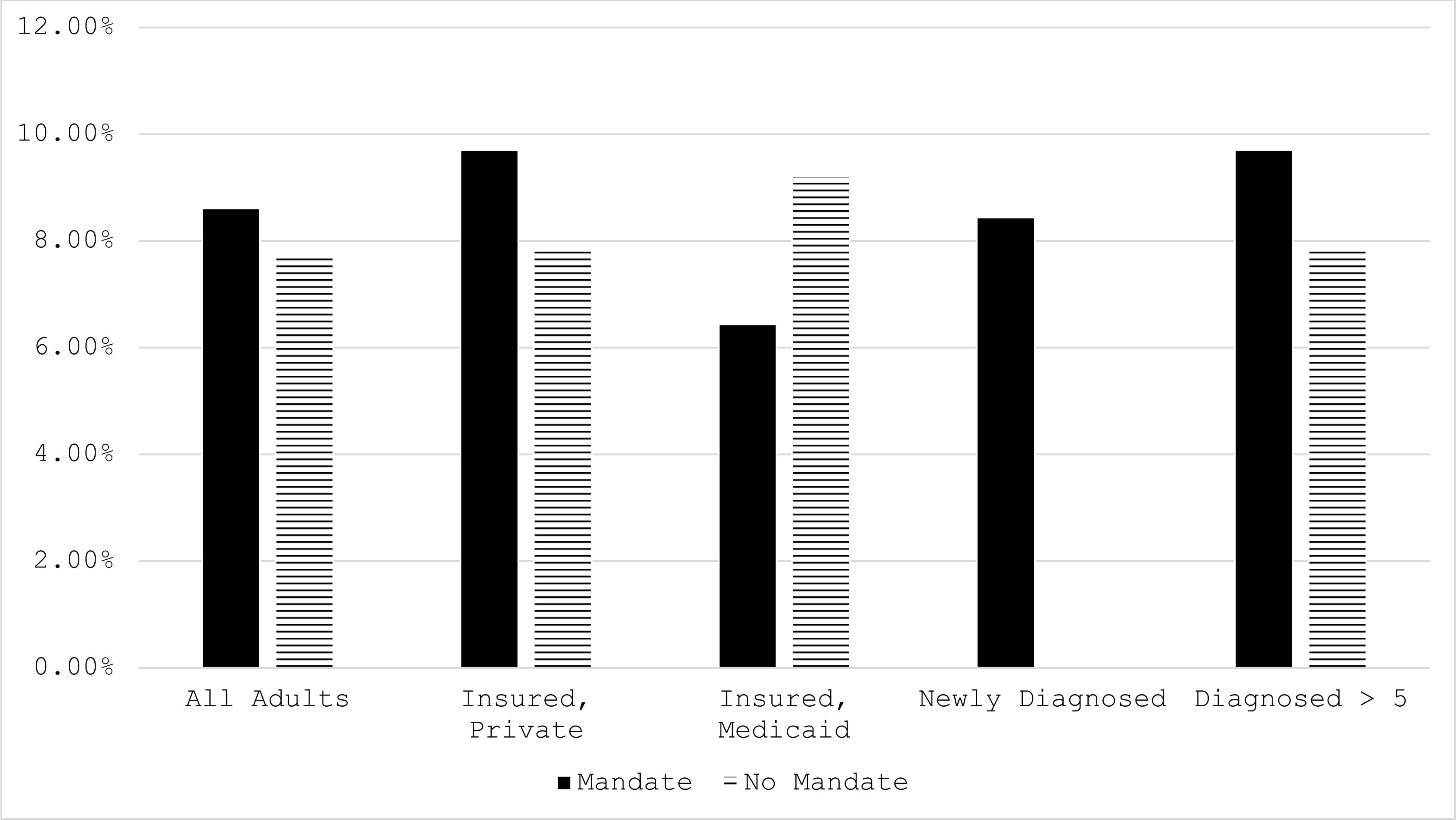

Table 5. Characteristics Associated with DSME/T Utilization, 2008-2016

Variables of Interest	Adults with Diabetes			Privately Insured Adults with Diabetes			Medicaid Insured Adults with Diabetes		
	β	C.I.		β	C.I.		β	C.I.	
		Lower	Upper		Lower	Upper		Lower	Upper
Adoption Status									
No Mandate	[Reference]			[Reference]			[Reference]		
Adopted a Mandate	-.010	-.140	.120	-.056	-.211	.099	.048	-.272	.368
ACA Provisions									
ACA Enactment	.007	-.083	.097	.026	-.067	.119	-.009	-.184	.166
Pre-Existing / Individual Mandate	-.037	-.143	.068	-.032	-.157	.093	-.055	-.274	.163
1st Dollar Prevention	-.026	-.162	.109	-.026	-.137	.084	-.037	-.202	.129
Medicaid Expansion	.092	-.026	.209	.040	-.107	.186	.069	-.155	.292
Availability of Resources									
HPSA Score, Overall	-.050	-.139	.039	.019	-.107	.144	-.097	-.289	.096
HPSA Score, Primary Care	.047	-.003	.098	-.032	-.131	.066	.095	-.032	.223
HPSA Score, Mental Health	.037	-.002	.076	.017	-.036	.070	.047	-.042	.136
DSME/T Programs	-.0001	-.011	.010	.006	-.009	.020	-.001	-.022	.019
DSME/T Program Sites	-.002	-.004	.0001	-.004	-.009	.001	-.003	-.010	.003
DSME/T Providers	.0003	-.0002	.0008	-.0001	-.0008	.0006	.001*	.0001	.002

Notes: * - $p \leq$ 0.05 ; ** - $p \leq$ 0.01

Table 6. Reimbursement Provisions and DSME/T Utilization Among Adopting States

Variables of Interest	Adults with Diabetes			Privately Insured Adults with Diabetes			Medicaid Insured Adults with Diabetes		
	β	C.I.		β	C.I.		β	C.I.	
		Lower	Upper		Lower	Upper		Lower	Upper
Any Provider Can Order									
No	[Reference]			[Reference]			[Reference]		
Yes	-.090	-.279	.099	-.026	-.190	.139	-.419*	-.767	-.070
Any Provider Can Deliver									
No	[Reference]			[Reference]			[Reference]		
Yes	.107	-.082	.297	.109	-.121	.340	-.073	-.398	.252
Any Medical Trigger for Coverage									
No	[Reference]			[Reference]			[Reference]		
Yes	.116	-.123	.356	-.081	-.373	.211	.749**	.455	1.04
No Coverage Cap									
No	[Reference]			[Reference]			[Reference]		
Yes	-.098	-.293	.097	-.213*	-.402	-.030	.090	-.315	.494
Multiple Delivery Settings									
No	[Reference]			[Reference]			[Reference]		
Yes	-.218	-.606	.171	-.055	-.702	.593	-.357	-.791	.078

Notes: * - $p \leq 0.05$; ** - $p \leq 0.01$

Discussion

Despite trends that show DSME/T utilization increasing over time, state-mandated insurance benefits for DSME/T do not appear to improve utilization of the service. In fact, in most cases, even flexible reimbursement provisions had a negative impact on utilization rates. Moreover, federal policy interventions, including provisions of the ACA designed to improve preventative care utilization, also showed no significant impact on DSME/T utilization. While previous research suggests that the mere presence of a coverage mandate may not be enough to improve utilization of diabetes care,(Li, Zhang, Barker, & Hartsfield, 2010) the negative impact of flexible reimbursement could be attributable to the high demand for services during the study period. Specifically, the expansion of insurance coverage and shifting focus to preventative health care under the ACA(111th United States Congress, 2010) rapidly increased the demand for health services, particularly among those with pre-existing chronic conditions like diabetes.(Frogner, Spetz, Parente, & Oberlin, 2015) It is possible that the supply of DSME/T resources and primary care providers was not enough to meet the demand and support the intent of state mandates.

Interestingly, however, states with higher provider shortage scores, particularly among primary care and mental health providers, appear to have higher rates of utilization; while the supply of DSME/T resources has no impact at all. This may seem counterintuitive, but patients in these areas may lack a usual source of care(Berk, Berstein, & Taylor, 1983; Richman, Clark, Sullivan, & Camargo, 2007) and, therefore, may prioritize self-management as an alternative to office-based medical care. Moreover, overburdened providers in these areas often rely on physician extenders, such as nurse practitioners, physician assistants, and pharmacists,(Allen & Downs, 2006; Dyrbye & Shanafelt, 2011; Everett, Schumacher, Wright, & Smith, 2009; Sisson & Kuhn, 2009) who may have the training and certification to incorporate group-based education into patient care to address unmet need.

Notably, contradicting calls for state-mandated coverage of DSME/T,(Carpenter et al., 2012) our findings highlight the fact that a supportive policy environment is simply not sufficient to improve patient utilization. This could be due to other factors outside the purview of the state and the scope of these mandates.(Aday & Andersen, 1974) For instance, reimbursement rates have long been criticized for being too restrictive;(Powell et al., 2005b) and despite states’ attempts to mandate coverage, mandatory coverage without sufficient reimbursement would likely not address financial barriers to DSME/T. These mandates are also unable to address structural barriers to patient utilization of DSME/T. Specifically, lack of awareness of program availability and/or not receiving a recommendation from a physician reduces the likelihood of enrollment and attendance.(Peyrot & Rubin, 2008; Peyrot et al., 2009) This highlights the important role of primary care providers, particularly physicians, in improving patient utilization of DSME/T. Lastly, previous research shows that the very structure of didactic patient education can be a barrier to utilization.(Krall et al., 2018, 2019) DSME/T is typically offered during weekly sessions over a four- to six-week period. This is a major time commitment for patients in addition to the "work of being a patient with diabetes" as well as day to day responsibilities. Also, few organizations have the capacity and resources to offer more than one course at a time, (Butcher et al., 2011; Emerson et al., 2007; Peyrot & Rubin, 2008; Peyrot et al., 2009; Powell, Glover, Probst, & Laditka, 2004, 2005a; Shaw et al., 2011) which limits scheduling options for interested patients. This barrier could potentially be addressed by the expansion of DSME/T services via web-based platforms as noted in national standards for DSME/T;(Beck et al., 2018) however, very few states (Montana, New York, Oregon, and Utah) permit reimbursable DSME/T to be delivered using such platforms.(Policy Surveillance Program, 2016)

Limitations

This study has several limitations. First, MEPS is based on self-reported data and the variable used to measure the outcome of interest may not accurately capture reimbursable DSME/T. Based on the branching logic used in the Diabetes Care Survey, respondents could indicate that they received DSME/T from a provider (within or outside of their primary care office or over the phone) or from a group class. Both options are acceptable formats for reimbursable DSME/T, but it is unclear if patients who report receiving education from providers includes patients who only received a pamphlet or printed materials without the extended course component. This could result in overstated findings. To ensure that we were only capturing formal DSME/T, we limited our primary analysis only to patients who attended a group class, but we repeated the analysis with all respondents who received DSME/T from a provider or in a class as a sensitivity check. Second, the variable used for the outcome measure was not included in the MEPS Diabetes Care Survey until 2008 and the most recent data is from 2016. Therefore, all models had to start after 2008, even though many states had adopted mandates prior to that year, while many adopting states' laws did not "turn on" in our models because they were effective after January 2016. Also, MEPS uses a sample that is weighted to represent the population. However, the inclusion criteria (adult patients with diabetes with at least one provider encounter and either private or Medicaid insurance) often limited the number of respondents that represented a particular state in a given year. This could have resulted in understated utilization rates. Lastly, the outcome of interest focuses on DSME/T in the year preceding the survey. It is possible that patients had received the education, just not during the twelve months preceding the survey.

Conclusion

Though standards of care recommend that all patients with diabetes receive DSME/T and several initiatives have aimed to improve utilization, mandated insurance benefits do not appear to be an effective solution. Future research should identify characteristics of insured patients who utilize DSME/T and whether these characteristics differ between adopting and non-adopting states. Moreover, future studies must determine whether state-mandated benefits play a role in decision-making and service utilization among patients.

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CHAPTER FOUR

PROVIDER REFERRALS: THE KEY TO EQUITABLE ACCESS TO DSME/T?

Background

National standards of care for diabetes recommend that primary care providers assess patients' need for diabetes self-management education and training (DSME/T)[v] at diagnosis, during annual condition assessments, at the onset of complicating factors, and following events that affect the continuity of care.(American Diabetes Association (ADA), 2018; Beck et al., 2018, 2017; Powers et al., 2017) Receipt of DMSE/T in accordance with accepted standards is associated with positive long-term patient outcomes and reduced health expenditures,(Beck et al., 2018, 2017; Chrvala, Sherr, & Lipman, 2016; Johnson, Richards, & Churilla, 2015; Norris, Engelgau, & Narayan, 2001; Powers et al., 2017; Robbins, Thatcher, Webb, & Valdmanis, 2008; Stetson et al., 2011) yet DSME/T is largely underutilized by patients in need.(Duncan et al., 2009; Kolb & Lipman, 2015; Li et al., 2014; Office of Disease Prevention and Health Promotion (ODPHP), n.d.; Powell, Glover, Probst, & Laditka, 2005; Powers et al., 2017; Roski et al., 2003; Shaw, Killeen, Sullivan, & Bowman, 2011; Strawbridge, Lloyd, Meadow, Riley, & Howell, 2015)

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[v] This term has recently been updated to "diabetes self-management education and support" in the national standards; however, state mandates reference the previous term.

Multiple factors influence provider decisions both for and against referring patients to DSME/T.(Duncan et al., 2009; Kent et al., 2013; Powell et al., 2005; Shaw et al., 2011) Working against referrals are provider attitudes and beliefs about the efficacy of DSME/T, the availability of on-site diabetes educators, and conflicting treatment philosophies with DSME/T providers.(Peyrot & Rubin, 2008; Peyrot, Rubin, Funnell, & Siminerio, 2009) In fact, instead of referring at the recommended intervals and in response to key factors, providers report viewing DSME/T as a “last resort” following major glycemic crises or when traditional clinical treatment fails.(Peyrot & Rubin, 2008; Peyrot et al., 2009) On the other hand, patient-level factors such as complex morbidities,(Ruppert, Uhler, & Siminerio, 2010a) high risk of complications,(Ruppert et al., 2010a) and established medical homes(Manard et al., 2016; Shaw et al., 2011) are associated with a greater likelihood of being referred to DSME/T. This suggests providers consider medical history and continuity of care in referral decision-making.

However, evidence suggests that need (as defined by national standards) is not a key factor in providers’ ordering behavior.(Mehta et al., 2017) In fact, contrary to national standards, providers frequently do not refer patients to DSME/T.(Kent et al., 2013; Peyrot et al., 2009; Sarkar et al., 2008) It is unclear how providers determine patients' need for DSME/T, and whether these assessments, and subsequent referrals, align with established standards of care. This study explores physicians' DSME/T referrals in a safety net population. We are particularly interested in how provider referrals impact the accessibility of DSME/T service relative to patient need (i.e., equitable access).(Aday, 1976; Aday & Andersen, 1981; Andersen, McCutcheon, Aday, Chiu, & Bell, 1983; Davis, 1991) We examine the association between patients' evaluated need for DSME/T according to the DSME/T Algorithm of Care(Beck et al., 2018, 2017; Powers et al., 2017) and provider referrals. Because DSME/T mandates generally limit referral authority to licensed physicians, we also identify factors associated with referrals during physician encounters.

Methods

This analysis utilized an 8 year patient panel to test the association between need and provider referrals to DSME/T.

Setting

Indiana has a well-established and long-standing mandate that extends DSME/T benefits to all publicly and privately insured patients with diabetes.(110th General Assembly of the State of Indiana, 1997; Policy Surveillance Program, 2016) Under the state's mandate, insurance coverage for DSME/T is triggered at diagnosis, following a change in health status, and when reeducation is recommended by providers.(Policy Surveillance Program, 2016) This reimbursement provision grants physicians the authority and flexibility to apply the DSME/T Algorithm of Care as recommended. Central Indiana is also the home of one of the country's oldest and largest community health information exchanges (HIE) and urban safety net health systems. The patient population served by this health system is largely low-income and publicly insured. Moreover, the health system has had a highly rated, multi-site AADE accredited DSME/T program since 2014.

Data Sources

The primary data sources were Eskenazi Health's electronic health record (EHR) and the Indiana Network for Patient Care (INPC) database. Eskenazi's EHR includes structured referral data in a computerized order entry system from every provider with Eskenazi Health as well as unstructured provider notes. The INPC, the oldest and largest community health information exchange (HIE) in the nation, stores electronic health records including information on patient demographics, diagnoses, lab results, provider orders, and encounters from 25,000 physicians, 106 hospitals, 110 clinics, and numerous other health organizations in Indiana.(Vest, Grannis, Haut, Halverson, & Menachemi, 2017)

INPC data provides the added benefit of tracking patients within, and across health systems, over time.

Sample

The study panel included adults (18 to 64) with a type 2 diabetes (DM) diagnosis (before or during the study period) who had at least one provider encounter each year between 2010 and 2016. The final sample included 8,782 distinct patients with a total of 356,631 encounters.

Outcome Measures

Our primary outcome of interest was an indicator of whether a patient encounter resulted in a DSME/T referral. Referrals were identified from orders placed using a computerized order entry system and unstructured provider notes using natural language processing techniques.(Chandrasekaran et al., 2017; Imler, Ring, & Crabb, 2015) Referrals were then linked to encounters by patient and dates. These notes and orders are the best direct measure of provider referral behaviors.

Determinant of Interest

The primary determinant of interest was an indicator of patient need for DSME/T at the time of the encounter. Patient need was measured based on the criteria set in the DSME/T Algorithm of Care framework (see Figure 10).(American Diabetes Association (ADA), 2018; Beck et al., 2018, 2017;

Powers et al., 2017) Patients were considered “in need” if they met any of these criteria:

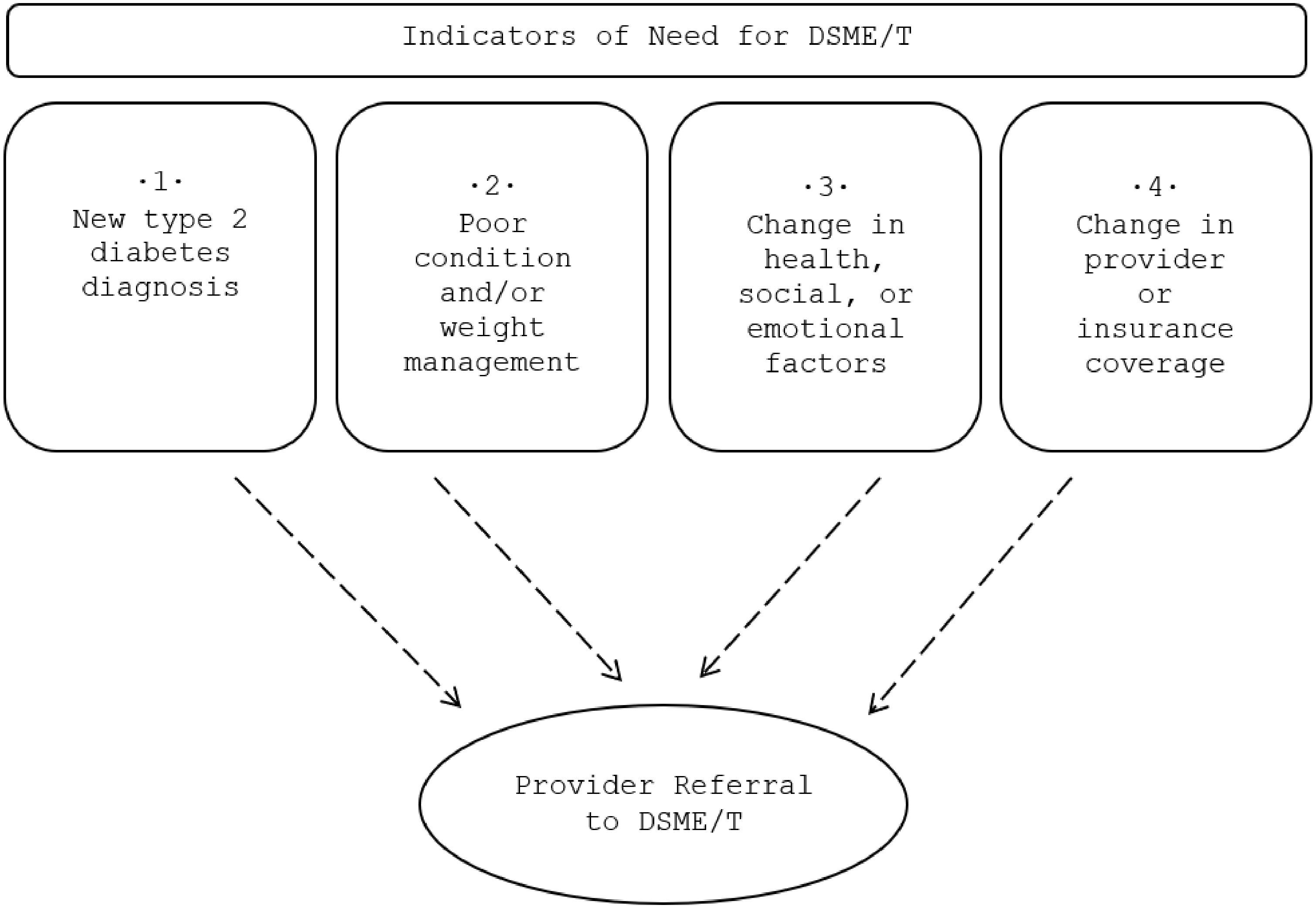
Initial diagnosis. Patients should first receive DSME/T at the time of initial diagnosis. In the absence of a specific ICD9/ICD10 code for onset of diabetes, we defined an encounter with an initial diagnosis only if the condition was not diagnosed at any of the patient’s previous encounters.

Annual condition assessment. Among patients with existing diabetes mellitus, referral to DSME/T should occur when annual assessments indicate that the condition is not being properly managed. Therefore, patients were considered “in need” at the encounter if their A1C level exceeded 7.0%, systolic BP was greater than 140 or diastolic BP was greater than 90, cholesterol ratio was 5.0 or higher, or body mass index (BMI) was 30 or more.(American Diabetes Association (ADA), 2018) For each of these indicators of improper management we used the most recent measure before the encounter.

Complicating factors. Because DSME/T provides patients with the skills and tools necessary to manage the condition in their everyday lives, the onset of complicating factors that alter patients’ day-to-day routine signals need for re-education. These complicating factors include a newly diagnosed comorbid condition, social issues, or financial strain. We used ICD codes, as well as admitting and discharge diagnoses at previous encounters, to determine if patients were newly diagnosed with congestive heart failure, hypertension, renal failure, or depression; all of which patients with diabetes are at increased risk of developing. Additionally, patient appointment records, provider notes, and service orders were used to determine whether the patient was experiencing social issues or financial strain. Mentions of homelessness, food insecurity, or family issues, or referrals or appointments with a social worker, financial counselor, or medical-legal partnership, were considered indicators of social or financial complications. If any of these conditions were true, patients were considered "in need" under this measure.

Transitions in care. Events signaling a transition in care also may necessitate a DSME/T referral. These events typically include a transition from inpatient or long-term care or a change in insurance status. For a transition in care, patients were considered "in need" for DSME/T at the outpatient encounter immediately following an inpatient stay for a diabetes-related complication. Changes in insurance status from uninsured to insured were determined using the payer at the time of the encounter. Newly insured patients who previously were listed as self-pay at all prior visits were considered to have had a change in insurance status. Patients meeting either of these criteria were considered “in need” for DSME/T under this measure.

Figure 10. Four Critical Times to Refer Patients to DSME/T, Adapted from Powers et al.,2015



Model Covariates

All models controlled for patient and community factors associated with referral ordering behaviors (Shortell & Anderson, 1971) and access.(Aday & Andersen, 1974) These model covariates included health status, prior utilization, encounter setting (e.g., inpatient, outpatient, ED), and comorbidity risk scores, which were calculated using a widely accepted algorithm to measure comorbidity when using administrative data.(Elixhauser, Steiner, Harris, & Coffey, 1998) We also controlled for the enactment of the Affordable Care Act (ACA), the state's expansion of Medicaid, and the count of accredited DSME/T program sites in the community.

Analysis

Frequencies, percentages, and means were used to describe the variables of interest. A fixed-effects linear probability model estimated the association between patients' evaluated need for DSME/T and receipt of a referral to DSME/T. The following model used clustered robust standard errors for estimation:

$$Y_{it} = \alpha + \beta_1 Need1_{it} + \beta_2 Need2_{it} + \beta_3 Need3_{it} + \beta_4 Need4_{it}$$
$$+ \beta_5 ACA_t + \beta_6 HIP_t + \beta_7 Site_t + X_{it}\theta + X_i + T_t + \varepsilon_{it}$$

i is an indicator of encounter-level measurement and t is a time measure. $Need1_{it}$ is the time-varying measure of whether the patient was newly diagnosed with DM at the encounter.

$Need2_{it}$ is the time-varying measure of whether assessed levels were out of target at the encounter. $Need3_{it}$ is the time-varying measure of whether the patient was experiencing complicating factors at the encounter. $Need4_{it}$ is an indicator of whether the patient had recently experienced an event that resulted in a transition in care or insurance. β_1, β_2, β_3, and β_4 test the association between patient need and the likelihood of receiving a DSME/T referral. The model included dummy indicators to control for the enactment of the Affordable Care Act (ACA_t) and Medicaid expansion (HIP_t) in Indiana. $Site_t$ indicates the count of accredited DSME/T program sites in the state at the time of the encounter. X_{it} represents all other time-variant measures. X_i and T_t represent patient and time fixed effects, respectively. Lastly, because the proportion of encounters that resulted in a referral was below 20%, we repeated this strategy with a logit model to confirm our findings.

Sensitivity Analysis

Because Indiana's insurance mandate limits reimbursement to DSME/T that is ordered by a licensed physician,(Policy Surveillance Program, 2016) as a sensitivity check, we modeled the association between patient need and DMSE/T referrals but limited the panel to physician encounters

(8,120 patients; 93,986 encounters). A logistic model was used as a consistency check.

Results

Of the 356,631 patient encounters that occurred between 2010 and 2016, nearly two-thirds of those encounters (63.8%) indicated a need for DSME/T (see Table 7). Each of the four indicators of need was represented in the sample: new DM diagnosis (0.3%), evidence of poor condition management at annual assessment (7.8%), onset of complicating factors (2.1%), and transitions in care and/or insurance coverage (38.0%). More than 15% of encounters had indicators of multiple types of need. Additionally, on average, patients' comorbidity scores (μ=3.4) indicated an increased risk of hospitalization and mortality.(Elixhauser et al., 1998) Most encounters occurred in outpatient settings (92.9%) and were covered by some type of health insurance coverage (93.5%). Despite these indicators, only 5.4% of patient encounters resulted in a provider referral to DSME/T.

Most provider referrals occurred during encounters where patients were considered "in need" for DSME/T (81.9%) (Table 8). Stratifying by type of need, less than 1 out of 100 referrals were received by newly diagnosed patients , 1 out of 5 were placed for patients not meeting target levels, 1 out of 20 were ordered for patients with complicating factors, and 1 out of 4 were received by patients experiencing transitions in care/insurance. Most referrals were ordered during encounters with multiple types of need. Some patients who were not considered “in need” according to national standards were also referred to DSME/T. Overall, evaluated need was associated with whether a provider issued a referral to DSME/T ($p < 0.01$).

Patient Need and Provider Referrals to DSME/T

Controlling for all other factors at the time of the encounter, each type of need was associated with the likelihood of receiving a referral to DSME/T (Table 9). A new DM diagnosis ($\beta = .076$; $p < 0.01$), having off target levels($\beta = .085$; $p < 0.01$), the onset of complicating factors ($\beta = .080$; $p < 0.01$), transitions in care and insurance coverage ($\beta = .005$; $p < 0.01$), and multiple types of need ($\beta = .102$; $p < 0.01$) increased the likelihood of being referred to DSME/T. Encounters with patients who are older or with higher comorbidity scores were less likely to result in a referral($p < 0.01$). Encounters in settings other than outpatient also significantly decreased the likelihood of referral ($p < 0.01$). Lastly, both paying for the encounter out-of-pocket and seeing a physician increased the likelihood of receiving a DSME/T referral ($p < 0.01$).

Sensitivity Analysis Results: Physician Encounters

Of the 93,986 encounters with physicians, 29% resulted in referrals. Findings from the sensitivity analysis were mostly consistent with the primary model. With respect to indicators of need (see Table A-14), all types of evaluated need and paying out-of-pocket remained positively associated with receiving a referral ($p < 0.01$). Also consistent with the previous model, older patients and patients seen in emergency and inpatient settings were significantly less likely to be referred to DSME/T ($p < 0.01$).

Table 7. Descriptive Analysis of Patient Encounters

	n	%
Referral to DSME/T		
Yes	19,260	5.4
No	337,371	94.6
Health Status at Encounter		
Any Need for DSME/T	227,449	63.8
Need 1- New DM Diagnosis	977	0.3
Need 2- Levels Off Target	27,783	7.8
Need 3- Complicating Factors	7,549	2.1
Need 4- Transition in Care	135,586	38.0
Multiple Types of Need	55,554	15.6
Average Comorbidity Score (S.D.)	3.4	(2.3)
Encounter Payer		
Any Health Insurance	333,552	93.5
Private	25,476	7.1
Medicaid	185,103	51.9
Medicare	119,834	33.6
Other	3,139	0.9
Self-Pay	13,553	3.8
Payer, Unknown	9,526	2.7
Encounter Setting		
Outpatient	317,810	92.9
Inpatient	7,276	2.1
Emergency Department	17,171	5.0
Physician Seen During Encounter?		
Yes	93,986	26.4
No	262,645	73.7

Table 8. Comparison of Evaluated Need, by Referral Status

	Referral		No Referral	
	n	%	n	%
Any Need for DSME/T**	15,769	81.9	211,680	62.7
Need 1- New DM Diagnosis**	75	0.4	902	0.3
Need 2- Levels Off Target**	3,352	17.4	24,431	7.2
Need 3- Complicating Factors**	874	4.5	6,675	2.0
Need 4- Transition in Care**	4,170	21.7	131,416	39.0
Multiple Types of Need**	7,298	37.9	48,256	14.3
No Need for DSME/T	3,491	18.1	125,691	37.3

Notes:
* - $p \leq 0.05$
** - $p \leq 0.01$

Table 9. Factors Associated with the Likelihood of Receiving a Referral to DSME/T

	β	Confidence Interval	
		Lower	Upper
Status at Encounter			
No Need	[reference]		
Need 1- New DM Diagnosis	.076**	.059	.092
Need 2- Levels Off Target	.085**	.080	.089
Need 3- Complicating Factors	.080**	.072	.088
Need 4- Transition in Care	.005**	.003	.007
Multiple Types of Need	.102**	.098	.106
Patient Characteristics			
Age (at time of encounter)	-.040**	-.043	-.037
Comorbidity Score	-.001**	-.002	-.0005
Encounter Payer			
Private	[reference]		
Medicaid	.001	-.005	.006
Self-Pay	.013**	.006	.020
Encounter Setting			
Outpatient	[reference]		
Inpatient	-.021**	-.028	-.015
Emergency	-.041**	-.044	-.037
Physician Seen During Encounter			
No	[reference]		
Yes	.007**	.005	.009
DSME/T Program Availability			
# of Sites	.0128**	.012	.013

Notes: * - $p \le 0.05$ ** - $p \le 0.01$

Discussion

Clinical guidelines for DSME/T recommend that providers refer patients to the service when indicators of need are present.(Beck et al., 2018, 2017) Our findings indicate that most referrals are for patients with some type of evaluated need and being “in need” increases the likelihood of being referred. Nevertheless, only a small proportion of encounters with indicators of need actually result in a referral. Moreover, the effect size of need on referral is relatively small, indicating that providers’ decisions to refer is indeed driven by factors other than evaluated need.(Mehta et al., 2017) The lack of referrals for those indicated by clinical guidelines is not surprising given the providers’ poor adherence to many evidence-based guidelines.(Cabana et al., 1999)

Having insurance does not appear to improve the likelihood of being referred to DSME/T, even in a state with a favorable policy environment for DSME/T reimbursement. In fact, patients who were likely to pay for DSME/T out-of-pocket were more likely to be referred. This contradicts previous research that suggests that out-of-pocket costs deter patients from participating in DSME/T.(Nam, Chesla, Stotts, Kroon, & Janson, 2011; Peyrot & Rubin, 2008; Peyrot et al., 2009; Shaw et al., 2011) It is possible that higher referrals for self-pay patients in this population were due to the presence of the public health department’s accredited program, which offers DSME/T free of charge to patients with diabetes in the county. Fortunately, our findings suggest that the availability of more program sites is associated with greater likelihood of referral.

Seeing a physician during an encounter increased the likelihood of being referred to DSME/T, not a surprising finding given that Indiana limits reimbursable DMSE/T to claims resulting from physician referrals. Nevertheless, within physician encounters, the impact of different types of need was similar to that of all encounters. Interestingly, patient comorbidity scores had no significant impact on referrals during physician encounters. This contradicts evidence that physicians consider complex comorbidities when making referral decisions.(Ruppert, Uhler, & Siminerio, 2010b)

Also, among physician encounters, fewer referrals were ordered for patients exhibiting need. This could be due to the limited contact time during physician-patient visits,(Gottschalk & Flocke, 2005; Mechanic, McAlpine, & Rosenthal, 2001; Rui & Okeyode, 2019) which restricts physicians’ ability to thoroughly review the massive amount of clinical information in patients’ health records (which are often poorly organized)(Koopman et al., 2011; Sittig et al., 2008) as well as consult clinical guidelines and identify available diabetes management resources in the area. It is possible that the expansion of EHR capabilities to include clinical decision support could potentially improve provider referrals to DSME/T.(Bright et al., 2012; Cebul, Love, Jain, & Hebert, 2011; Koopman et al., 2011; O'Connor et al., 2011)

Limitations

A number of data limitations could have potentially affected our findings. First, though INPC captures patient data across health systems, referrals and provider notes regarding referrals were unavailable outside of the Eskenazi Health system. It is possible that referrals were issued by other providers outside of the Eskenazi health system but not captured in INPC. Next, the county health department offers a free diabetes self-management education course through their accredited program. Because there is no claim or reimbursement, a provider referral is not required. To account for this, we included provider notes that mention recommending DSME/T to the patient as a measure of "referrals", rather than limiting our analysis to orders and billing. Additionally, our modeling strategy linked referrals to a single encounter by date. However, it was possible that the referral was the attending provider's response to clinical indicators noted at multiple encounters. Moreover, oftentimes the same patient was referred to DSME/T during multiple encounters in the year. This could result in overstated findings. Finally, we had limited data on the individual providers, such as years in practice and training in diabetes management, therefore we were unable to discuss provider referral behaviors and patterns.

Conclusion

Consistent with clinical guidelines, patient need for DSME/T does improve the likelihood of being referred to the service. Yet, provider referral rates were low despite clinical indicators of need in patients' electronic health records. Future research should explore providers' EHR capabilities and determine if clinical decision support improves provider referrals among patients in need. Moreover, to facilitate targeted outreach, providers must have the tools necessary to identify patients in need for DSME/T, who have been referred but have yet to enroll. Therefore, future research should examine how EHR systems can be used as a tool to calculate patients' propensity to enroll in DSME/T.

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CHAPTER FIVE

TRIANGULATING THE FINDINGS

Access to care is a key determinant of successful diabetes management. Using conceptualizations presented in the Access to Medical Care Framework and the Behavioral Model of Health Care Utilization as well as health policy measurement strategies(Aday & Andersen, 1974; Andersen, 1995; Burris et al., 2010; Chriqui, O'Connor, & Chaloupka, 2011; Macinko & Silver, 2012; Phillips, Morrison, Andersen, & Aday, 1998), this dissertation leverages a rigorous, empirical approach to determine if and how the expansion of insurance coverage under state insurance mandates and reimbursement provisions impact the supply of DSME/T resources, patient utilization, and need-based referrals in adopting states.

Expectations v. Reality

Theoretical frameworks for measuring access to care(Aday & Andersen, 1974; Andersen, 1995) provided a solid foundation to conceptualize how state-mandated benefits and reimbursement provisions would impact access to DSME/T in our study. According to Aday and Andersen's Access to Medical Care Framework (see Chapter One, Figure 3), health policies prompt changes to "enabling" characteristics of the population (i.e., resources available to individuals for the use of health services), such as insurance coverage, as well as changes to the characteristics of the health delivery system, such as the volume and distribution of health care providers.(Aday & Andersen, 1974) In turn, these health policies can influence patient utilization by reducing out-of-pocket costs and improving the availability of health services. The Behavioral Model of Health Care Utilization (see Chapter One, Figure 4), by contrast, does not consider the direct effect of health policy on population characteristics but rather explores the complex relationship between the environment in which care is utilized, population characteristics, and health behaviors to identify patient-, provider-, and community- level factors that result in differences in potential and realized access.(Andersen, 1995; Phillips et al., 1998) Therefore, the adoption of a policy that mandates coverage for specific health services to insured patients increases the enabling resources for that population (i.e., insurance benefits), but accessibility would be function of patient need for the service, whether the patient has a usual source of care, provider referrals to a service, and other health determinants.

Based on these conceptualizations, we predicted that the introduction of policies that regulate the financing of DSME/T services into the external environment, coverage and reimbursement for these services would expand (see Chapter

One, Figure 6). These enabling resources would, in turn, affect supply and demand for DSME/T. Patient demand for and utilization of DSME/T would increase (or be expected to increase over time), prompting the health system to respond by increasing the supply of DSME/T resources. The favorable policy environment would also encourage providers refer patients to DSME/T according to clinical guidelines for patient need rather than the affordability of the service. Lastly, these supply-side increases would further encourage patient utilization of DSME/T. However, this is not what we observed.

The introduction of mandated benefits and reimbursement for DSME/T into the market did not have a significant effect on whether the health system increased the supply of DSME/T resources. In fact, certain provisions were found to be detrimental to the supply of resources. However, it appears that the health system did significantly improve the supply of DSME/T resources in response to the enactment of the ACA. This suggests that extending benefits to insured patients who have already entered the health system does not increase demand enough to warrant a systemwide response, but a rapid increase of the number patients gaining entry into the health system is a sufficient catalyst.

Similarly, patient utilization of DSME/T was not driven by states’ adoption of mandated benefits or even the enactment of the ACA and its provisions. Surprisingly, DSME/T utilization improved as the provider shortage worsened. This confirms that patient decision-making and health behavior is complex; and simply addressing the affordability of a service is not enough to influence patient utilization, particularly of a service that is considered “low value”.(Peyrot & Rubin, 2008) Moreover, these mandates only target reimbursable DSME/T, thus only improving the affordability for insured patients. If the intent is to encourage patients to utilize DSME/T, regardless of whether it is reimbursable, then this policy solution may not be the most appropriate to improve overall utilization.

Fortunately, within the context of an adopting state that offers physicians the authority to prescribe DSME/T based on clinical expertise rather than state regulations, patient need becomes the driving force behind DSME/T referrals. However, uninsured patients, who by definition would not be impacted by state-mandated coverage, were more likely to be referred than their insured counterparts. This suggests that while flexible policies for health care financing may create the ideal environment for providers to prescribe services as needed, mandated insurance benefits themselves may not actually facilitate provider referrals.

Addressing Gaps in the Literature

The model of public health law research (see Chapter One, Figure 5) demonstrates the causal links between the input of interventional laws, such as insurance mandates, mediating factors like changes in health behaviors or the availability of resources, and population health outcomes.(BURRIS et al., 2010) Rigorous methodologies employed in policy impact studies are crucial to understanding the relationship between the laws and regulations on access to care and health outcomes.(BURRIS et al., 2010; Chriqui et al., 2011; Macinko & Silver, 2012) Yet, despite the proliferation of state laws and regulations governing insurance coverage for diabetes-related health services,(NCSL, 2016) only four studies to date have assessed the impact of such laws.(Grecu & Spector, 2014; Klick & Stratmann, 2007; Li, Zhang, Barker, & Hartsfield, 2010; Li, Zhang, & Narayan, 2008) Most of these analyses focus on the diabetes-related behaviors and outcomes associated with insurance mandates rather than the accessibility of health services. Klick and Strattman, for instance, use a triple-difference methodology to establish a strong causal link between states' adoption of mandated benefits and higher BMIs among patients with diabetes after the adoption.(Klick & Stratmann, 2007) Similarly, Grecu and Spector employ the triple-difference approach to link states adoption of insurance mandates to reductions in premature and low birth weight births among privately-insured mothers.(Grecu & Spector, 2014) Li and colleagues (2008), on the other hand, use a difference-in-difference approach to determine that the Balanced Budget Act of 1997, which authorized Medicare to expand the coverage for glucose monitors and strips and diabetes self-management training, was associated with increased self-monitoring among Medicare beneficiaries.(Li et al., 2008) Only one paper focuses specifically on the utilization of diabetes care services. Li and colleagues (2010) use a fixed effects modeling strategy to explore the role of state-mandated coverage on utilization of preventative diabetes care services, such as annual eye and foot exams.(Li et al., 2010) They found that these mandates had no measurable impact on patient utilization of annual eye or foot exams individually but was associated with an increase in combined utilization of annual eye exams, foot exams, and daily blood glucose monitoring.

Though each of these studies offer critical knowledge regarding the impact of state-mandated insurance benefits, this dissertation provides a significant contribution to the existing body of knowledge. First, Burris and colleagues

(2010) identify quasi-experimental designs using sophisticated econometric methodologies, including fixed-effects and difference-in-difference models, as providing the rigor necessary for measuring the impact of these laws.(BURRIS et al., 2010) However, Macinko and Silver (2012) as well as Chriqui and colleagues (2011), note the importance of evaluating the “nuances of a given policy”(Chriqui et al., 2011) and caution that measuring the mere presence or absence of a specific legal intervention is not adequate for rigorous measurement.(Chriqui et al., 2011; Macinko & Silver, 2012) While each of these studies employed a rigorous analytic approach to answer their research questions, the determinant of interest was the mere presence of a mandate and did not account for variations in provisions. Li et al. (2010) note variation in coverage and provisions between adopting states, but their analytic approach does not include measurement of the impact of this variation. Rather than employing this conventional policy analysis approach, our analyses assess the impact of variations in the state mandates and reimbursement provisions over time. Additionally, our studies control for federal laws and other nuances in the larger “health policy landscape”(Macinko & Silver, 2012) that likely impact access to care and health outcomes. Second, patient health care utilization and individual health behaviors are a function of access to resources necessary to support these behaviors as well as community- and system-level factors.(Aday & Andersen, 1974; Andersen, 1995; Phillips et al., 1998) Previous focus specifically on patient health behaviors with limited regard to access. Analyses in this dissertation not only control for contextual factors that can influence access and, subsequently, health behaviors, but each analysis focuses on a distinct mechanism by which access is achieved. For example, the third analysis examines on provider referrals to DSME/T in the context of a favorable policy environment. Moreover, we triangulate our findings from three separate analyses to offer a holistic understanding of the role of these mandates on access to DSME/T. Lastly, this dissertation leverages a systematically collected and validated legal dataset rather than relying on policy tracking systems that are commonly used in policy research but rarely compiled for the purposes of policy impact studies. This enables us to not only assess the nuances of policies and track changes over time but offer appropriate comparisons between states with similar policy environments.

Implications for Policy and Practice

Policymaking is an iterative process informed by the successes and failures of past policy implementation, evidence from health policy research, and the unintended consequences of enacted policies.(Chriqui et al., 2011) This "feedback loop" is a critical element of evidence-based policymaking. Evidence from this dissertation suggests that the mere presence of state insurance mandates for DSME/T services is not an effective policy intervention to improve the supply of DSME/T resources or patient utilization of the service. Other policy levers should be explored to incentivize the health delivery system to expand the availability of DSME/T resources. Because health insurance mandates are unable to address immutable patient-level factors, such as sociodemographic characteristics and health beliefs, health care providers and organizations should implement processes and systems to identify patients in need but not receiving DSME/T and develop outreach strategies. These processes can include the expanding EHR capabilities to identify patients in need of education services and patient-specific education resources in the area or partnering with faith-based organizations to deliver education services. Lastly, states' adoption of these mandates does not significantly increase demand for DSME/T services or the supply of DSME/T resources, likely because benefits are only extended to insured patients. It is possible that the adoption of these mandates in conjunction with expanded insurance coverage would result in a significant increase in supply and demand of DSME/T services. Notably, of the 36 US jurisdictions that have not adopted some type of insurance mandate for Medicaid, ten also have not adopted Medicaid expansion. This adoption pattern may present an opportunity to explore whether simultaneous adoption of mandated benefits and Medicaid expansion improves access.

Future Research

Future research is needed to determine ways in which changes in health policy and the delivery system can or did influence access to DSME/T among patients with diabetes. First, the volume and distribution of DSME/T resources is a function of the number of resources available and the number of diagnosed individuals in a given area. Using county or zip code rather than state as the unit of analysis, a future analysis will assess the volume and distribution of DSME/T resources; and how these measures differ in adopting and non-adopting states. Next, immutable patient level characteristics (i.e., predisposing factors that cannot be influenced by health policy) play a significant role in patient utilization of services. Moreover, patients' perception of need for a service often differs from that of clinical evaluation. Therefore, future patient-level analyses will utilize survey data to identify characteristics of patients who utilize DSME/T and electronic health records to determine if clinical indicators can be used to calculate patients' propensity to enroll. Next, patient satisfaction is a defined product of health policy with regards to access to care. Given that the policy of interest seeks to expand insurance benefits to cover a service that may not have been included in insureds' health plans previously, future research will employ the CAHPS Health Plan Survey to assess the performance of health plans and enrollee satisfaction before and after the adoption of these mandates. Lastly, only fifteen states have adopted some type of mandate or reimbursement provisions for Medicaid. As other state legislatures draft and consider similar proposals, future research needs to determine whether adopting states benefited from reduced Medicaid expenditures and/or reduced high-cost utilization. Contingent on these results, further analyses will be needed to measure states' return on investment in DSME/T coverage.

Conclusion

This dissertation explored the impact of decades of state policy interventions designed to address one of the nation's leading public health burdens. Through the application of longstanding theoretical frameworks and rigorous analytic approaches, this work offers a sound evidence-base for policymakers, health professional organizations, and health policy researchers who are interested in the effectiveness of state insurance mandates as a tool to improve access to diabetes care services. Future research will build upon these findings to further explore the role of state policymaking on diabetes management.

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Table A-10. Comparing Supply of DSME/T Resources, 2010 & 2017

	2010		2017		Percent Change (+/-)
	Mean	St. Dev.	Mean	St. Dev.	
Accredited DSME/T Programs	1.7	2.0	14.4	10.8	+ 747.06%
Accredited DSME/T Program Sites	11.4	15.1	39.3	34.9	+ 244.74%
Certified DSME/T Providers	324.6	310.7	380.7	391.2	+ 17.28%

Table A-11. Relationship between Mandates and the Supply of DSME/T Resources, by Insurers Targeted

Variables of Interest	Accredited Programs			Accredited Program Sites			Certified Providers		
	β	C.I.		β	C.I.		β	C.I.	
		Lower	Upper		Lower	Upper		Lower	Upper
DSME/T Mandate									
Private or Medicaid	0.78	-1.69	3.24	2.9	-3.01	8.81	-17.95	-40.44	4.55
Private & Medicaid	1.29	-1.03	3.61	1.71	-4.66	8.09	-15.39*	-30.61	-0.16
Any Provider Delivers									
Private or Medicaid	2.29	-1.51	6.1	2.38	-6.32	11.09	-8.56	-25.69	8.57
Private & Medicaid	5.9	-1.53	13.33	12.34	-6.19	30.87	10.57	-14.57	35.71
Flexible Certification Requirement									
Private or Medicaid	-4.28	-11.55	3.00	-42.05	-59.36	-24.73	-107.7	-150.5	-64.91
Private & Medicaid	-2.23	-10.52	6.07	-35.38	-56.39	-14.37	-92.18	-129.26	-55.09
Flexible Training Requirement									
Private or Medicaid	-2.49	-17.02	12.04	46.47	13.49	79.44	107.8	31.3	184.32
Private & Medicaid	-0.97	-14.92	12.98	50.32	19.41	71.23	107.69	45.41	169.97
Flexible National Compliance									
Private or Medicaid	1.71	-6.52	9.93	-4.53	-23.91	14.85	-24.95	-59.06	9.16
Private & Medicaid	0.89	-7.53	9.31	-10.93	-29.28	7.42	-13.28	-51.47	24.91
Flexible State Compliance									
Private or Medicaid	2.37	-6.61	11.36	12.17	-8.97	33.3	17.18	-6.33	40.69
Private & Medicaid	-1.11	-7.82	5.59	3.84	-12.19	19.86	18.88	-0.22	37.98
Multiple Delivery Settings									
Private or Medicaid	-0.78	-6.73	5.17	-2.13	-12.21	7.94	9.45	-14.72	33.62
Private & Medicaid	omitted for collinearity			omitted for collinearity			omitted for collinearity		
Notes: * - $p \leq 0.05$; ** - $p \leq 0.01$									

Table A-12. Health-Related Factors That Could Affect Demand for DSME/T, 2016

	No Mandate		With Mandate	
	Mean	Standard Error	Mean	Standard Error
Perceived in 'Fair' Health	0.25	0.04	0.23	0.01
Perceived in 'Poor' Health	0.12	0.05	0.09	0.01
Diabetes-related kidney problems	0.09	0.03	0.10	0.01
Diabetes-related eye problems	0.14	0.04	0.16	0.01
Experiencing Depression	0.18	0.04	0.19	0.01
# Office-Based Visits	10.9	1.31	10.4	0.40
# Nights in Hospital	1.01	0.41	1.19	0.13

Table A-13. Relationship between Mandates and DSME/T Utilization Among Newly Insured

Variables of Interest	Adults with Diabetes			Privately Insured Adults with Diabetes			Medicaid Insured Adults with Diabetes		
	β	C.I.		β	C.I.		β	C.I.	
		Lower	Upper		Lower	Upper		Lower	Upper
Adopted a DSME/T Mandate?									
No Mandate	[reference]			[reference]			[reference]		
Adopted a Mandate	-0.05	-0.24	0.16	-0.18	-0.39	0.02	0.03	-0.10	0.16
Any Provider Can Order									
No	[reference]			[reference]			[reference]		
Yes	0.26	-0.10	0.61	0.18	-0.37	0.72	0.21	-0.09	0.52
Any Provider Can Deliver									
No	[reference]			[reference]			[reference]		
Yes	-0.40	-0.81	0.01	-0.57	-1.26	0.12	-0.01	-0.39	0.37
Any Medical Trigger for Coverage									
No	[reference]			[reference]			[reference]		
Yes	0.56*	0.09	1.04	0.50	-0.15	1.16	-0.05	-0.42	0.33
No Coverage Cap									
No	[reference]			[reference]			[reference]		
Yes	0.18	-0.26	0.63	0.26	-0.38	0.90	-0.02	-0.24	0.21
Multiple Delivery Settings									
No	[reference]			[reference]			[reference]		
Yes	-0.08	-0.39	0.22	0.11	-0.11	0.33	omitted for collinearity		

Notes:
* - $p \leq 0.05$
** - $p \leq 0.01$

Table A-14. Likelihood of a Person with Diabetes Receiving a Referral to DSME/T among Physician Encounters, n=93,986

	β	Confidence Interval	
		Lower	Upper
Type of Need			
No Need	[reference]		
Need 1- New DM Diagnosis	.055**	.028	.082
Need 2- Levels Off Target	.078**	.069	.086
Need 3- Complicating Factors	.081**	.068	.094
Need 4- Transition in Care	.009**	.004	.014
Multiple Types of Need	.101**	.094	.108
Patient Characteristics			
Age (at time of encounter)	-.048**	-.055	-.041
Comorbidity Score	.001	-.0006	.002
Encounter Payer			
Private	[reference]		
Medicaid	.008	-.003	.020
Self-Pay	.026**	.012	.039
Encounter Setting			
Outpatient	[reference]		
Inpatient	-.031**	-.039	-.023
Emergency	-.039**	-.044	-.033
DSME/T Program Availability			
# of Sites	.013**	.012	.015
Notes: * - $p \leq 0.05$; ** - $p \leq 0.01$			

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IU President’s Diversity-Doctoral Scholar
Delta Omega Public Health Honor Society
Southern Regional Education Board (SREB) Doctoral Scholar

PEER-REVIEWED PUBLICATIONS

1. Brown-Podgorski, B., Holmes, A.M., Golembiewski, E., Jackson, J., and Menachemi, N. (2018). Employment Trends among Public Health Doctoral Recipients (2003-2015). American Journal of Public Health, 108(9), 1171-1177.

2. Brown-Podgorski, B., Hilts, K. E., Kash, B. A., Schmit, C. D., and Vest, J.R. (2018). The Association Between State-Level Health Information Exchange Laws and Hospital Participation in Community Health Information Organizations. American Medical Informatics Association (AMIA) Annual Meeting Proceedings. [FORTHCOMING]

3. Golembiewski, E. H., Holmes, A. M., Jackson, J. R., Brown-Podgorski, B., & Menachemi, N. (2018). Interdisciplinary Dissertation Research Among Public Health Doctoral Trainees, 2003-2015. Public Health Reports, 133(2), 182-190.

4. Andraka-Christou, B., Rager, J. B., Brown-Podgorski, B., Silverman, R. D., & Watson, D. P. (2018). Pain clinic definitions in the medical literature and US state laws: an integrative systematic review and comparison. Substance Abuse Treatment, Prevention, and Policy, 13(1), 17.

5. Oruche, U. M., Robb, S. L., Draucker, C. B., Aalsma, M., Pescosolido, B., Chacko, A., Ofner, S., Bakoyannis, G., & Brown-Podgorski, B. (2018). Pilot Randomized Trial of a Family Management Efficacy Intervention for Caregivers of African American Adolescents with Disruptive Behaviors. In Child & Youth Care Forum (pp. 1-25). Springer US.

6. Jackson, J. R., Jennings, J., Golembiewski, E., Brown-Podgorski, B. L., & Menachemi, N. (2017). Black Graduates of Health Administration Doctoral Programs: Examining Trends. Journal of Health Administration Education, 34(2), 213-227.

7. Oruche, U. M., Robb, S. L., Aalsma, M., Pescosolido, B., Brown-Podgorski, B., & Draucker, C. B. (2017). Developing a multiple caregiver group for caregivers of adolescents with disruptive behaviors. Archives of Psychiatric Nursing, 31(6), 596-601.

8. Ray, B., Grommon, E., Buchanan, V., Brown, B., & Watson, D. P. (2017). Access to Recovery and recidivism among former prison inmates. International Journal of Offender Therapy and Comparative Criminology, 61(8), 874-893.

CONFERENCE PRESENTATIONS

1. Brown-Podgorski, B., de Groot, M.K., and Vest, J.R. (June 2019). Examining the Impact of State-Mandated Benefits on Potential Access to Diabetes Self-Management Education and Training. Poster presentation at the 2018 AcademyHealth Annual Research Meeting, Washington, DC.

2. Brown-Podgorski, B., de Groot, M.K., and Vest, J.R. (June 2018). State Medicaid Reimbursement Laws and Diabetes Self-Management Education and Training (DSME/T) Program Availability. Poster presentation at the 2018 AcademyHealth Annual Research Meeting, Seattle, WA.

3. Brown-Podgorski, B. (November 2015). Pressure on the Front Lines: Street-Level Bureaucrats and Housing First Implementation. Poster presented at the 143rd American Public Health Association (APHA) Annual Meeting and Exposition, Chicago, IL.

4. Brown, B., Omenka, I., and Watson, D.P. (November 2014). Using the Housing First Model (HFM) Fidelity Index to Evaluate the Current Supportive Housing System in Indiana. Poster presented at the 142nd American Public Health Association (APHA) Annual Meeting and Exposition, New Orleans, LA.

5. Brown, B. and Watson, D.P. (April 2014). The Climate of Permanent Supportive Housing in the State of Indiana: Examination and Evaluation. Poster presented at the 2014 Urban Health Conference, Indianapolis, IN.

6. Watson, D., Buchanan, V., Brown, B., Inman, H. and Freeman, S. (October 2013). The 'Little Things' that Make Recovery Work: An Evaluation of Indiana's Access to

Recovery Program (ATR) presented at The Addiction Health Services Research Conference, Portland, OR.

7. Freeman, S., Inman, H., and Brown, B. (2013, April). Summative Evaluation of Indiana Access to Recovery. Poster presented at the IUPUI Research Day, Indianapolis, IN.

8. Brown, B., Freeman, S., and Inman, H. (2012, September). Evaluation of Indiana Access to Recovery. Poster presented at the Public Health Research and Service Symposium, Indianapolis, IN.

TECHNICAL REPORTS & COMMENTARIES

1. Brown-Podgorski, B., Hart, A., Miller, L., Murphy, J., Riley, C., Sudduth, K. and Vogel, A. (2016, April). Indiana Youth Suicide Prevention: A Formative Report. Indianapolis, IN: Prepared for Marion County Commission on Youth.

2. Buchanan, V., Watson, D., Freeman, S., Brown, B., and Inman, H. (2013, August). Indiana's Access to Recovery Program (ATR) Summative Evaluation Report. Center for Health Policy, Indianapolis, IN: Prepared for Indiana's Family and Social Services Administration, Division of Mental Health and Addiction.

3. Freeman, S., Inman, H., Brown, B., and Watson, D. (2013, May). Formative Evaluation of Indiana's Access to

Recovery Program (ATR). Center for Health Policy, Indianapolis, IN: Prepared for Indiana’s Family and Social Services Administration, DMHA.

4. Brown, B. (2012). “Chronic Illness v. Affordable Care Act.” Journal for Student National Medical Association. (2012, December).

5. Brown, B., Watson, D., Freeman, S., and Inman, H. (2012, August). Preliminary Analysis of Access to Recovery (ATR) Client Focus Groups. Center for Health Policy, Indianapolis, IN: Prepared for .Indiana FSSA, DMHA

RESEARCH SUPPORT

Funder: AHRQ

Funding Year: 2018 – 2019

Title: The Impact of State-Mandated Insurance Benefits and Reimbursement Provisions on Access to Diabetes Self-Management Education and Training (DSME/T)

Role: Principal Investigator

Funder: IU Dissertation Fellowship

Funding Year: 2018 – 2019

Title: Examining the Impact of Insurance Reimbursement Laws on Access to DSME/T among Adult Patients with Diabetes

Role: Principal Investigator

Funder: Indiana CTSI & NIH

Year: 2015

Title: Pressure on the Front Lines: Street-Level Bureaucrats and Housing First Implementation in the State of Indiana (Thesis), under "Housing as a Clinical Intervention: Implementation, Recovery Outcomes, and the Mediating Influence of Social Networks", PI: Dennis Watson, Award # KL2TR001106

Role: Student Investigator

TEACHING ACTIVITIES

Course: H474, Ethics in Health Administration

Role: Instructor of Record

Term(s): Fall 2017, Fall 2018

Course: P300, Leadership in Health Management

Role: Teaching Assistant

Term(s): Spring 2017

Course: H120, Ethics in Health Care Delivery

Role: Guest Lecturer

Term(s): Spring 2017

Course: H315, Harm Reduction and the Role of Government

Role: Guest Lecturer

Term(s): Spring 2017

Course: A519, Environmental Science in Public Health

Role: Teaching Assistant

Term(s): Fall 2014, Spring 2015

PROFESSIONAL SERVICE ACTIVITIES

Ad Hoc Peer Reviewer, Journal of Applied Social Science

Ad Hoc Peer Reviewer, Journal of the Student National Medical Association

COMMUNITY SERVICE ACTIVITIES

Organization: Sagamore Institute

Year: 2015 – 2018

Responsibilities: Technical assistance with data analysis and reporting policy recommendations

Organization: MCCOY

Year: 2016

Responsibilities: Technical assistance with data analysis and reporting for suicide prevention policy recommendations to state legislature

Organization: Mental Health America of Greater Indianapolis

Year: 2014 - 2015

Responsibilities: Qualitative data collection and reporting for development of a school-based behavioral and mental health intervention

Organization: Center of Wellness for Urban Women of Indianapolis

Year: 2014

Responsibilities: Collaboration and design of a nutritional wellness curriculum for adult women

PROFESSIONAL MEMBERSHIPS

American Medical Informatics Association

Academy of Management

Network for Public Health Law

AcademyHealth

American Public Health Association