Coordinated Health Planning Project:

Final Report of Findings

March 4, 2013

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Introduction

In the Fall 0f 20012, the Rhode Island Executive Office of Health and Human Services (EOHHS), in collaboration with the Office of the Insurance Commissioner and the Department of Health (DOH), sought technical assistance and health planning expertise to begin a more comprehensive statewide health planning process. Rhode Island's Director of Health created a Health Care Planning and Accountability Advisory Council under the "Rhode island Coordinated Health Planning Act of 2006" to make recommendations related to statewide health planning. The Robert Graham Center for Policy Studies in Family Medicine and Primary Care ("Graham Center") was selected to produce "gap analysis" regarding Rhode Island's primary care services to provide support for Rhode Island's EOHHS and DOH to utilize in creating a statewide health plan.

Created in 1999 as an editorially independent functional division of the American Academy of Family Physicians, the Graham Center has more than ten years of state health policy and health care industry experience. The Graham Center exists to improve individual and population health by enhancing the delivery of primary care. The Graham Center aims to achieve this mission through the generation or synthesis of evidence that brings a family medicine and primary care perspective to health policy deliberations from the local to international levels. The Graham Center employees social scientists of diverse background who have expertise in the analysis and development of indices and measures of underservice, social determinants of health, health workforce, and geospatial analysis that relates these factors with population health and health care cost outcomes. This expertise is borne of and reinforced by recent contracts with the U.S. Agency for Healthcare Research and Quality (AHRQ), Health Resources and Services Administration ([HRSA] Office of Rural Health Policy and Bureau of Primary Health Care), the Commonwealth Fund, and participation on the Federal Negotiated Rule Making Committee for health care workforce shortage and underservice designation.

The Graham Center has summarized Rhode Island's primary care services and health care workforce development to enhance Rhode Island's understanding of the overall health needs of its population. The Graham Center has produced this final report consisting of two gap analyses. The first analysis provides a comprehensive examination of the delivery of primary care services in Rhode Island and outlines the extent to which Rhode Island's population has access to primary care services.

The primary care services gap analysis merges data from a variety of sources on the U.S. physician workforce, Census and health data in order to permit analysis of both the need for primary care service and the current and future availability of primary care providers (including Nurse Practitioners (NPs) and Physician Assistants (PAs)) at small area levels for Rhode Island. Rhode Island's small size, population density, and lower than average poverty and uninsurance rates provide natural strengths for facilitating population health planning relative to other states. In contrast, the Graham Center developed social deprivation index scores suggest that Rhode Island remains at risk of excessive health care utilization and Rhode Island's community hospital infrastructure struggles financially.

The Graham Center's second gap analysis focuses on health care workforce development in Rhode Island. Using U.S. physician workforce data, the Graham Center examines the current production of health care providers in Rhode Island, including NPs and PAs. Many state policymakers are interested in the extent to which physicians trained in-state actually remain in-state to practice. The Graham Center addresses physician retention through an examination of the extent to which Rhode Island relies on migration of physicians from other states. The workforce gap analysis complements the primary care service analysis by providing a better understanding of how well the current health workforce pipeline addresses the future needs of the population to access primary care services in their communities.

1. Background: Current State of Rhode Island

Rhode Island is a unique state in the United States in many ways. To give context to the gap analysis presented below, brief background information on Rhode Island is presented. Statistics on the demographics, income, poverty and employment of Rhode Island are presented first. To lay the foundation of the later health care system work, an overview of the health insurance coverage of Rhode Islanders; the Rhode Island health care system; the impact the Patient Protection and Affordable Care Act (P.L. 111-148) (ACA) has had, and will continue to have, to the health care system in Rhode Island; the health status of Rhode Islanders; the access to health care specialties; and the current state of Rhode Island's heath information technology systems are outlined.

1.1 Demographics, Income, Poverty, and Employment

The 2011 U.S. Census Bureau's American Community Survey (ACS) estimates Rhode Island's population to be approximately 1,051,000, 43rd in the nation.[1] The 2000 Census shows that Rhode Island has the smallest land area of the U.S. at 1045 square miles. Rhode Island also has an average of approximately 1000 individuals and 420 housing units per square mile. Thus Rhode Island has the third highest population density in the U.S.. Additionally, Rhode Island ranks 45th in the nation in terms of population change from 1990 to 2000, and 29th in terms of urban population. [2]

Almost 21 percent of Rhode Island's population are under 18 years old, 64 percent are between 18 and 64, and almost 15 percent are 65 and older. There are slightly more women (almost 52 percent) than men (about 48 percent) in Rhode Island. The majority of the population in Rhode Island is white, at 86 percent, with 2 percent reporting two or more races. Slightly more than seven percent of the population is African American, and almost 13 percent identify as being of Hispanic or Latino origin. Approximately three percent of the population is Asian, and less than two percent falls into the category of American Indian, Alaskan Native, Native Hawaiian or Other Pacific Islander.[3]

Rhode Island's household size is 2.47 persons per household[4] and the median household income at almost $54,000 (the mean is slightly more than $72,000).[5] In Rhode Island, more than 10 percent of the

[1] *See e.g.*, U.S. Census Bureau, State and County QuickFacts: Rhode Island, *available at http://quickfacts.census.gov/qfd/states/44000.html*.

[2] *See e.g.*, U.S. Census Bureau, United States Summary: 2000: Populaiton and Housing Unit Counts, Table 17, page 29 (April 2004), *available at* http://www.census.gov/prod/cen2000/phc3-us-pt1.pdf.

[3] U.S. Census Bureau, American FactFinder, data extracted October 30, 2012, *available at* http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml.

[4] *See e.g.*, U.S. Census Bureau, State and County QuickFacts: Rhode Island, *available at* http://quickfacts.census.gov/qfd/states/44000.html.

[5] U.S. Census Bureau, American FactFinder, data extracted October 30, 2012, *available at* http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml.

workforce is unemployed.[6] Approximately 11 percent of Rhode Island's families, and almost 15 percent of all people, are below the poverty line, compared with almost 12 percent of families, and almost 16 percent of all people (respectively), for the U.S. The "educational services, and health care and social assistance" industry employs approximately 27 percent of Rhode Island's civilian employed population. A little more than 12 percent of Rhode Island's population is employed in the retail trade industry, with the manufacturing and "arts, entertainment, and recreation, and accommodations and food services" industries each employing almost 11 percent of Rhode Island's population.[7] Large private companies headquartered in Rhode Island include CVS Pharmacy, Hasbro and Amica Insurance. Fidelity Investments, Metropolitan Insurance and General Dynamics also base large divisions of their companies in Rhode Island. The top ten employers in Rhode Island and their number of Rhode Island employees are (1) the Rhode Island State Government (14,904), (2) Lifespan (11,869), (3) the U.S. Government (11,581), (4) the Roman Catholic Diocese of Providence (6,200), (5) Care New England (5,953), (6) CVS Corp (5,800), (7) Citizens Financial Group, Inc. (5,800), (8) Brown University (4,800), (9) Stop and Shop Supermarket Co., Inc. (Royal Ahold) (3,632), and (10) Bank of America (3,500).[8]

1.2 Health Insurance Coverage

Blue Cross Blue Shield of Rhode Island (BCBSRI) was founded in 1939 and today has over 600,000 members (almost 65 percent of Rhode Island's insured population), over 9,000 participating Rhode Island providers, and employees over 1,000 individuals.

According to Kaiser Family Foundation, the largest insurer for Rhode Island's individual (non-group) insurance market holds 52 percent of the market, with only two insurers holding more than five percent of the individual insurance market share. In comparison, the largest insurer in Massachusetts and Connecticut holds 57 and 52 percent (respectively) of the market and four insurers hold more than five percent of each market.[9]

Approximately 88 percent of Rhode Island's civilian noninstitutionalized population have health insurance coverage and approximately 12 percent are uninsured, compared to almost 84 percent and about 16 percent for the United States. About 75 percent of Rhode Islanders has employer sponsored

[6] *See e.g.*, U.S. Bureau of Labor Statistics, Economy at a Glance: Rhode Island, (September 2012), *available at* http://www.bls.gov/eag/eag.ri.htm.

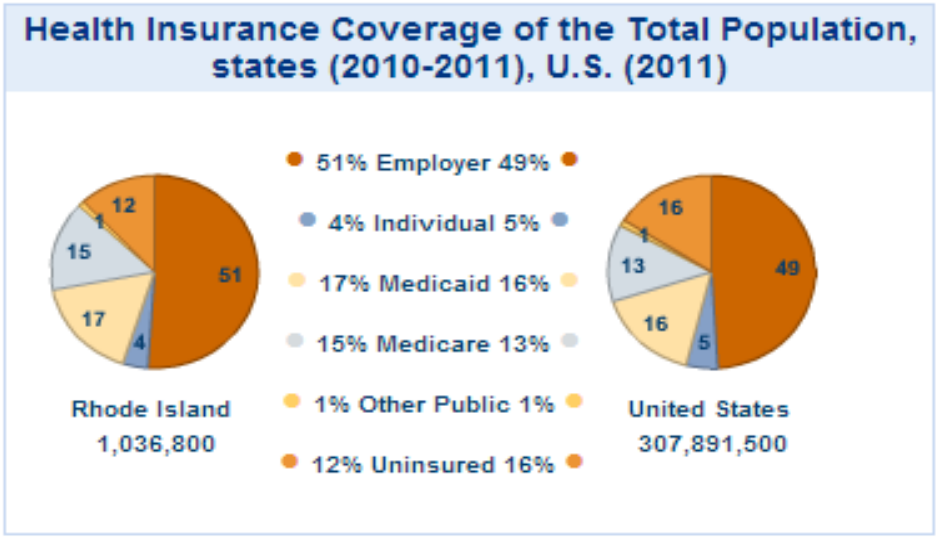
[7] *See e.g.*, U.S. Census Bureau, American FactFinder, data extracted October 30, 2012, *available at* http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml.

[8] Rhode Island Economic Development Corporation, Top Employers in Rhode Island (March 2011), *available at* http://www.riedc.com/files/Top%20Employers%20ranking%202011.pdf.

[9] *See e.g.*, The Henry J. Kaiser Family Foundation, How Competitive are State Insurance Markets? (October 2011), *available at http://www.kff.org/healthreform/upload/8242.pdf*.

health insurance, four percent have individual coverage, 17 percent are enrolled in Medicaid, 15 percent are enrolled in Medicare and one percent are enrolled in other public coverage.[10]

Figure 1. The Kaiser Family Foundation *statehealthfacts.org*



1.3 Health Care Systems

Rhode Island's current health care system consists largely of affiliated entities working together. Lifespan, the first such system, was founded as a non-profit organization in 1994 by the Rhode Island Hospital and the Miriam Hospital. The Warren Alpert Medical School of Brown University, Hasbro Children's Hospital, Bradley Hospital, and Newport Hospital are all currently affiliated with Lifespan's "integrated, academic health system."[11]

Located in Providence, Rhode Island Hospital was founded in 1863, currently employees 7,297 individuals, and has 719 licensed beds. The hospital brings in almost $1 billion in net patient service revenue and over $50 million in research funding revenue. Rhode Island Hospital is involved with several research programs, including the Family Research Program, the Vascular Disease Research Center, and The Center of Biomedical Research Excellence for Skeletal Health and Repair, among others.[12]

[10] *See e.g.*, The Kaiser Family Foundation, *statehealthfacts.org.* Data Source: Urban Institute and Kaiser Commission on Medicaid and the Uninsured estimates based on the Census Bureau's March 2011 and 2012 Current Population Survey (CPS: Annual Social and Economic Supplements).

[11] *See e.g.*, About Lifespan (assessed October 30, 2012), *available at* http://www.lifespan.org/about-lifespan-hospitals.

[12] *See e.g.*, Rhode Island Hospital: A Lifespan Partner (assessed October 30, 2012), *available at* http://www.rhodeislandhospital.org.

A private, not-for-profit hospital, The Miriam Hospital was founded in 1907 in Providence. Currently the hospital is staffed by more than 775 affiliated physicians, approximately 50 full-time house staff (medical school graduates), a nursing staff of 500 and more than 1,100 health care employees. The Miriam Hospital is affiliated with Brown Medical School and is one of Rhode Island's major teaching hospitals.

The Warren Alpert Medical School of Brown University is a national leader in medical education and biomedical research. Approximately 100 Doctor of Medicine (MD) degrees are awarded each year by the Medical School. Hasbro Children's Hospital opened on Valentine's Day in 1994 in Providence on the Rhode Island Hospital campus. In 1931, the first neuropsychiatric hospital devoted exclusively to children and adolescents, The Emma Pendleton Bradley Hospital, opened in East Providence. The Bradley Hospital operates the Bradley School, a fully accredited special education school, employees 932 individuals, has 39 affiliated physicians and 60 licensed beds. Newport Hospital began as a 12-bed cottage hospital in 1873 founded and funded by Newporters. Today Newport Hospital employees 899 individuals, has 299 affiliated physicians and 129 licensed beds.

A second health care system operating in Rhode Island is the Care New England System. In February 1996, Butler Hospital, Kent Hospital and Women & Infants Hospital of Rhode Island founded the Care New England System in Providence to serve the southeastern New England community. Rhode Island's only private, nonprofit psychiatric and substance abuse hospital for adults, adolescences, children and seniors, Butler Hospital was founded in 1844 and is located in Providence. Butler Hospital serves as the principal teaching affiliate for psychiatry and human behavior for Brown Medical School. Kent Hospital, an acute care nonprofit hospital, opened in 1951 with 90 beds and today serves approximately 300,000 residents of Warwick, West Warwick, East Greenwich, West Greenwich, Coventry and parts of North Kingstown, Exeter and Cranston with 359-beds. Kent Hospital is affiliated with the University of New England College of Osteopathic Medicine. Women & Infants Hospital of Rhode Island opened in 1884 as the Providence Lying-In Hospital. Women & Infants Hospital of Rhode Island is currently the eighth largest stand-alone obstetrical facility in the U.S. with almost 8,400 deliveries in 2011.[13]

The three state hospitals operated by the Rhode Island Department of Mental Health Retardation and Hospitals integrated into the Eleanor Slater Unified Hospital System in March of 1994. The John O. Pastore Center in Cranston and the Eleanor Slater Hospital/Zambarano Unit in Burrillville together house 495 public beds.[14]

South County Hospital Healthcare System in Wakefield is made up of South County Hospital, VNS Home Health Services, South County Quality Care, and South County Surgical Supply. South County Hospital is an independent, non-profit, acute-care hospital.[15]

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[13] Women & Infants Hospital of Rhode Island, Women & Infants Profile 2012: About Women & Infants (2012), *available at* *http://www.womenandinfants.org/upload/WI2012profile.pdf*.

[14] *See e.g.*, the Eleanor Slater Hospital webpage (assessed October 30, 2012) *at http://www.bhddh.ri.gov/esh/*.

[15] *See e.g.*, the South County Hospital Healthcare System webpage (assessed October 30, 2012) *at http://www.schospital.com/*.

Landmark Medical Center, located in Woonsocket, is a 214-bed, acute care non-profit, full-service hospital. In 1988 the former Woonsocket Hospital and John E. Fogarty Memorial Hospital merged to create the Landmark Medical Center. The Landmark Medical Center has allied with Harvard Medical Facility Physicians to bring "world renowned emergency care close to home for families in our community."[16]

The Roger Williams Medical Center affiliated with St. Joseph Health Services of Rhode Island in October 2009 creating the CharterCare Health Partners. CharterCare has 579 licensed beds, 3,405 employees, 527 physicians, net patient revenue of $329,518,453 and research funding revenue of $6,403,821.[17] On April 6, 1892 St. Joseph Hospital opened under the Roman Catholic Diocese of Providence. The Diocese of Providence opened Our Lady of Fatima Hospital in North Providence in 1954 as a hospital for the chronically ill to replace St. Joseph Hospital's Hillsgrove chronic care facility in Warwick.[18] At the end of the 1960s St. Joseph and Our Lady of Fatima Hospitals were merged under one administration. The Roger Williams Medical Center was founded in 1878 in the Smith Hill neighborhood of Providence.[19]

The U.S. Department of Veterans Affairs runs Providence VA Medical Center which has approximately 150 board certified physicians, a total of 1,038 full-time equivalent employees, and approximately 73 operating beds.[20] The Memorial Hospital of Rhode Island, founded in 1894, is a 294 bed community hospital serving the Blackstone Valley with its main campus in Pawtucket. The hospital is a teaching affiliate of The Warren Alpert Medical School of Brown University.[21] Providing Washington and New London (Connecticut) county residents a community hospital setting, Westerly Hospital is a 125 bed hospital with 130 primary and specialty physicians.[22] Duncan Lodge in Providence is a private pay mental health treatment center. Rehabilitation Hospital of Rhode Island in North Smithfield is devoted exclusively to inpatient and outpatient rehabilitation.[23] Gateway Healthcare, Inc. was established in 1995 as a community mental health center for the residents of northern and central Rhode Island.[24]

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[16] *See e.g.*, Landmark Medical Center's webpage (assessed October 30, 2012) *at http://www.landmarkmedical.org/*.

[17] *See e.g.*, CharterCare Health Partners webpage (assessed October 30, 2012) *at http://www.chartercare.org/*.

[18] *See e.g.*, St. Joseph Health Services of Rhode Island webpage (assessed October 30, 2012), *available at http://www.saintjosephri.com/*.

[19] *See e.g.*, Robert Williams Medical Center webpage (assessed October 30, 2012), *available at http://www.rwmc.org*.

[20] *See e.g.*, Providence VA Medical Center webpage (assessed October 30, 2012), *available at http://www.providence.va.gov/*.

[21] *See e.g.*, Memorial Hospital of Rhode Island webpage (assessed October 30, 2012), *available at http://www.mhri.org/news.php*.

[22] *See e.g.*, The Westerly Hospital webpage (assessed October 30, 2012), *available at http://www.westerlyhospital.org/*.

[23] *See e.g.*, Rehabilitation Hospital of Rhode Island webpage (assessed October 30, 2012), *available at* http://www.rhri.net/home.aspx and The Agape Center, Rhode Island Hospitals (assessed October 30, 2012), *available at* http://www.theagapecenter.com/Hospitals/Rhode-Island.htm#R.

[24] *See e.g.*, Gateway Healthcare Inc, webpage (assessed October 30, 2012), *available at* http://www.gatewayhealth.org/.

1.4 Health Care Reform Changes

Rhode Island is on track to meet the health benefits exchange requirements of the ACA. Rhode Island's Governor Lincoln Chafee issued an Executive Order to establish the Rhode Island Health Benefit Exchange and appointed the public member of the Exchange Board on September 19, 2011. According to the State of Rhode Island Healthcare Reform Commission website, "The Exchange will function as a marketplace for health insurance for individuals, families, and small business. The Exchange Board will recommend design and policy decisions for the Exchange as it is developed, which is scheduled to start enrolling Rhode Islanders in health insurance by late 2013. The construction of the Exchange is fully paid through federal funds."[25] Thus Rhode Island's Exchange will be established and operated by Rhode Island's Executive Department's newly established Rhode Island Health Benefits Exchange Division. The Exchange is operated by the State with the State the active purchaser, instead of a clearinghouse. The Exchange received a planning grant of $1 million and an establishment grant of approximately $58.5 million.[26]

Rhode Island has also established a Pre-Existing Condition Insurance Plan run by Blue Cross Blue Shield of Rhode Island, under a contract with the U.S. Office of Health & Human Services. Individuals are eligible for coverage if they are a citizen or natural of the U.S. or residing in the U.S. legally, have been uninsured for a least six months before application, and have a pre-existing condition or been denied coverage because of their health condition.[27]

Rhode Island has also pledged to expand Medicaid under the ACA. Rhode Island did not adopt the early expansion to cover adults and did not receive the grant award for disease prevention; however, Rhode Island submitted a plan for a Medicaid eligibility system upgrade. Rhode Island submitted a State Plan Amendment (SPA) for Health Homes but did not receive a planning grant. Additionally Rhode Island posted a Proposal for a Financial Alignment Model under the dual eligible beneficiaries' option but did not design a contract award to integrate care for dual eligible beneficiaries.

The Kaiser Family Foundation has estimated that Rhode Island's Medicaid expansion to 133 percent of the Federal Poverty Level (FPL) will result in a 20 percent increase in enrollment by 2019, a 0.7 percent increase in State spending from 2014 to 2019, a 14.6 percent increase in Federal spending and an 8.1 percent increase in total spending. In comparison, the Medicaid expansion will result in a 27.4 percent increase in enrollment in the U.S. average by 2019, a 1.4 percent increases in State spending from 2014 to 2019, a 22.1 percent increase in Federal spending and an 13.2 percent increase in total spending.

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[25] *See e.g.*, State of Rhode Island Healthcare Reform Commission website (assessed October 30, 2012), *available at http://www.healthcare.ri.gov/exchange/about/*.

[26] *See e.g.*, The Kaiser Family Foundation, Facts At-a-Glance: Rhode Island (assessed October 30, 2012), *available at http://www.statehealthfacts.org/healthreformsource.jsp?rgn=41*.

[27] *See e.g.*, HealthCare.gov, Pre-Existing Condition Insurance Plan: Rhode Island (assessed October 30, 2012), *available at http://www.healthcare.gov/law/features/choices/pre-existing-condition-insurance-plan/ri.html*.

2. Task 1: Gap Analysis for Primary Care Services

Rhode Island's DOH requested a gap analysis of Rhode Island's primary care services enabling Rhode Island to clearly understand the extent to which the existing system adequately addresses the varying needs of a diverse population. To present such a picture, the Graham Center engaged in three technical subtasks: 1) a geo-spatial examination of health needs across Rhode Island, paying particular attention to trends in health disparities across socio-economic and racial/ethnic divides; 2) an analysis of Rhode Island's primary care workforce "drilled down to the census tract level," including a comparison of Rhode Island's health workforce composition to that of other states and trends across time; and 3) based on the first two analyses, the Graham Center identifies areas potentially in need of greater resources, as well as areas with adequate or excess capacity.

2.1 Subtask 1: Geo-Spatial Analysis of Deprivation and Health Needs

The first subtask focuses on combining data from a variety of sources to characterize the varying health needs of different geographical areas of Rhode Island. One policy relevant issue is identifying areas where the population is healthier, or less healthy, than models taking into account the underlying level of deprivation of the area would predict. Developing parallel social deprivation and health measures allows the advantage of investigating this issue more fully.

Examining the population at a geographic level, enables a comparison of an area's indicators of social deprivation measures to measures of health. Through this analysis, locations that have populations with health outcomes outside of predicted values become apparent. The results provide valuable information to help policymakers identify ways to improve population health across the state. Prior[28] efforts to construct a Social Deprivation Index (SDI)[29] used ACS data to identify communities with higher levels of social deprivation. The results show that individually or combined into an index, the social deprivation measures are strong predictors of increased need for health care than poverty measures. One advantage of this SDI measure is that it is available at the census tract level and provides a more nuanced geography of need.

The available health indicators include infant mortality, avoidable hospitalization, obesity rates and diabetes rates.[30] Medicare claims data underlie the Dartmouth Atlas data; thus the Dartmouth Atlas data represent the highest quality indicators of health care utilization. Currently the data are

[28] *See e.g.*, D. C. Butler, S. Petterson, R. L. Phillips, and A. W. Bazemore, Measures of Social Deprivation That Predict Health Care Access and Need within a Rational Area of Primary Care Service Delivery, Health Services Research, (2012), doi: 10.1111/j.1475-6773.2012.01449.x.

[29] See the Appendix for details on the construction of the SDI.

[30] The indicators from the ACS are relatively standard; thus to obtain precise estimates for small areas, the Census Bureau releases data pooled across five years. Although most of these measures are measured at the county level, we develop imputed values based on regression models similar to those developed by the Centers for Disease Control and Prevention (CDC) researchers for from BRFSS data. *See e.g.*, *http://www.cdc.gov/features/dsObesityDiabetes/*.

aggregated to the ZIP Code Tabulation Areas (ZCTAs)[31] or primary care service areas (PCSAs).[32] The Health Care Utilization Project (HCUP) data helps identify zip codes with greater than usual acute care sensitive hospitalizations and emergency visits. These data are closely associated with poor access to primary care and further identify areas of need.

Small-area estimates of the risk of uninsurance/underinsurance in relation to workforce are also presented. Such an analysis allows identificantion of areas at risk of poor access to primary care services when the full provisions of the ACA go into effect 2014. Based on Massachusetts's experience, individuals who do not have health insurance prior to taking up health insurance under the ACA have 'pent-up' demand for health care. When these individuals newly receive health insurance, this 'pent-up' demand could lead to increased use of health care services that will prove costly if not anticipated in current workforce planning.

Table 1. Health and Health Utilization Measures Underlying the Social Deprivation Index (SDI)

	Source	Geographic Level
A. Social Deprivation Measures		
Unemployment	ACS, 2005-2009	Census Tract
Poverty	ACS, 2005-2009	Census Tract
< 12 Years Schooling	ACS, 2005-2009	Census Tract
Single Parent Families	ACS, 2005-2009	Census Tract
Crowding	ACS, 2005-2009	Census Tract
No Car	ACS, 2005-2009	Census Tract
Renter Occupied	ACS, 2005-2009	Census Tract
Uninsured/Insurance Type	ACS, 2009	County
B. Health Measures		
Infant Mortality	CDC data from the ARF, 2009	County
Low Birth Weight	CDC data from the ARF, 2009	County
Mortality (age, sex adjusted)	CDC, Vital Statistics, 2009	County
Diabetes Prevalence	BRFSS, 2008-2010	County
C. Health Utilization Measures		
Medicare Spending	Dartmouth Atlas Data, 2008	ZCTA/PCSA
Avoidable Hospitalizations	Dartmouth Atlas Data, 2008	ZCTA/PCSA
Hospitalizations	HCUP, 2009	Zip Code

Notes: ACS: American Community Survey (Census Bureau); CDC: Center for Disease Control, ARF: Area Resource File, ZCTA: Zip Code Tabulation Areas; PCSA: Primary Care Service Areas; HCUP: Health Care Utilization Project.

[31] See e.g., *http://www.census.gov/geo/reference/zctas.html*.

[32] See e.g., *http://pcsa.dartmouth.edu/pcsa.html*.

Table 2. Select Social Deprivation Measures, percentage of the population

	Mortality (per 100K)	Diabetes	High BP	Infant Mortality	LBW
Rhode Island	**763.7**	**7.4**	**28.4**	**6.2**	**7.8**
Connecticut	713.9	6.9	26.1	5.9	7.9
Maine	792.3	8	28.6	5.6	6.7
Massachusetts	723	7.3	26.4	4.9	7.8
New Hampshire	737.3	7.4	26.3	5.2	6.8
Vermont	735.5	6.5	24.8	5.2	6.5
New England	732	7.2	26.6	5.3	7.6
Nation	784.8	8.7	27.6	6.8	8.1

Source: 5-year Infant Mortality (2002-2006) and 3-year Low Birth Weight [LBW] (2004-2006) are from 2009 Area Resource File, and Age Adjusted Mortality Rates (2007) are from CDC Wonder.

Table 2 shows that, with respect to select health outcomes, Rhode Island generally fares relatively well compared to the nation as a whole; however, Rhode Island does not compare well to other states in the New England region. For instance, while the mortality rate in Rhode Island is below the National rate, among New England states only Maine has a higher level. Additionally, among New England states, Rhode Island has the highest proportion of the population with high blood pressure level and the highest infant mortality rate.

Table 3. Select Demographic Measures (percentage of the population)

	Poverty	Unemp	Single Parent	<12 Years School	No Car	Renter Occupied	Crowding	SDI
Rhode Island	**11.9**	**7.3**	**19.4**	**17.1**	**8.7**	**36.3**	**1.6**	**49.5**
Connecticut	9.2	7	17.7	12.2	8.4	30.2	1.8	38.7
Maine	12.7	6.3	16.8	10.6	6.3	26.5	1.1	40.2
Massachusetts	10.2	6.9	17.5	11.9	11.2	34	1.5	41.7
New Hampshire	8.1	5.4	14.8	9.5	4.8	26.4	1.2	30.6
Vermont	11.5	5.8	17.4	9.8	6	28.4	1.2	38.8
New England	10.2	6.7	17.4	11.9	9.1	31.6	1.5	40.3
Nation	13.8	7.6	18.6	16	8.6	32.9	3.5	50.9

Source: All measures, except for the Social Deprivation Index (SDI), are from 2005-2009 American Community Survey (ACS).

The relatively poorer health in Rhode Island compared to other New England states is partly attributable to higher levels of deprivation in Rhode Island (Table 3). The poverty rate in Rhode Island averaged 11.9 percent from 2006 to 2010, below the national average of 13.8 percent. However, Rhode Island's rate is well above the New England average of 10.2 percent. Among the components of the SDI, Rhode Island

stands out as having a particularly high level of individuals with less than 12 years of schooling (17.1 percent compared to the national average of 16.0 percent).

The last column of Table 3 displays SDI scores converted to percentiles; a score of zero represents the lowest and 100 represents the highest level of deprivation. With a score of 49.5, Rhode Island is almost exactly in the middle, well above the average of the other New England states (40.3). Figure 2 below displays ZCTA level estimates of separate components of the SDI as well as the overall SDI score.

Figure 2. Demographic Measures in Rhode Island

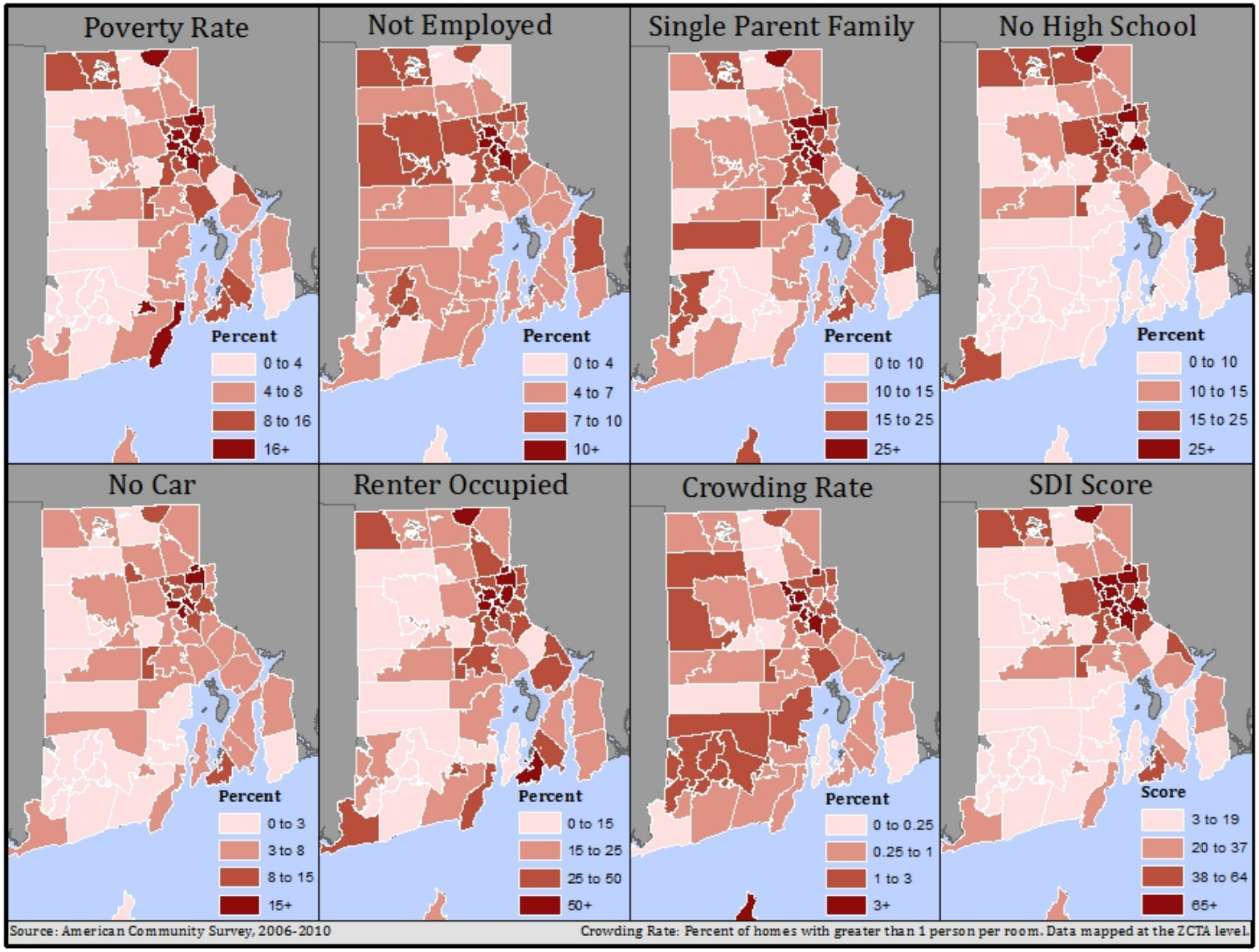


Figure 3. Four Health Outcomes for Rhode Island

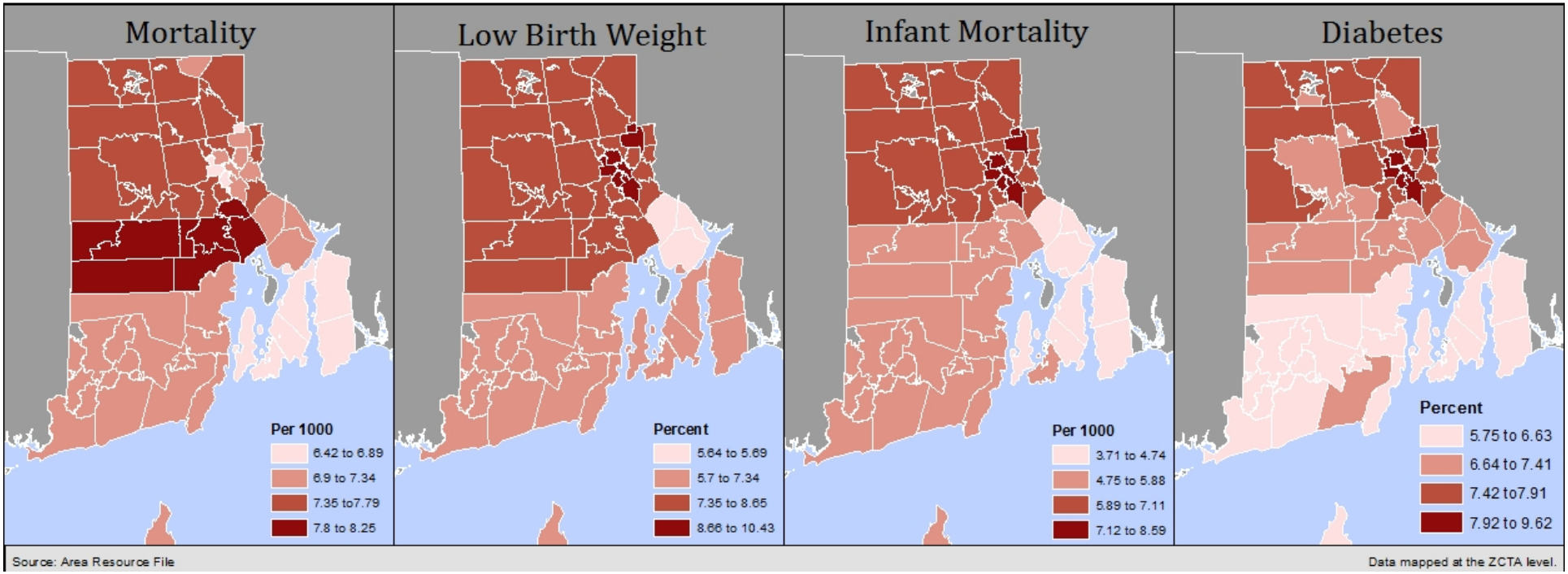


Table 4. Correlation between SDI Score/Poverty and Race/Ethnicity, ZCTA Level

	Rhode Island (n=70)		All States (n=31,170)	
	SDI Score	Poverty	SDI Score	Poverty
Hispanic	0.9090*	0.8401*	0.3797*	0.1640*
Foreign Born	0.8694*	0.7860*	0.2364*	0.0221*
African American	0.8524*	0.8064*	0.4614*	0.4309*

Source: American Community Survey, 2005-2009, Social Deprivation Index (SDI) is a Graham Center created composite measure of the social deprivation of a geographical area.
* Significant at the 10 percent level.

Table 4 shows that for Rhode Island, but not for the nation as a whole, there is a strong association between the SDI and three measures of race/ethnicity: percent Hispanic, percent foreign born and percent African American.[33] Stated differently, areas with higher concentrations of Hispanic, Foreign-born and African American populations in Rhode Island are more likely to overlap areas of social deprivation and poverty than is true of the nation as a whole.

Table 5 shows, with the exception of mortality, large and significant positive associations between the SDI Score and four health outcomes. Given the strong correlation between poverty and SDI (r=.907), there is a similar pattern with poverty. To examine the relationship between SDI (as well as poverty) on utilization measures two data sets were used. The first is ZCTA-level data from the Dartmouth Atlas and the second is Rhode Island hospital discharge data. Across small areas, there is the expected strong association between hospitalization rates, in both data sets and measures of deprivation. Likewise, in the Dartmouth data, there is a sizeable association between SDI and Emergency Department (ED) visit rates (r=.624) as well as with avoidable hospitalization (r=.512). In the Rhode Island hospital data, there is moderate association with readmission rates. There is not an association between SDI and the mean length of stay in the hospital. An important finding is that there is uniformly a stronger association between the SDI measure than with poverty alone.

Table 5. Correlation between SDI Score/Poverty and Health Outcomes in Rhode Island,

Health Outcome	SDI Score	Poverty
Mortality	-0.4344*	-0.5334*
Diabetes	0.8140*	0.7867*
Infant Mortality	0.7212*	0.6758*
Low Birth Weight	0.6719*	0.5965*

Source: American Community Survey, 2005-2009, Social Deprivation Index (SDI) is a Graham Center created composite measure of the social deprivation of a geographical area.
* Significant at the 10 percent level.

[33] By design, the SDI does not include geographical measures of race and ethnicity, mainly because there is a weak relationship between these measures and health outcomes.

Table 6. Correlation between SDI Score/Poverty and Health Utilization Outcomes in Rhode Island, ZCTA level

	SDI Score	Poverty
Dartmouth Measures		
Hospitalization	0.6274*	0.4920*
Emergency Department Visit	0.6242*	0.5763*
Avoidable Hospitalization	0.5125*	0.3438*
RI Hospital Discharge Data (2010)		
Hospitalization	0.5688*	0.3975*
Readmission (30 Days)	0.4050*	0.2796
Mean Length of Stay	0.2669	0.1825

Figure 4 shows state level variation in four indicators of Medicare health care utilization available from the Dartmouth Atlas: emergency department rates, hospitalization, avoidable hospitalizations and total Part A Medicare spending per beneficiary. These measures were obtained by aggregating 2006 PCSA level data to the state level. Overall the findings are mixed. On one hand there is a strong association between the supply of primary care and the two hospitalization measures. States with the fewest PC providers per capita have the highest hospitalization rates. On the other hand, there is a weaker association with emergency department visit rates and total costs. Compared to the predicted values at different values of primary care supply, as defined by the line of best fit, Rhode Island appears to have slightly higher rates of emergency department visits and avoidable hospitalizations.

Figure 5 presents findings using rates of family physicians per 100,000 residents. The findings are similar to those reported by Baicker and Chandra, who restrict their measure of primary care supply to family physicians and general practitioners. The results show that states with more family physicians per capita have lower hospitalization and emergency department visits as well as lower costs. Rhode Island has relatively fewer family physicians, similar to such New England states as Massachusetts and Connecticut, and higher hospitalization rates and Medicare costs than states such as Vermont or Maine who have relatively more family physicians.

Figure 4. Rate of Primary Care Physicians by Health Care Utilization and Costs

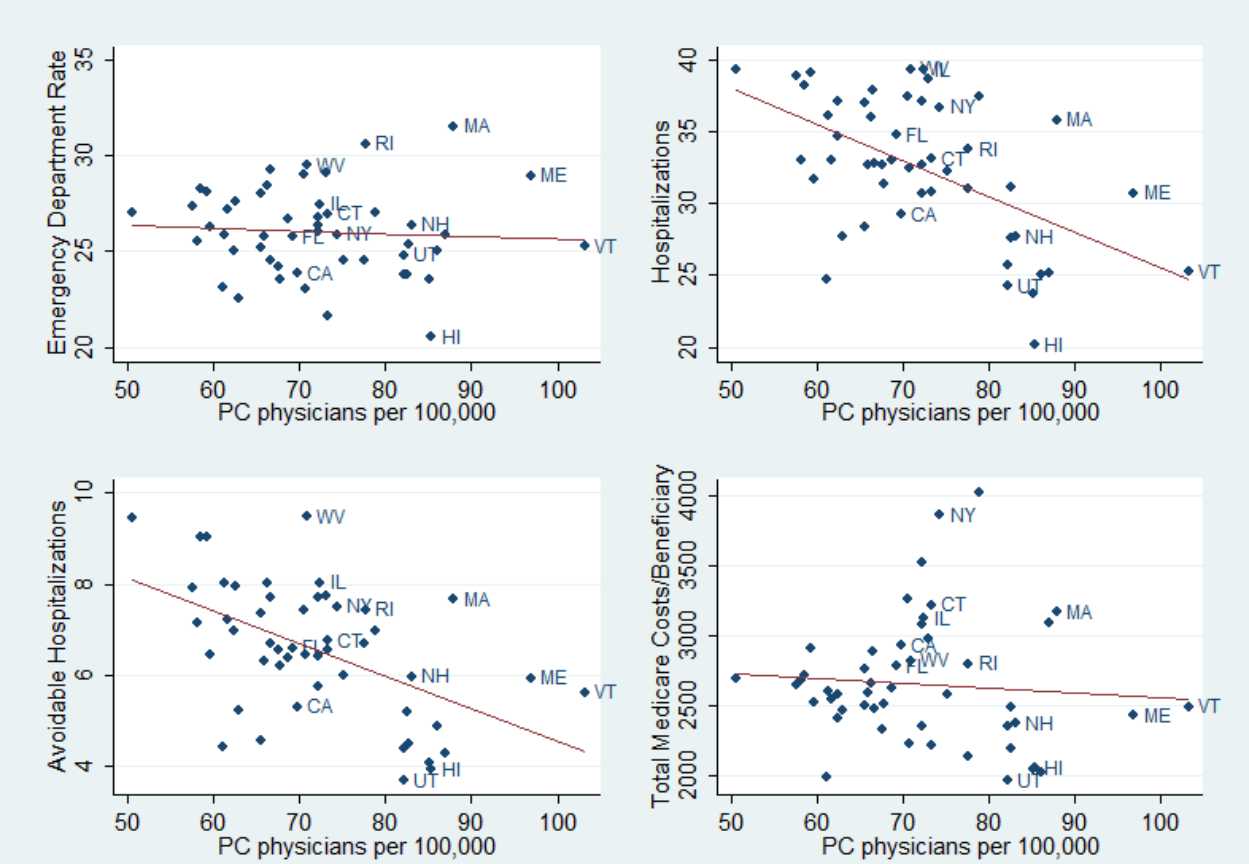


Figure 5. Rate of Family Physicians by Health Care Utilization and Costs

2.2 Subtask 2: Availability of Primary Care Providers Across Rhode Island

Subtask 2 provides a detailed examination of the primary care provider distribution across Rhode Island. The distributions of NPs and PAs are also assessed due to their increasing importance as members of primary care teams. Based on address information of physicians, counts and rates at the smallest levels of geography levels, including census tract as well as zip codes, are created. The Graham Center has several sources of workforce data that often complement each other. To match data from the Dartmouth Atlas and HCUP, in addition to census tract level estimates, both ZCTA and PCSA level counts are constructed.

Section 2.2.1 provides background and literature on primary care workforce. The available data on primary care workforce are described in Section 2.2.2. Section 2.2.3 summarizes the techniques for providing estimates of Rhode Island's available workforce, including NPS and PAs. Estimates of the primary care workforce in Rhode Island are presented in Section 2.2.4. A demographic profile of the Rhode Island primary care physicians is outlined in Section 2.2.5. Finally, Section 2.2.6 presents

estimates and maps small area counts of the supply of primary care providers. Throughout, where available, Rhode Island will be compared to other states and the Nation as a whole.

2.2.1 Background and Literature

Healthcare researchers at Dartmouth Atlas have investigated the relationship between the supply of a health care resource, such as the number of hospital beds, and the utilization of the resource. Dartmouth has found that there are several medical resources which they would classify as resulting in 'supply-sensitive care.' Dartmouth Atlas resources have also concluded that the supply of resources needed for medical services influences the utilization rate of the resource. Dartmouth research has shown that these supply-sensitive care differences are largely due to the fact that the United States' current health care payment system structure promotes fully deploying the existing medical care capacity. Although Dartmouth researchers found that patients in areas with fewer medical resources received less medical care, they also found no evidence that these patients experienced worse health outcomes. Dartmouth has shown that over half of all Medicare spending can be attributed to supply-sensitive care.[34] Additionally, studies have shown that access to primary care services is linked to improved population health outcomes. Knowing the distribution of primary care providers in a state is a necessary component for determining which areas of the state exhibit the greatest need for additional providers.

2.2.2 Available Workforce Data

Using the data sets described below the Graham Center analyzed the physician workforce for Rhode Island.

- The American Medical Association's (AMA) Physician Masterfile is a nearly complete listing of all physicians in the United States. The AMA Physician Masterfile includes detailed information about each physician, including their age, gender, self-reported specialty, current activity status, address, type of medical degree (MD or Doctor of Osteopathic Medicine, DO) and current address.[35]
- The Centers for Medicare & Medicaid Services' (CMS) National Plan and Provider Enumeration System (NPPES) Downloadable File contains the National Provider Identifier (NPI) for each health care provider. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) mandated that the required identifier for Medicare services, the unique provider identification number (UPIN), be replaced by the NPI. Other payers, including commercial healthcare insurers, also use the NPI. In October 2006 CMS began issuing NPIs. By May 23, 2007, all HIPAA covered entities, such as providers completing electronic transactions, healthcare clearinghouses, and

[34] *See e.g.*, The Dartmouth Atlas of Health Care, Supply-Sensitive Care webpage at http://www.dartmouthatlas.org/keyissues/issue.aspx?con=2937.

[35] Proprietary data purchased by, and located on-site of, the Graham Center. To analyze the physician workforce in Rhode Island, we use AMA Physician Masterfile data from January 2012.

large health plans are required to use only the NPI to identify covered healthcare providers. One of the advantages of the NPPES data is that the data are not restricted to physicians, permitting an analysis of NPs and PAs. The NPPES data also contain more precise physician address information than the AMA Physician Masterfile data. A drawback of the NPPES data is the lack of an indicator for currently active providers.[36]

- Rhode Island's health provider licensure data includes detailed information on active or inactive Rhode Island licensed starting from 1920. Physician characteristic include age, gender, medical school, self-reported specialty, license status, address, type of medical degree (MD or Doctor of Osteopathic Medicine, DO) and current address.[37]
- The Community Health Center (CHC) Data is available to the Graham Center through an on-going contract with the Health Resources and Services Administration (HRSA). The CHC Data has detailed information about the service areas of all community health centers across the nation. In addition to addresses of each site, the data also includes zip code-level data on the service areas of each CHC for 2009 and earlier years.
- The UDSMapper[38] includes additional information such as National Health Services Corps (NHSC) sites, rural health clinics, and low income population served by grantee.

Using common identifying information, the Graham Center creates a crosswalk between the AMA Physician Masterfile and the NPPES data. Drawing on the strengths of each data set, the AMA Physician Masterfile is used to identify physicians who are engaged in direct patient care. If available, address information from the NPPES data is given priority. The NPPES data is also used to provide estimates of the number of primary care NPs and PAs.

2.2.3 Techniques for Estimating the Available Workforce

Identification of Active Primary Care Physicians

Primary care physicians are identified in the 2012 AMA Physician Masterfile by selecting physicians who indicate they provide direct patient care with a primary, self-designated primary specialty of family medicine, general practice, general internal medicine, general pediatrics, or geriatrics. To address the fact that the AMA Physician Masterfile undercounts the number of retirees,[39] counts of physicians are adjusted based on a comparison of the age distribution of physicians in the AMA Physician Masterfile with the age distribution of physicians in the NPPES database. The AMA Physician Masterfile physician counts for general internists are also adjusted downward by 20 percent to account for physicians who function as hospitalists or practice in other non-primary care settings[40] and for family physicians,

[36] Data freely available from http://www.cms.gov/Regulations-and-Guidance/HIPAA-Administrative-Simplification/NationalProvIdentStand/DataDissemination.html, updated quarterly (downloaded June 2012).

[37] Proprietary data provided to the Graham Center by the State of Rhode Island.

[38] *See e.g.*, *www.UDSMapper.org*.

[39] Staiger DO, Auerbach DI, Buerhaus PI. Comparison of physician workforce estimates and supply projections. JAMA. 2009; 302(15): 1674-80, *available at http://www.nejm.org/doi/pdf/10.1056/NEJMsa0802381*.

[40] Kuo Y, Sharma G, Freeman JL, Goodwin JS. Growth in the care of older patients by hospitalists in the United States. N Engl J Med. 2009; 360(11): 1102-12.

pediatricians. Additionally, geriatrician counts are adjusted downward by five percent to account for physicians who work primarily in urgent or emergency care settings.[41]

The 2012 estimates may undercount physicians as those physicians with unspecified specialties and physicians with unknown patient care status were not included. On the other hand, some researchers have voiced concern that the AMA Physician Masterfile does not adequately capture physicians that have left direct patient care. Without more reliable data, these issues are assumed to be offsetting.

Identification of Primary Care Nurse Practitioners and Physician Assistants Physicians

The NPPES data identifies NPs and PAs; however, the data do not include a clear identifier of NPs and PAs who provide primary care. Address information was used to create an identifier for nurse practitioner and physician assistant who are located with other primary care provider. Those providers who were identified as *colocated with physicians* are inferred to be providing primary care services. Specifically, if a NP or PA shares an address with only primary care providers, they are assumed to be engaged in primary care. If a NP or PA share an address only with specialists they are inferred not to be engaged in primary care. A probability of providing primary care is assigned based on the relative mix of primary care and non-primary care physicians with which each health care provider co-locates. Finally, in cases where the NP or PA is not collocated with physicians, they are assumed to be engaged in primary care. To minimize the issue of over counting inactive NPs and PAs, early 2010 data is used instead of 2012 data.

Geocoding Addresses

The addresses of all health care providers are geocoded using ArcGIS 10.0 software. Nationwide, approximately 98 percent of the addresses are geocoded. The addresses of physicians make it possible to create counts and rates at the smallest levels of geography, including census tract as well as ZIP code level and township/city level.

2.2.4 Estimates of Rhode Island's Primary Care Workforce

Table 7 below presents data from the AMA Physician Masterfile and the NPPES data. Rhode Island's health care workforce consists of 1,008 physicians with a primary care specialty who are practicing in direct patient care and 1,844 specialists. As noted above, to account for the likelihood that the AMA Physician Masterfile over counts retirees and that those physicians with a primary care specialty may be working in a non-primary care setting, such as a hospital, an emergency department or an urgent care center, these figures are adjusted. The adjusted number of primary care physicians in Rhode Island is

[41] This figure is based on an analysis of American Board of Family Medicine (ABFM) data showing that roughly 5-6 percent of family physicians report spending more than 50 percent of their time in urgent or emergency care (Petterson S, Johnson N, Bazemore A. Scope of Practice of Family Physicians, manuscript, 2011)

841 and the adjusted figure for specialists is 1,726. Compared to the Nation as a whole, Rhode Island has more primary care physicians who are general internist/internal medicine (IM), nearly half (46.5 percent) versus a little more than a third (34.2 percent). The percentage of primary care physicians who are pediatricians is similar in Rhode Island (25.7 percent) and the Nation (21.5 percent). Rhode Island has a smaller percentage of primary care physicians who are family physicians (24.0 percent versus 38.9 percent) and general practitioners (2.1 percent versus 3.9 percent). For both Rhode Island and the Nation only a small number of primary care physicians are geriatricians (1.8 percent and 1.5 percent respectively).

Table 7. Estimates of Direct Patient Care Physician Workforce in Rhode Island and the Nation

	Rhode Island			Nation		
	Adj. Total Providers (unadj. count)	% of All PC Providers	% of All Providers	Adj. Total Providers (unadj. count)	% of All PC Providers	% of All Providers
PC	**841 (1,008)**	**100.0%**	**32.8%**	**209,220 (246638)**	**100.0%**	**33.3%**
FM	202 (220)	24.0%	7.9%	81,484 (89,734)	38.9%	13.0%
GER	15 (17)	1.8%	6.0%	3,196 (3,474)	1.5%	0.5%
GP	18 (21)	2.1%	7.0%	8,093 (9,747)	3.9%	1.3%
IM	391 (511)	46.5%	15.2%	71,546 (94,001)	34.2%	11.4%
PD	216 (239)	25.7%	8.4%	44,901 (49,682)	21.5%	7.1%
Specialists	**1,726 (1,844)**		**67.2%**	**419,405 (445,755)**		**66.7%**
TOTAL	**2,567 (2,852)**		**100.0%**	**628,624 (692,393)**		**100.0%**

Table 8 presents data from the NPPES on NPs and PAs. In Rhode Island, as of 2010 there were 422 NPs and 227 PAs listed in the NPPES data. Using information about their colocation with primary care and specialist physicians, we estimate that 227 of the NPs work in primary care and 100 of the PAs work in primary care. The estimates are comparable to the Nation as a whole and to New England.

Table 9 below presents the physician-to-population ratio for Rhode Island, other New England states, the New England Region, and the Nation. With 80.2 primary care physicians per 100,000 residents, Rhode Island has a higher physician to population ration than the Nation (at 66 primary care physicians per 100,000 residents), but a slightly lower rate than the New England region (at 84.1 per 100,000 residents).

Table 8. Counts of Physician Assistants and Nurse Practitioners in Rhode Island, Region and Nation

	Nurse Practitioners			Physician Assistants		
	Total	Primary Care	Percentage Primary Care	Total	Primary Care	Percentage Primary Care
Rhode Island	422	200	47.5	227	100	43.9
New England	8,517	4,468	52.5	4,442	1,721	38.7
Nation	106,073	55,625	52.4	70,383	30,402	43.2

Data: National Plan and Provider Enumeration System (2010).

Notes: New England Region includes RI, MA, CT, NH, VT and ME. Assignment of PAs and NPs as primary care are based on their colocation with physicians of different specialties (see text) .

Table 9. Physician-to-Population Ratio (per 100,000) for Rhode Island

	Primary Care		Specialists	
	Rate	State Rank	Rate	State Rank
Rhode Island	**80.2**	**8**	**165.8**	**6**
Connecticut	71.3	20	170.5	4
Maine	96.3	2	154.3	8
Massachusetts	87.9	4	198.0	2
New Hampshire	86.5	5	151.4	12
Vermont	92.8	3	146.3	13
New England	84.1		178.5	
Nation	66.0		133.0	

Source: AMA Physician Masterfile and National Plan and Provider Enumeration System Data; 2011 Population Estimates from Census Bureau.

Table 10. Select Physician Characteristics for Rhode Island

	Median Size	State Rank	Practice Size Distribution (percent)					
			1	2-3	4-5	6-10	11-25	26+
Rhode Island	**11**	**30**	**13.9**	**12.8**	**8.2**	**13.1**	**21**	**31.1**
Connecticut	10	26	14.4	13.2	9	15	18	30.3
Maine	9	15	15	14.6	8.1	15.6	22.9	23.8
Massachusetts	19	48	12.6	9.6	6.4	10.2	17.5	43.6
New Hampshire	14	40	12.4	9.5	8.7	11.9	21.6	35.9
Vermont	8	5	16.5	17.4	9.6	11.2	14.3	31
New England	14		13.5	11.5	7.7	12.3	18.6	36.4
Nation	12		15.9	13	8.2	12.3	17.1	33.6

Source: AMA Physician Masterfile and National Plan and Provider Enumberation System Data; Population Estimates from U.S. Census Bureau

To examine practice sizes, the geocoded address of physicians and colocation were used to proxy for a practice (see Table 10). Median primary care practice size in Rhode Island is slightly smaller than other states (11 physicians compared to 12 nationwide and 14 in New England states). About 13.9 percent of primary care physicians are in solo practices and another 12.8 percent are in practices with only two or three physicians. At the other end of the spectrum, 31.1 percent of primary care physicians are in practices with more than 25 physicians.

2.2.5 Demographic Profile of Rhode Island Primary Care Physicians

Table 11 below outlines selected demographic properties of Rhode Island physicians. The percent of Rhode Island primary care physicians over the age of 54 (42.8 percent) is nearly equal to the national average (42.7 percent) and slightly lower than the percent for New England as a whole (43.6 percent). For this measure, Maine and Vermont stand out as having an older physician workforce. Approximately 6.1 percent of Rhode Island's primary care workforce is osteopaths (DOs) which is lower than the national average, but higher than the rate for New England states. Maine has the most osteopaths in the nation as a whole. Finally, Rhode Island (along with other New England states) has more women in primary care.

Table 11. Select Demographic Physician Characteristics for Rhode Island

	Age> 54		Oesteopaths		Female	
	Percent	State Rank	Percent	State Rank	Percent	State Rank
Rhode Island	**42.8**	**29**	**6.1**	**25**	**32.5**	**40**
Connecticut	44.6	40	3.5	6	31.8	36
Maine	46	44	15.5	48	31.1	33
Massachusetts	42.8	27	2.5	3	37	50
New Hampshire	41.9	24	7.4	34	30.8	32
Vermont	46.9	47	3.4	5	35.9	49
New England	43.6		4.7		34.2	
Nation	42.7		7.2		29.5	

Source: 2012 AMA Physician Masterfile and National Plan and Provider Enumeration System Data

2.2.6 Estimate and Map Small Area Counts of the Supply of Primary Care Providers

Within Rhode Island there is considerable variability in the supply of primary care providers when we examine the data at the town/city level. There is also considerable variation in the location of different specialties (see Table 12 and Figure 6). Among major cities (population greater than 16,000), Pawtucket, Warwick and Newport have the highest rates of family physicians. In some of these cities, such as Woonsocket, Coventry and Cumberland there are few family physicians. Providence, East Providence, South Kingston, Westerly and Lincoln have high rates of general internists; Coventry, West Warwick and Bristol have low rates of general internists. The rates for pediatricians are also quite varied. Again the rates are highest in Providence, East Providence and Lincoln, but very low in Coventry, Bristol and Central Falls.

Table 12 and Figure 6 display the rate of primary care physicians to the population, i.e. the number of primary care physicians to 100,000 Rhode Island residents. These rates can be a bit misleading due to the small size of some of the towns leading to the potential for a few physicians to inflate the rates. As expected, among the major cities (those with a population great than 16,000 residents) the rate of primary care physicians is highest in the city of Providence and East Providence. In contrast, there are a number of smaller towns with few, if any, physicians and are some communities with relatively low rates.

Table 12. Health Care Provider-to-Population Rates, Town/City Level

	Specialists	Primary Care	PC NP/PA	Population
BARRINGTON	80.9	97.2	21.5	16,310
BRISTOL	39.2	45.2	0	22,905
BURRILLVILLE	11.8	29.5	31.3	15,955
CENTRAL FALLS	9.3	42.4	0	19,323
CHARLESTOWN	44.9	34.3	12.8	7,791
COVENTRY	13.3	15.9	16.1	34,965
CRANSTON	85.2	63.4	24.7	80,438
CUMBERLAND	56.8	64	5.7	33,506
EAST GREENWICH	310.8	240.8	0	13,092
EAST PROVIDENCE	254.1	113.8	22.1	46,748
EXETER	0	0	0	6,426
FOSTER	0	18.8	0	4,606
GLOCESTER	0	8.2	10.3	9,751
HOPKINTON	21.2	52.1	36.6	8,188
JAMESTOWN	19.2	34.3	19.2	5,211
JOHNSTON	94.7	61.5	16.1	28,784
LINCOLN	69.2	155.3	47.2	21,018
LITTLE COMPTON	0	18.3	0	3,492
MIDDLETOWN	63.8	50.9	33	16,148
NARRAGANSETT	40.1	52.6	20.7	15,680
NEW SHOREHAM	0	175	0	1,022
NEWPORT	212.9	94.2	33.8	24,645
NORTH KINGSTOWN	41.8	38.8	27.9	26,521
NORTH PROVIDENCE	163.7	77.3	5.3	32,257
NORTH SMITHFIELD	76.1	87.6	14.9	11,967
PAWTUCKET	179.7	107.3	26.7	71,193
PORTSMOUTH	48.6	37.8	11.7	17,053
PROVIDENCE	449.6	132.1	59.6	177,946
RICHMOND	0	12.3	13	7,708
SCITUATE	0	8.9	0	10,329
SMITHFIELD	40	64.4	44.5	21,425
SOUTH KINGSTOWN	144.8	115.7	38.8	30,639
TIVERTON	13.4	27.2	31.8	15,739
WARREN	44.1	32.7	29.8	10,617
WARWICK	184.8	86.8	25.4	82,080
WEST GREENWICH	0	0	0	6,133
WEST WARWICK	26.3	23.8	11.4	29,260
WESTERLY	251	75.8	18.7	22,672
WOONSOCKET	136.9	45.8	37.1	41,186

Source: 2012 AMA Masterfile, 2010/2012 NPPES Data.

Table 13. Distribution of Primary Care Physicians, by Specialty

Town/City	General Internists	Pediatricians	Family Physicians	Population
BARRINGTON	19.2	56	16.1	16,310
BRISTOL	33.6	7.5	4.1	22,905
BURRILLVILLE	29.5	0	0	15,955
CENTRAL FALLS	18.3	9.4	14.7	19,323
CHARLESTOWN	10.3	0	24	7,791
COVENTRY	8.3	0	5.4	34,965
CRANSTON	34.6	9.2	15.3	80,438
CUMBERLAND	22.5	30.5	8.4	33,506
EAST GREENWICH	97	69.4	71.1	13,092
EAST PROVIDENCE	48.8	35.7	25.5	46,748
EXETER	0	0	0	6,426
FOSTER	0	18.8	0	4,606
GLOCESTER	0	0	0	9,751
HOPKINTON	17.3	0	34.8	8,188
JAMESTOWN	0	0	34.3	5,211
JOHNSTON	20.7	17.6	19.7	28,784
LINCOLN	50.9	91	13.4	21,018
LITTLE COMPTON	18.3	0	0	3,492
MIDDLETOWN	27.5	0	23.4	16,148
NARRAGANSETT	13.7	0	36	15,680
NEW SHOREHAM	0	0	175	1,022
NEWPORT	38.1	15.2	40.9	24,645
NORTH KINGSTOWN	16.4	6.4	12.5	26,521
NORTH PROVIDENCE	46.3	17.7	8.6	32,257
NORTH SMITHFIELD	26.7	0	44.8	11,967
PAWTUCKET	36.6	8.7	50	71,193
PORTSMOUTH	4.7	11.1	21.9	17,053
PROVIDENCE	78.6	41.1	10.2	177,946
RICHMOND	0	0	12.3	7,708
SCITUATE	0	0	8.9	10,329
SMITHFIELD	24.4	8.9	17.4	21,425
SOUTH KINGSTOWN	45	38.3	29.2	30,639
TIVERTON	4.1	0	23.1	15,739
WARREN	15.1	0	17.6	10,617
WARWICK	39.5	20.3	24.9	82,080
WEST GREENWICH	0	0	0	6,133
WEST WARWICK	4.9	3.2	15.7	29,260
WESTERLY	40.1	19.5	16.3	22,672
WOONSOCKET	36.8	6.9	2.1	41,186

Source: 2012 AMA Masterfile, 2010/2012 NPPES Data.

Figure 6. Primary Care Physician-to-Population Rates

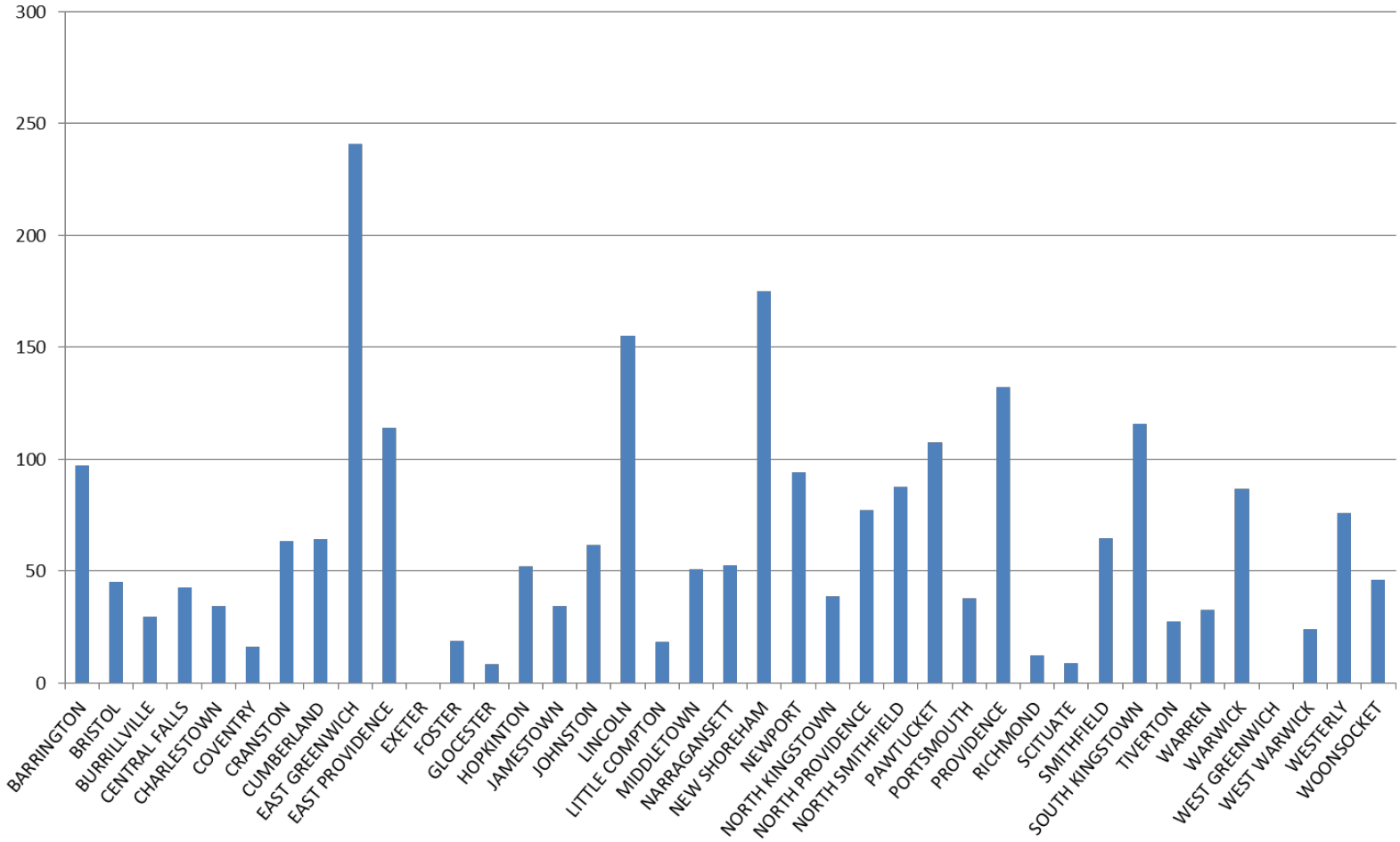


Table 14. PCSA-Level Estimates of Physicians in Rhode Island

	Estimate of Physicians					Population	Rates (per 100,000)	
	IM	FP	PD	PC	SPEC		PC	SPEC
BLOCK ISLAND	0	1	0	1	0	960	96	0
BRISTOL	10	3	2	15	22	33,567	43.4	64.5
GREENVILLE	5	6	2	17	13	38,415	43.3	34.3
HOPE VALLEY	1	5	0	6	2	9,187	67.1	18.9
NEWPORT	16	24	9	50	75	62,198	80.2	120.7
PASCOAG	5	0	0	5	2	15,745	34.8	12.5
PAWTUCKET	55	44	25	127	172	162,706	78.3	105.7
WAKEFIELD	22	15	15	54	87	81,915	65.8	106.5
WARWICK	42	37	29	111	227	178,258	62.5	127.4
WESTERLY	14	10	7	33	63	49,153	66.5	127.4
PROVIDENCE	181	40	97	330	922	313,290	105.2	294.4
EAST PROVIDENCE	31	14	27	75	86	78,830	94.8	108.9

The primary care physician-to-population rates across Rhode Island PCSAs, ranging from a low of 34.8 in the Pascoag PCSA to a high of 105.2 in Providence (Table 14). The rates for specialists are more dispersed, ranging from zero in Block Island and 12.5 in Pascoag to 294.4 in Providence. Because these service areas are generally larger and more uniform in size than towns/cities, there is less overall variability in these measures. There are also interesting differences in the specialty of primary care physicians across PCSAs. For instance, there are relative more family physicians in Newport, Pawtucket and Warwick than statewide. There are relatively more pediatricians in Providence, East Providence and Warwick.

2.3 Subtask 3: Gaps in Rhode Island's Primary Care Service System

The third subtask uses the results developed for the first two subtasks to identify areas with relatively fewer primary care providers after taking into account varying levels of need. A central question for this task, not easily resolved, is what constitutes "optimal" levels of service. In previous work at a national level, the Graham Center developed a variety of approaches applicable to Rhode Island. The simplest approach is to develop national- or state-level benchmark using average (means or medians) rates of primary care providers for different levels of need. Areas with lower than average rates would be classified as "underserved." A more sophisticated approach, at the heart of the work associated with the Dartmouth Atlas, attempts to specify the relationship between provider supply and health, health care utilization, and outcomes to identify points at which additional primary care providers do not substantially improve area-level outcomes. An area is defined as having a shortage if the primary care physician to population ratio in the area is less than 80 per 100,000, Rhode Island's overall rate.

The results of this analysis at the town/city level show that most areas have primary care physician-to-population rates below 80/100,000; however, eleven towns or cities have rates above that level. To eliminate these differences would require shifting 217 physicians. PCSAs with an "excess" have less

variability in primary care to population rates; thus eliminating the difference in rates would require shifting physicians away from these areas.

For clarity, it is noted that this is a heuristic exercise. The next step in this analysis is to better understand differences in rates across communities. In the PCSA analysis, the higher primary care rates in Providence and East Providence reflect to a certain extent the greater likelihood that primary care physicians in this area are working as hospitalists. Likewise, as noted above, these areas also have a generally less healthy population and may require more physicians. In the towns or cities, in particular, the proximity of more providers in nearby areas may suggest that for policy purposes, it may make sense to combine certain areas into more rational service areas.

Table 15. Maldistribution of Primary Care Physicians, Town/City-level

Town/City	PC Rate	Population	Current PC	Needed PC	Excess	Shortage
BARRINGTON	97.2	16,310	16	13	-3	0
BRISTOL	45.2	22,905	10	18	0	8
BURRILLVILLE	29.5	15,955	5	13	0	8
CENTRAL FALLS	42.4	19,323	8	15	0	7
CHARLESTOWN	34.3	7,791	3	6	0	3
COVENTRY	15.9	34,965	6	28	0	22
CRANSTON	63.4	80,438	51	64	0	13
CUMBERLAND	64	33,506	21	27	0	6
EAST GREENWICH	240.8	13,092	32	10	-22	0
EAST PROVIDENCE	113.8	46,748	53	37	-16	0
EXETER	0	6,426	0	5	0	5
FOSTER	18.8	4,606	1	4	0	3
GLOCESTER	8.2	9,751	1	8	0	7
HOPKINTON	52.1	8,188	4	7	0	3
JAMESTOWN	34.3	5,211	2	4	0	2
JOHNSTON	61.5	28,784	18	23	0	5
LINCOLN	155.3	21,018	33	17	-16	0
LITTLE COMPTON	18.3	3,492	1	3	0	2
MIDDLETOWN	50.9	16,148	8	13	0	5
NARRAGANSETT	52.6	15,680	8	13	0	5
NEW SHOREHAM	175	1,022	2	1	-1	0
NEWPORT	94.2	24,645	23	20	-3	0
NORTH KINGSTOWN	38.8	26,521	10	21	0	11
NORTH PROVIDENCE	77.3	32,257	25	26	0	1
NORTH SMITHFIELD	87.6	11,967	10	10	0	0
PAWTUCKET	107.3	71,193	76	57	-19	0
PORTSMOUTH	37.8	17,053	6	14	0	8
PROVIDENCE	132.1	177,946	235	142	-93	0
RICHMOND	12.3	7,708	1	6	0	5
SCITUATE	8.9	10,329	1	8	0	7
SMITHFIELD	64.4	21,425	14	17	0	3
SOUTH KINGSTOWN	115.7	30,639	35	25	-10	0
TIVERTON	27.2	15,739	4	13	0	9
WARREN	32.7	10,617	3	8	0	5
WARWICK	86.8	82,080	71	66	-5	0
WEST GREENWICH	0	6,133	0	5	0	5
WEST WARWICK	23.8	29,260	7	23	0	16
WESTERLY	75.8	22,672	17	18	0	1
WOONSOCKET	45.8	41,186	19	33	0	14
Total		**1,050,729**	**841**	**841**	**-188**	**188**

Table 16. Maldistribution of Primary Care Physicians, PCSA-level

	Population	PC Rate	Current PC	Need PC	Shortage	Excess
BLOCKISLAND	960	96	1	1	0	0
BRISTOL	33,567	43.4	15	27	12	0
GREENVILLE	38,415	43.3	17	31	14	0
HOPEVALLEY	9,187	67.1	6	7	1	0
NEWPORT	62,198	80.2	50	50	0	0
PASCOAG	15,745	34.8	5	13	7	0
PAWTUCKET	162,706	78.3	127	131	4	0
WAKEFIELD	81,915	65.8	54	66	12	0
WARWICK	178,258	62.5	111	143	32	0
WESTERLY	49,153	66.5	33	40	7	0
PROVIDENCE	313,290	105.2	330	252	0	-77
EASTPROVIDENCE	78,830	94.8	75	63	0	-11
Total	1,024,224		824	824	89	-88

3. Task 2: Gap Analysis for Workforce Development

The second gap analysis looks at the physician workforce development in Rhode Island. The production of health care providers in Rhode Island is examined and whether current state-level efforts are adequate given Rhode Island's changing needs is determined. By design, this gap analysis is a complement to the analysis related to primary care services.

3.1 Rhode Island's Production of Health Care Professionals

The 2011 American Medical Association (AMA) Masterfile and its GME historical supplement were used to identify physicians completing residency between 2006 and 2008 (117,504 physicians nationwide). A historical cohort was selected to allow physicians time to locate after training and the AMA Masterfile to update. Given the focus on characterizing institutional and training site outcomes, 8,977 physicians completed more than one residency during this period and were represented more than once in our data set. Using the same data, these physicians were characterized 5-7 years after they had completed residency in order to estimate primary care and other indicators. In cases where there was a conflict between the physicians' primary specialty and the specialty associated with their final residency training, the residency information was used. Primary care was defined as family medicine, general internal medicine, general pediatrics, internal medicine-pediatrics, internal medicine geriatrics, family medicine geriatrics.

Practice addresses were used to determine physician location. The National Provider and Plan Enumeration System Downloadable File (NPPES)35 was used to improve the quality of practice addresses in the AMA Masterfile. Using unique combinations of name and address, 97% of the physicians in the 2011 NPPeS were matched with physicians in the Masterfile. The NPPES physician address was given preferential treatment if the NPPES update year was later than the last year of residency for an individual physician. As the cohort (2006-2008 graduates) was a relatively recent cohort, the NPPES correction increased the likelihood of capturing current work addresses.

For Rhode Island, six sponsoring institutions were identified (see Table 17). These vary substantially in terms of the number of residents who graduated from 2006 to 2008, with Rhode Island Hospital-LifeSpan accounting for most of the state's residents (n=556), followed by Roger Williams hospital (n=82) and Memorial Hospital (n=78). There is substantial variation in the production of primary care, with Memorial Hospital having exactly 50% of their graduates practicing as primary care physicians compared to just 20% of Rhode Island Hospital's residents. The gender composition is roughly comparable across the six sponsoring institutions. Restricting the analysis to the residents practicing in direct patient care as of 2012, the in-state retention rate of residents is generally low, with the larger institutions retaining 20-23% of their residents in-state. Butler Hospital is an exception with 54% of its residents staying in-state.

At the same time that Rhode Island loses many of its residents to other states, it also benefits from residents from other states moving to Rhode Island (see Table 18). Massachusetts is by far the largest

exporter to Rhode Island with 70 residents who graduated in 2006-2008. The other top states—California, New York, New Jersey and Florida are generally larger populations.

Table 17. Characteristics of Rhode Island's Residents who Graduated in 2006-2008, by Sponsoring Institution

Sponsoring Institution	Residents	% PC	%FP	% IM	% IMG	% Female	Practice in State *	
Roger Williams Hospital	82.0	25.6	1.2	24.4	0.0	46.3	23.0	(=9/39)
Memorial Hospital of Rhode Island	78.0	84.6	50.0	30.8	2.8	57.7	20.0	(=9/45)
Rhode Island Hospital - Lifespan	556.0	14.7	0.2	8.3	1.4	44.2	20.0	(=59/290)
Butler Hospital	37.0	5.4	2.7	2.7	0.0	59.5	54.0	(=7/13)
Brown University Affiliate Hospitals	4.0	0.0	0.0	0.0	0.0	50.0	0.0	(=0/3)
Women & Infants Hospital	35.0	5.7	2.9	2.9	0.0	82.9	41.0	(=7/17)

Table 18. Top States Sending Residents to Rhode Island

Top States Sending Residents to Rhode Island	
State	**Number of Residents**
Massachuetts	70
California	31
New York	19
Florida	15
New Jersey	15
Source: AMA Masterfile, 2006-2008	

3.2 Projections of Future Needs for Health Care Professionals

Current health care utilization data (available nationally and at a state-level) was used to project future health care needs due to such factors as (a) population growth, (b) aging of the population, and (c) the rise in the number of insured patients. Specifically the 2007-2009 data from the Medical Expenditure Panel Survey (MEPS) is used to calculate primary care utilization rates. The MEPS is administered by the Agency for Healthcare Research and Quality (AHRQ) and collects data from a nationally representative sample of individuals and families regarding health conditions, health status, use of medical services, insurance coverage, and access to care. MEPS queries a sample of the civilian, noninstitutionalized population regardless of their health care use, thereby allowing estimates of mean office visits by age, sex, and insurance status.

To understand how demographic changes and the PPACA will affect future need, utilization rates by age groups and sex categories are calculated for both insured and uninsured respondents. Next the U.S. Census Bureau projections of the age-sex distribution of Rhode Island's population through 2025 are used to calculate future utilization, assuming current utilization patterns. Similarly, the best available estimates of the proportion of the uninsured that will be able to obtain coverage under the PPACA were

summarized. To provide an understanding of how these estimates are sensitive to the underlying assumptions, different scenarios can be modeled.

To begin calculating future primary care physician workforce needs, an estimate of the current primary care utilization rates and the size of the current U.S. primary care physician workforce are needed. These figures were used to estimate the average number of annual visits a physician conducts. Next, using U.S. Census data and current primary care utilization, the number of annual primary care visits Americans will make are projected based on population growth and aging. Finally, using the differences in current primary care utilization rates between those with and without insurance, increases in primary care utilization as a result of the ACA's insurance expansion are estimated. On the basis of the expected number of annual primary care office visits and the estimate of the number of visits a primary care physician conducts in a year, the future primary care physician workforce needs are calculated.

Ideally rates specific to Rhode Island or New England could have been calculated; however, small cell sizes (for age/sex/insurance combinations) yielded imprecise estimates. Instead, data from the North East region was used as the benchmark. The mean number of primary care physician office visits per person was calculated; a primary care physician office visit was defined as a visit to a general practitioner, family physician, pediatrician, geriatrician, or general internist. On the basis of the analysis (described subsequently), we estimate that 46.4 percent of all physician office visits are to primary care physicians. Although this figure is slightly lower than data from the 2007 National Ambulatory Medical Care Survey (NAMCS), which shows that 50 percent of all physician office visits are to primary care physicians, it is comparable.

The total estimated annual number of physician office visits is divided by the estimated number of practicing physicians to determine the current annual visits per primary care physician in the United States. The mean number of office-based visits to primary care physician is also calculated for each age category and sex, using MEPS from 2008 for the insured and uninsured populations. To determine the impact of population expansion and aging, these rates were applied to the U.S. Census Bureau projected populations for 2010- 2025 for population groups by age category and sex to calculate the total office-based visits for the entire projected population.

The total number of projected visits were divided by the current number of annual visits per physician to estimate the number of primary care physicians needed to accommodate the projected number of office visits given population expansion and aging. To estimate increased primary care physician use after the ACA goes into effect, first the number of physicians needed with universal coverage is calculated. To calculate the total office-based visits for a universally insured population, the mean number of office-based visits (using MEPS data for insured patients only) is multiplied by the entire projected U.S. population (for each age and sex category). Next this figure is substituted into the aforementioned equations to calculate the number of physicians needed under universal coverage.

The marginal primary care physician need was estimated by removing the physicians needed as a result of population aging and growth. This marginal need was then multiplied by the proportion of the currently uninsured who are likely to receive coverage under ACA to account for those who will remain

uninsured despite the ACA, calculated as the ratio of the Centers for Medicare and Medicaid Services (CMS) yearly estimate of the increased percentage of insured under the ACA and the percentage of uninsured in the absence of ACA. These projections do not account for the likely geographic maldistribution of additional primary care physicians; they are also conservative in that certain segments of the uninsured (such as older individuals) may be sicker than the insured and could use more services if insured.

Based on the analysis of the MEPS data, there were 1.7 million total office visits to Rhode Island primary care physicians and 896 such physicians. Yearly each primary care physician was estimated to have 1911 visits. According to the U.S. Census projections, Rhode Island's population will increase by about 36,000 from 2010 to 2025. Although all segments are expected to increase, the population aged older than 65 years will grow faster. The population thus will both increase overall and age. Using these projections and the mean office visits for each age and sex category calculated for our base year of 2008, the total number of office visits to primary care physicians for Rhode Island are projected to increase from a base of 1.71 million in 2011 to 1.87 million in 2025. Due to the aging of the population, the average number of visits to primary care physicians increases from 1.61 in 2008 to 1.69 in 2025.

Assuming the average Rhode Island primary care physician sees 1,911 visits yearly, to meet the increased need for primary care office visits, additional physicians will be required. By 2025 Rhode Island would require an estimated 1,025 practicing primary care physicians, an increase of 218 from the current workforce (Table 19). Most of this increased need is attributable to gradual population growth and aging. In contrast, the increase from insurance expansion, requiring approximately 50 additional physicians, will occur more abruptly, with the bulk of the increase expected in 2014 and 2015.

Table 19. Projected Primary Care Physicians Need for Rhode Island by Year

"PC" represents "Primary Care Physician"	2010	2015	2020	2025
Estimated RI Population	1,052,251	1,076,772	1,118,276	1,179,469
Total number of PC visits	1,659,053	1,722,125	1,818,316	1,954,239
Average number of PC visits per resident	1.58	1.60	1.63	1.66
RI Residents per PC Physician	1,174	1,158	1,139	1,117
Current number of PC Physicians	**896**	**896**	**896**	**896**
Increase due to Aging	0	12	28	49
Increase due to Population Growth	0	22	58	110
Increase due to ACA Coverage	50	52	55	59
Required number of PC Physicians	**946**	**982**	**1,037**	**1,115**
Excess/Surplus PC Physicians	**50**	**86**	**141**	**218**

4. Additional Analysis: Priority Question "How Does Changes in the Primary Care Delivery System Affect Health Care Outcomes?"

4.1 Hospitalizations and Primary Care

An early adopter of many provisions of the Patient Protection and Affordable Care Act (ACA), Rhode Island has opportunities in the next several years to seize ACA momentum and transform its local health care system. Executive decisions to engage early in ACA opportunities for Medicaid expansion and development of insurance exchanges will allow Rhode Island to expand Medicaid substantially with less than half the average state's investment. In many ways a 'city-state' Rhode Island's clustered population is mirrored by the affiliations of numerous health care providers. Rhode Island has a high penetration of federally qualified health centers serving its vulnerable population, which bodes well for access post-ACA when paired with the limited uninsured population. That said, Massachusetts, Rhode Island's neighbor and one of few states with lower uninsurance rates prior to implementation of a mandate, still struggled to build coalitions of care, create primary care adequacy, and reduce ER utilization after its own insurance mandate. As neighboring Massachusetts quickly learned and noted after their 2006 implementation of an insurance mandate, universal coverage does not equal universal access.

Rhode Island Population Projections

The U.S. Census Bureau uses the 2000 Census population numbers to project the population of Rhode Island from 2004 to 2030 by sex and age. To obtain insurance status for population projection figures, population estimates by sex, age and insurance status from the 2011 ACS[42] are acquired. Next the percentage of the total population is calculated for each cell, giving a "status quo – no ACA" version of Rhode Island's population for each year 2011 through 2030 by sex, age and insurance status. The "status quo – no ACA" projections take into account ACA insurance status changes which have already taken place through 2011. Table 20 below presents Rhode Island's population projections by age, sex and health insurance status.

Once the "status quo – no ACA" population projections are calculated, the percentage of Rhode Island's non-elderly population that are currently uninsured are estimated to decrease from approximately 14 percent in 2011 to approximately six percent in 2014. Additionally the percentage of Rhode Island's elderly population that are uninsured will decrease from approximately 0.88 percent in 2011 to 0.44

[42] *See e.g.*, U.S. Census Bureau, 2009 American Community Survey, Rhode Island, "Health Insurance Coverage Status by Sex by Age: Universe: Civilian noninstitutionalized population, 2009 American Community Survey 1-Year Estimates," *available at* http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_09_1YR_B27001&prodType=table.

percent in 2014.[43] Table 21 below presents Rhode Island's population projections by age, sex and health insurance status after applying the ACA insurance status adjustments.

[43] Based on Congressional Budget Office, Estimates for the Insurance Coverage Provisions of the Affordable Care Act Updated for the Recent Supreme Court Decision (July 2012), *available at* *http://www.cbo.gov/sites/default/files/cbofiles/attachments/43472-07-24-2012-CoverageEstimates.*pdf, and Mathew Buettgens, Bowen Garrett, and John Holahan, America Under the Affordable Care Act, Urban Institute and the Robert Wood Johnson Foundation (Dec 2010), *available at http://www.urban.org/UploadedPDF/412267-america-under-aca.pdf.*

Table 20. Baseline Rhode Island Population Projections by Sex, Age and Health Insurance Status, no ACA adjustments

	2011			2015			2020			2025			2030		
Age	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
ALL	**1,121,758**	**539,518**	**582,240**	**1,139,543**	**548,136**	**591,407**	**1,154,230**	**555,169**	**599,061**	**1,157,855**	**556,683**	**601,172**	**1,152,941**	**554,029**	**598,912**
0-6	**79,959**	40,930	39,029	**83,455**	42,860	40,595	**85,038**	43,824	41,214	**83,074**	42,998	40,076	**78,831**	40,985	37,846
ins	**78,009**	40,358	37,651	**81,423**	42,261	39,162	**82,971**	43,212	39,759	**81,058**	42,397	38,661	**76,922**	40,412	36,510
no ins	**1,950**	572	1,378	**2,032**	599	1,433	**2,067**	612	1,455	**2,016**	601	1,415	**1,909**	573	1,336
6-17	**168,134**	85,498	82,636	**164,884**	83,984	80,900	**168,973**	86,463	82,510	**173,744**	89,404	84,340	**173,900**	89,999	83,901
ins	**160,321**	81,381	78,941	**157,222**	79,939	77,282	**161,119**	82,299	78,820	**165,667**	85,098	80,568	**165,814**	85,665	80,149
no ins	**7,813**	4,117	3,695	**7,662**	4,045	3,618	**7,854**	4,164	3,690	**8,077**	4,306	3,772	**8,086**	4,334	3,752
18-24	**121,428**	61,572	59,856	**117,460**	59,211	58,249	**103,975**	52,427	51,548	**99,528**	50,348	49,180	**101,192**	51,541	49,651
ins	**96,658**	48,149	48,509	**93,510**	46,303	47,207	**82,774**	40,998	41,776	**79,229**	39,372	39,857	**80,544**	40,305	40,239
no ins	**24,770**	13,423	11,347	**23,950**	12,908	11,042	**21,201**	11,429	9,772	**20,299**	10,976	9,323	**20,648**	11,236	9,412
25-34	**149,693**	72,931	76,762	**153,200**	75,600	77,600	**159,750**	78,932	80,818	**148,801**	73,203	75,598	**132,260**	65,158	67,102
ins	**119,652**	53,349	66,303	**122,328**	55,301	67,027	**127,545**	57,739	69,806	**118,845**	53,548	65,297	**105,622**	47,663	57,959
no ins	**30,041**	19,582	10,459	**30,872**	20,299	10,573	**32,205**	21,193	11,012	**29,956**	19,655	10,301	**26,638**	17,495	9,143
35-44	**139,985**	67,935	72,050	**140,872**	68,026	72,846	**146,700**	70,918	75,782	**149,467**	73,385	76,082	**154,153**	75,946	78,207
ins	**119,764**	55,214	64,551	**120,551**	55,288	65,264	**125,532**	57,638	67,894	**127,806**	59,643	68,163	**131,791**	61,725	70,067
no ins	**20,221**	12,721	7,499	**20,321**	12,738	7,582	**21,168**	13,280	7,888	**21,661**	13,742	7,919	**22,362**	14,221	8,140
45-54	**166,746**	80,725	86,021	**157,679**	76,058	81,621	**138,990**	66,778	72,212	**135,888**	64,859	71,029	**140,496**	67,133	73,363
ins	**145,578**	70,133	75,445	**137,664**	66,078	71,586	**121,350**	58,016	63,334	**118,645**	56,349	62,296	**122,668**	58,324	64,343
no ins	**21,168**	10,592	10,576	**20,015**	9,980	10,035	**17,640**	8,762	8,878	**17,243**	8,510	8,733	**17,828**	8,809	9,020
55-64	**136,396**	65,447	70,949	**146,751**	69,874	76,877	**152,832**	72,725	80,107	**142,845**	67,573	75,272	**125,602**	59,082	66,520
ins	**122,355**	58,303	64,052	**131,650**	62,247	69,404	**137,106**	64,786	72,320	**128,151**	60,197	67,955	**112,686**	52,633	60,053
no ins	**14,041**	7,144	6,897	**15,101**	7,627	7,473	**15,726**	7,939	7,787	**14,694**	7,376	7,317	**12,916**	6,449	6,467
65-74	**78,000**	35,557	42,443	**94,123**	43,388	50,735	**110,819**	50,928	59,891	**122,201**	55,720	66,481	**126,749**	57,829	68,920
ins	**77,559**	35,514	42,044	**93,594**	**43,336**	**50,259**	**110,195**	**50,867**	**59,329**	**121,510**	**55,653**	**65,857**	**126,032**	**57,759**	**68,273**
no ins	**441**	43	399	**529**	**52**	**476**	**624**	**61**	**562**	**691**	**67**	**624**	**717**	**70**	**647**
75+	**81,417**	28,923	52,494	**81,119**	29,135	51,984	**87,153**	32,174	54,979	**102,307**	39,193	63,114	**119,758**	46,356	73,402
ins	**81,356**	28,923	52,433	**81,059**	**29,135**	**51,924**	**87,089**	**32,174**	**54,915**	**102,234**	**39,193**	**63,041**	**119,673**	**46,356**	**73,317**
no ins	**61**	0	61	**60**	**0**	**60**	**64**	**0**	**64**	**73**	**0**	**73**	**85**	**0**	**85**

Table 21. ACA Rhode Island Population Projections by Sex, Age and Health Insurance Status, including ACA adjustments

Age	2011			2015			2020			2025			2030		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
ALL	**1,121,758**	**539,518**	**582,240**	**1,139,543**	**548,136**	**591,407**	**1,154,230**	**555,169**	**599,061**	**1,157,855**	**556,683**	**601,172**	**1,152,941**	**554,029**	**598,912**
0-6	**79,959**	40,930	39,029	**83,455**	42,860	40,595	**85,038**	43,824	41,214	**83,074**	42,998	40,076	**78,831**	40,985	37,846
ins	**78,009**	40,358	37,651	**82,475**	42,571	39,904	**84,032**	43,526	40,506	**82,083**	42,703	39,381	**77,891**	40,703	37,188
no ins	**1,950**	572	1,378	**980**	289	691	**1,006**	298	708	**991**	295	695	**940**	282	658
6-17	**168,134**	85,498	82,636	**164,884**	83,984	80,900	**168,973**	86,463	82,510	**173,744**	89,404	84,340	**173,900**	89,999	83,901
ins	**160,321**	81,381	78,941	**161,188**	82,033	79,155	**165,150**	84,436	80,714	**169,774**	87,288	82,486	**169,916**	87,864	82,053
no ins	**7,813**	4,117	3,695	**3,696**	1,951	1,745	**3,823**	2,027	1,796	**3,970**	2,116	1,854	**3,984**	2,135	1,849
18-24	**121,428**	61,572	59,856	**117,460**	59,211	58,249	**103,975**	52,427	51,548	**99,528**	50,348	49,180	**101,192**	51,541	49,651
ins	**96,658**	48,149	48,509	**105,908**	52,985	52,923	**93,654**	46,863	46,791	**89,552**	44,954	44,598	**91,019**	46,005	45,014
no ins	**24,770**	13,423	11,347	**11,552**	6,226	5,326	**10,321**	5,564	4,757	**9,976**	5,394	4,582	**10,173**	5,536	4,637
25-34	**149,693**	72,931	76,762	**153,200**	75,600	77,600	**159,750**	78,932	80,818	**148,801**	73,203	75,598	**132,260**	65,158	67,102
ins	**119,652**	53,349	66,303	**138,309**	65,809	72,500	**144,072**	68,615	75,457	**134,079**	63,543	70,536	**119,136**	56,538	62,597
no ins	**30,041**	19,582	10,459	**14,891**	9,791	5,100	**15,678**	10,317	5,361	**14,722**	9,660	5,062	**13,124**	8,620	4,505
35-44	**139,985**	67,935	72,050	**140,872**	68,026	72,846	**146,700**	70,918	75,782	**149,467**	73,385	76,082	**154,153**	75,946	78,207
ins	**119,764**	55,214	64,551	**131,071**	61,882	69,189	**136,395**	64,453	71,942	**138,821**	66,631	72,190	**143,136**	68,939	74,196
no ins	**20,221**	12,721	7,499	**9,801**	6,144	3,657	**10,305**	6,465	3,840	**10,646**	6,754	3,892	**11,017**	7,007	4,011
45-54	**166,746**	80,725	86,021	**157,679**	76,058	81,621	**138,990**	66,778	72,212	**135,888**	64,859	71,029	**140,496**	67,133	73,363
ins	**145,578**	70,133	75,445	**148,025**	71,244	76,781	**130,403**	62,513	67,890	**127,414**	60,676	66,737	**131,712**	62,793	68,919
no ins	**21,168**	10,592	10,576	**9,654**	4,814	4,840	**8,587**	4,265	4,322	**8,474**	4,183	4,292	**8,784**	4,340	4,444
55-64	**136,396**	65,447	70,949	**146,751**	69,874	76,877	**152,832**	72,725	80,107	**142,845**	67,573	75,272	**125,602**	59,082	66,520
ins	**122,355**	58,303	64,052	**139,467**	66,195	73,272	**145,176**	68,860	76,316	**135,623**	63,948	71,676	**119,238**	55,904	63,334
no ins	**14,041**	7,144	6,897	**7,284**	3,679	3,605	**7,656**	3,865	3,791	**7,222**	3,625	3,596	**6,364**	3,178	3,186
65-74	**78,000**	35,557	42,443	**94,123**	43,388	50,735	**110,819**	50,928	59,891	**122,201**	55,720	66,481	**126,749**	57,829	68,920
ins	**77,559**	35,514	42,044	**93,950**	**43,371**	**50,579**	**110,621**	**50,909**	**59,713**	**121,978**	**55,698**	**66,279**	**126,507**	**57,805**	**68,701**
no ins	**441**	43	399	**173**	**17**	**156**	**198**	**19**	**178**	**223**	**22**	**202**	**242**	**24**	**219**
75+	**81,417**	28,923	52,494	**81,119**	29,135	51,984	**87,153**	32,174	54,979	**102,307**	39,193	63,114	**119,758**	46,356	73,402
ins	**81,356**	28,923	52,433	**81,099**	**29,135**	**51,964**	**87,133**	**32,174**	**54,959**	**102,283**	**39,193**	**63,090**	**119,729**	**46,356**	**73,373**
no ins	**61**	0	61	**20**	**0**	**20**	**20**	**0**	**20**	**24**	**0**	**24**	**29**	**0**	**29**

Rhode Island Hospitalization Rate Projections

Rhode Island has seen a decline in both the number of hospitalizations and the average days spent in the hospital over the past several years. Other areas have also experienced similar trends. Kalra et al. found that while the number of internal medicine hospital admissions increased from 117 per month in 1991 to 455 per month in 2004 while the mean length of stay decreased from 8.76 to 4.9 days at Temple University Hospital (the hospital with the highest percentage of Medicaid and uninsured patients in the state of Pennsylvania).[44] The CDC shows that the rate of hospitalization for stroke increased from 32.4 in 1989 to 34.9 in 1999 and has since decreased to 31.8 in 2009.[45]

According to the Kaiser Health News Blog, UnitedHealth Group's chief financial officer Dan Schumaher reported in April 2012 that its treatment volume is "tracking right in line with our expectations, which is the say we saw a modest increase in utilization." Additionally, "Outpatient is the place where we see the most increases, and on the inpatient side we actually continue to see that very restrained. Our hospital bed days are actually flat to down in each of our businesses." According to the Healthcare Cost and Utilization Project (HCUP) and the Agency for Heathcare Research and Quality (AHRQ), from 2003 to 2007 the rate of potentially preventable hospitalizations declined faster for older adults, those individuals aged 65 and older, than for younger adults, individuals aged 18 to 64.[46]

To project baseline hospitalization rates from 2011 through 2030, first the hospitalization rate for each age, sex and insurance status cell is determined using MEPS data. Then the percentage of the insured (uninsured) population who experience a hospitalization in a given year are multiplied by the baseline population projections. Total hospitalization numbers are found by summing the number of hospitalizations experienced by the uninsured and insured population for each age, sex category. Table 22 presents the baseline hospitalizations projections through 2030. These baseline projections do not take into account the change in the rate of uninsurance expected as a result of implementing the ACA provisions.[47] Table 23 presents Rhode Island's hospitalization projections through 2030 that take into account the ACA insurance status adjustments discussed above.

[44] *See e.g.*, Amit D. Kalra, Robert S. Fisher, and Peter Axelrod, Decreased Length of Stay and Cumulative Hospitalized Days Despita Increased patient Admissions and Readmissions in an Area of Urban Poverty, Journal of General Internal Medicine, Volume 25, Number 9 (September 2010).

[45] *See e.g.*, Margaret Jean Hall, Shaleah Levant, and Carol DeFrances, Hospitalization for Stroke in U.S. Hospitals, 1989-2009, Centers for Disease Control and Prevention, National Center for Health Statistics Data Brief, Number 95 (May 2012), *available at http://www.cdc.gov/nchs/data/databriefs/db95.pdf*.

[46] *See e.g.*, Elizabeth Strangers and Bernard Friedman, Potentially Preventable Hospitalization Rates Decline for Older Adults, 2003-2007, Healthcare Cost and Utilization Project and Agency for Healthcare Research and Quality, Statistical Brief #83 (December 2009), *available at http://www.hcup-us.ahrq.gov/reports/statbriefs/sb83.pdf*.

[47] ACA adjusted population and hospitalization rates will be presented in the final full report.

Table 22. Baseline Rhode Island Hospital Discharge Projections by Sex, Age and Health Insurance Status, no ACA adjustments

Age	2011			2015			2020			2025			2030		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
ALL	**113,154**	**42,077**	**71,078**	**116,995**	**44,067**	**72,928**	**121,596**	**46,516**	**75,081**	**126,204**	**49,209**	**76,994**	**129,714**	**51,243**	**78,471**
0-6	3,803	1,953	1,850	3,969	2,045	1,924	4,045	2,091	1,953	3,951	2,052	1,899	3,749	1,956	1,793
ins	3,719	1,932	1,787	3,882	2,023	1,859	3,956	2,068	1,887	3,865	2,029	1,835	3,668	1,934	1,733
no ins	84	22	62	87	23	65	89	23	66	87	23	64	82	22	60
6-17	3,544	1,423	2,121	3,474	1,398	2,077	3,557	1,439	2,118	3,653	1,488	2,165	3,651	1,498	2,154
ins	3,490	1,407	2,083	3,421	1,382	2,039	3,503	1,423	2,080	3,597	1,471	2,126	3,596	1,481	2,115
no ins	54	16	38	53	15	38	54	16	38	55	16	39	55	16	39
18-24	7,646	1,381	6,266	7,425	1,328	6,098	6,572	1,176	5,396	6,277	1,129	5,148	6,353	1,156	5,198
ins	6,881	1,268	5,613	6,681	1,219	5,462	5,913	1,079	4,834	5,649	1,037	4,612	5,717	1,061	4,656
no ins	766	113	653	744	109	635	658	96	562	629	92	536	636	95	541
25-34	12,317	1,532	10,784	12,491	1,588	10,902	13,013	1,658	11,354	12,159	1,538	10,621	10,796	1,369	9,427
ins	11,406	1,136	10,270	11,560	1,177	10,383	12,042	1,229	10,813	11,254	1,140	10,115	9,992	1,015	8,978
no ins	911	397	514	931	411	520	971	429	541	904	398	506	804	354	449
35-44	9,909	3,650	6,259	9,984	3,655	6,328	10,394	3,811	6,583	10,553	3,943	6,609	10,875	4,081	6,794
ins	9,265	3,374	5,891	9,335	3,379	5,956	9,718	3,522	6,196	9,865	3,645	6,220	10,166	3,772	6,394
no ins	645	276	369	649	276	373	676	288	388	687	298	389	709	309	400
45-54	15,974	6,434	9,539	15,114	6,062	9,052	13,331	5,323	8,008	13,047	5,170	7,877	13,487	5,351	8,136
ins	15,069	5,957	9,112	14,259	5,613	8,646	12,577	4,928	7,649	12,310	4,786	7,524	12,725	4,954	7,771
no ins	905	477	428	855	449	406	754	395	359	736	383	353	761	397	365
55-64	18,246	7,917	10,329	19,644	8,453	11,191	20,459	8,798	11,662	19,132	8,175	10,958	16,831	7,147	9,684
ins	16,817	7,052	9,765	18,110	7,529	10,581	18,862	7,836	11,026	17,641	7,281	10,360	15,522	6,366	9,155
no ins	1,429	865	563	1,534	924	611	1,598	961	636	1,491	893	598	1,309	781	528
65-74	15,707	7,614	8,093	18,965	9,290	9,674	22,325	10,905	11,420	24,608	11,931	12,677	25,525	12,383	13,142
ins	15,684	7,614	8,070	18,937	9,290	9,647	22,293	10,905	11,388	24,572	11,931	12,641	25,487	12,383	13,104
no ins	23	0	23	28	0	28	33	0	33	36	0	36	38	0	38
75+	26,008	10,172	15,836	25,929	10,247	15,682	27,901	11,316	16,586	32,824	13,784	19,040	38,447	16,303	22,143
ins	26,002	10,172	15,830	25,923	10,247	15,676	27,895	11,316	16,579	32,816	13,784	19,032	38,438	16,303	22,134
no ins	6	0	6	6	0	6	7	0	7	8	0	8	9	0	9

Table 23. ACA Rhode Island Hospital Discharge Projections by Sex, Age and Health Insurance Status, including ACA adjustments

Age	2011			2015			2020			2025			2030		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
ALL	**113,154**	**42,077**	**71,078**	**119,480**	**44,701**	**74,779**	**124,002**	**47,120**	**76,882**	**128,522**	**49,809**	**78,713**	**131,973**	**51,859**	**80,114**
0-6	3,803	1,953	1,850	3,974	2,049	1,926	4,049	2,095	1,955	3,956	2,055	1,901	3,754	1,959	1,795
ins	3,719	1,932	1,787	3,932	2,038	1,894	4,006	2,083	1,923	3,913	2,044	1,870	3,714	1,948	1,765
no ins	84	22	62	42	11	31	43	11	32	43	11	31	40	11	30
6-17	3,544	1,423	2,121	3,533	1,426	2,107	3,616	1,468	2,148	3,713	1,517	2,196	3,712	1,527	2,184
ins	3,490	1,407	2,083	3,507	1,418	2,089	3,590	1,460	2,130	3,686	1,509	2,177	3,684	1,519	2,165
no ins	54	16	38	25	7	18	26	8	19	27	8	19	27	8	19
18-24	7,646	1,381	6,266	7,878	1,447	6,430	6,969	1,281	5,688	6,653	1,229	5,424	6,733	1,258	5,475
ins	6,881	1,268	5,613	7,519	1,395	6,124	6,648	1,234	5,414	6,344	1,183	5,161	6,420	1,211	5,209
no ins	766	113	653	359	52	306	320	47	274	309	45	264	313	47	267
25-34	12,317	1,532	10,784	13,080	1,599	11,481	13,621	1,670	11,952	12,723	1,548	11,175	11,296	1,378	9,918
ins	11,406	1,136	10,270	12,631	1,401	11,230	13,149	1,460	11,688	12,279	1,353	10,926	10,900	1,203	9,696
no ins	911	397	514	449	198	251	473	209	263	445	196	249	396	175	221
35-44	9,909	3,650	6,259	10,409	3,915	6,494	10,833	4,079	6,754	10,998	4,219	6,779	11,333	4,365	6,968
ins	9,265	3,374	5,891	10,096	3,782	6,314	10,504	3,939	6,565	10,660	4,072	6,588	10,984	4,213	6,771
no ins	645	276	369	313	133	180	329	140	189	338	147	191	349	152	197
45-54	15,974	6,434	9,539	15,737	6,268	9,469	13,876	5,502	8,374	13,576	5,342	8,234	14,033	5,529	8,503
ins	15,069	5,957	9,112	15,325	6,052	9,273	13,509	5,310	8,199	13,214	5,154	8,060	13,657	5,334	8,324
no ins	905	477	428	412	217	196	367	192	175	362	188	174	375	195	180
55-64	18,246	7,917	10,329	19,918	8,452	11,465	20,742	8,797	11,945	19,395	8,174	11,221	17,063	7,147	9,916
ins	16,817	7,052	9,765	19,177	8,007	11,171	19,964	8,329	11,635	18,662	7,735	10,927	16,418	6,762	9,656
no ins	1,429	865	563	740	446	294	778	468	310	733	439	294	645	385	260
65-74	15,707	7,614	8,093	19,015	9,298	9,717	22,386	10,914	11,472	24,674	11,941	12,734	25,592	12,393	13,199
ins	15,684	7,614	8,070	19,006	9,298	9,708	22,375	10,914	11,461	24,663	11,941	12,722	25,579	12,393	13,187
no ins	23	0	23	9	0	9	10	0	10	12	0	12	13	0	13
75+	26,008	10,172	15,836	25,937	10,247	15,690	27,910	11,316	16,594	32,834	13,784	19,049	38,458	16,303	22,154
ins	26,002	10,172	15,830	25,935	10,247	15,688	27,908	11,316	16,592	32,831	13,784	19,047	38,455	16,303	22,151
no ins	6	0	6	2	0	2	2	0	2	2	0	2	3	0	3

Table 24 presents three scenarios for the projected total number of hospitalizations in Rhode Island. The first set of columns gives the "Status Quo Rhode Island Rate" scenario that simply repeats the total row from above. The "Maine Rate" scenario presents the total hospitalizations Rhode Island could experience if their rate of hospitalizations was to drop to a rate closer to Maine's rate, a reduction of 3 percent. If Rhode Island's number of hospitalizations dropped 8.5 percent, to the "Vermont Rate," Rhode Island could see slightly more than 11,000 fewer hospitalizations in 2030.

Table 24. Rhode Island's Hospitalizations Under Other State Hospitalization Rate Scenarios

	Rhode Island Rate Status Quo			Maine Rate (3% fewer)			Vermont Rate (8.5% fewer)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
2011	113,154	42,077	71,078	109,760	40,814	68,945	103,536	38,500	65,036
2015	120,177	45,079	75,098	116,571	43,727	72,845	109,962	41,247	68,714
2020	124,463	47,452	77,011	120,729	46,028	74,701	113,884	43,419	70,465
2025	128,704	50,121	78,583	124,843	48,617	76,226	117,764	45,861	71,904
2030	131,907	52,167	79,740	127,950	50,602	77,348	120,695	47,732	72,962

Table 25 below presents three scenarios for the projected total number of hospitalizations in Rhode Island. The first column gives the population to which the numbers pertain. The second column gives the Program used as a template for calculating numbers. The next two columns present the results of each initiative that was investigated for impacts on hospitalizations. The final columns presents the potential percentage change/difference in hospitalizations rate Rhode Island could achieve if the state were to adopt the initiative studied. In summary, Rhode Island could reduce the rate of hospitalizations for their elderly population by approximately 43.9 percent per 1,000 member months and the rate of hospitalizations for their non-elderly population by approximately 6 percent per 1,000 member months.

Table 25. Potential Reductions in Rhode Island's Hospitalization Rates

Hospitalization Rate per 1,000 Member Months or Beneficiary Years						
Population Type	Program	Comparison Group	Initiative Group	Difference	Percentage Change	Percentage Difference
Limited RI population	PCMH (CSI-RI)	8.45	7.93	-0.52	-6.15%	
					*(-8.1%)	
Nationwide Medicare	PC to POP Optimal Ratio	322	298	24		-7.45%
Medicare: Texas and 7-state region	ACO (WellMed)	239	134	105		-43.90%

* 8.1% decrease includes the 6.15% decrease in the CSI group, plus 1.95%, which is the avoided increase in hospitalization in the Rhode Island general population (9.22 to 9.40 hospitalizations per 1,000 member months)

Hospitalizations and Hospital Referral Regions

For the Rhode Island study we use Dartmouth Atlas hospital referral region (HRR)[48] hospitalization data from 2008-2010 and workforce data from 2006 to examine the relationship between workforce size/composition and hospitalization rates.

According to Dartmouth Atlas,

> **Hospital referral regions** (HRRs) represent regional health care markets for tertiary medical care that generally requires the services of a major referral center. The regions were defined by determining where patients were referred for major cardiovascular surgical procedures and for neurosurgery. Each hospital service area (HSA) was examined to determine where most of its residents went for these services. The result was the aggregation of the 3,436 hospital service areas into 306 HRRs. Each HRR has at least one city where both major cardiovascular surgical procedures and neurosurgery are performed.

In this data, the state of Rhode Island is entirely contained in a single HRR, centered in Providence.

A substantial literature has examined the determinants of variation in health utilization at an HRR level and other levels of geography.[49] These studies show that an increase in the supply of primary care

[48] See e.g., *http://www.dartmouthatlas.org*.

[49] See e.g., http://www.dartmouthatlas.org/downloads/reports/Primary_care_report_090910.pdf); Chiang-Hua Chang, et al., Primary Care Physician Workforce and Medicare Beneficiaries' Health Outcomes, Journal of American Medical Association, volume 305, number 20 (May 2011), Phillips, RL ; Petterson, SM; Bazemore, AW.

physicians, especially family physicians, tends to lead to a decrease in hospitalizations, health care costs and related measures. These results hold up in individual-level analyses which include controls for such factors as age, race and health conditions. [50]

The analysis uses three different measures of primary care workforce: 1) all primary care physicians (family physicians, general practitioners, general internists and pediatricians), 2) only family physicians (FP) and general practitioners (GP), and 3) family physicians/ general practitioners together with primary care nurse practitioners (NP) and physician (PA). For consistency in data sources, we used Dartmouth's estimates of the HRR level physician workforce as of 2006. Primary care NP and PA data were obtained from the NPPES as described above. Rates per 100,000 HRR residents were calculated using 2006 HRR population estimates available from Dartmouth Atlas.

Table 26. Cutoff Values for Provider per 100,000

	PC		FP		FP/NP/PA	
Cutoffs	Min	Max	Min	Max	Min	Max
1	43.9	55.8	9.7	20.4	24.7	42.3
2	56.3	60.3	20.4	23.6	42.4	46.6
3	60.5	63.7	23.7	26.4	46.9	52.2
4	63.8	67.1	26.5	29.1	52.5	56.5
5	67.2	69.0	29.1	31.5	56.7	60.1
6	69.1	71.6	31.6	34.2	60.1	65.0
7	71.9	76.0	34.2	37.2	65.0	70.0
8	76.3	79.5	37.3	41.1	70.0	77.4
9	79.6	87.0	41.1	45.7	77.4	84.6
10	87.1	117.0	45.8	61.9	84.8	140.8

For ease of presentation, the distribution of each of the three measures in deciles were divided such that each decile contains the same number of HRRs (30 or 31 per decile). The cutoffs for each set of deciles are shown in Table 26. With each decile estimates of overall hospitalization rates, which combine medical and surgical discharge rates available in the Dartmouth data, were calculated. The first set of estimates is unadjusted and the second set controls for a) acute hospital beds per 1000 and b) the number of specialists per 100,000. To help interpret the regression results, predicted adjusted and unadjusted rates setting the covariates at their margins were calculated. Also the percent difference in hospitalization rates by comparing the rates in the 8th and 10th deciles were computed.

Primary Care Physician Workforce and Outcomes JAMA. 2011;306(11):1201-1202., and K. Baicker and A. Chandra, Medicare Spending, the Physician Workforce, and Beneficiaries' Quality of Care, Health Affairs (Millwood) (2004).

[50] Fisher E. and J. Skinner, "Regional Disparities in Medicare Expenditures: Opportunity for Reform", National Tax Journal 1997; 50: 413-25. Fisher, ES, Wennberg, DE, Stukel, TA, et al., "The Implications of Regional Variations in Medicare Spending." Parts 1 & 2 Ann Intern Med. 18 February 2003;138(4). Zuckerman S., Waidmann, T., Berenson, R., Hadley, J., "Clarifying Sources of Geographic Differences in Gelman, A., Park, D., Shor, B. Bafumi, J.; Cortina, J. Red State, Blue State, Rich State, Poor State. Princeton University Press, 2008. The example actually comes from the Wikipedia entry on ecological fallacy and thus should be verified.

The results in Table 27 report the hospitalization regression results using the three different provider supply measures. The corresponding adjusted estimates are reported in Table 28 and displayed in Figure 7. In general, there appears to be a non-linear relationship between supply and hospitalization rates, with the largest decline from the 8th to the 10th decile. This holds across the three different measures and in both the adjusted and unadjusted results. For the primary care measure, for instance, the difference between these two deciles is 8.2% (322.6-259.9/322.6).

Table 27. Unadjusted and Adjusted Regression Coefficients for Effect of Provider Supply Hospitalization Rates

Primary Care

	No correction			With Correction	
	Coef	SE		Coef	SE
2	24.2	12.5	2	0.3	9.9
3	9.7	12.6	3	-7.9	10.1
4	-3.4	11.7	4	-6.0	9.4
5	17.0	12.2	5	0.9	9.8
6	13.7	12.6	6	-0.5	10.0
7	2.8	9.8	7	-7.0	8.3
8	1.0	11.9	8	-8.7	10.3
9	-16.6	12.4	9	-19.9	10.6
10	-16.0	11.8	10	-35.4	11.9

AcuteCareHospitalBedsper10	52.5	3.9
TotalSpecialistsper100000Re	0.4	0.1

Family Physicians

	No correction			With Correction	
	Coef	SE		Coef	SE
2	13.5	9.1	2	8.4	7.5
3	11.0	9.2	3	-1.4	7.4
4	0.5	6.7	4	-4.7	5.7
5	-4.8	10.4	5	-17.5	8.4
6	-5.1	9.7	6	-8.0	8.0
7	8.2	11.1	7	-10.4	9.2
8	8.8	11.5	8	-8.2	9.5
9	-30.6	11.2	9	-38.9	9.2
10	-40.6	11.7	10	-36.5	9.5

AcuteCareHospitalBedsper10	52.7	3.6
TotalSpecialistsper100000Re	0.0	0.1

FP/NP/PA

	No correction			With Correction	
	Coef	SE		Coef	SE
2	-4.6	9.6	2	-16.5	7.3
3	2.2	10.4	3	-11.9	8.0
4	-1.8	10.2	4	-8.4	7.8
5	-5.6	10.5	5	-17.4	7.9
6	-2.8	10.4	6	-16.7	8.1
7	-3.6	10.8	7	-12.5	8.2
8	14.6	11.9	8	-4.9	9.2
9	-34.0	11.5	9	-43.4	8.9
10	-40.5	12.1	10	-46.6	9.2

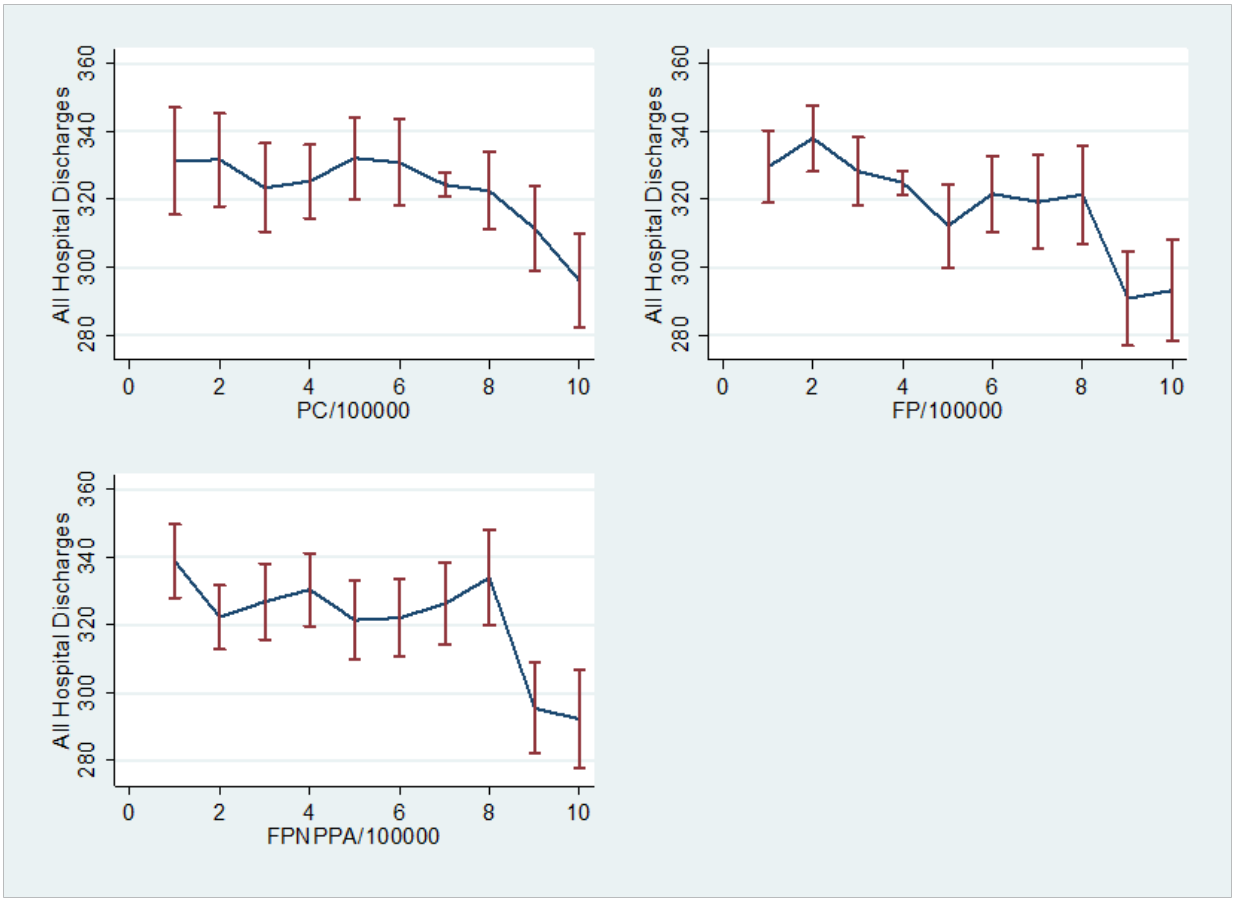
AcuteCareHospitalBedsper10	53.7	3.6
TotalSpecialistsper100000Re	0.0	0.1

Table 28. Adjusted Discharge Rates by Deciles for Three Measures of Provider Supply

	Primary Care 10			Family Physician 10			
	Margin	SD	95% CI		Margin	SD	95% CI
1	320.4498	9.518979	[301.8 339.1]	1	323.3502	6.30433	[311 335.7]
2	344.684	8.120805	[328.8 360.6]	2	336.8147	6.561686	[324 349.7]
3	330.1128	8.302301	[313.8 346.4]	3	334.3925	6.759767	[321.1 347.6]
4	317.0168	6.875819	[303.5 330.5]	4	323.8621	2.3051	[319.3 328.4]
5	337.4429	7.6937	[322.4 352.5]	5	318.507	8.218289	[302.4 334.6]
6	334.1276	8.181181	[318.1 350.2]	6	318.2506	7.367345	[303.8 332.7]
7	323.296	2.37891	[318.6 328]	7	331.5237	9.101301	[313.7 349.4]
8	321.4528	7.131021	[307.5 335.4]	8	332.1068	9.56672	[313.4 350.9]
9	303.8034	7.950722	[288.2 319.4]	9	292.7121	9.242102	[274.6 310.8]
10	304.4114	6.982572	[290.7 318.1]	10	282.7163	9.915214	[263.3 302.1]

	FP/NP/PA		
	Margin	SD	95% CI
1	328.803	7.145144	[314.8 342.8]
2	324.1988	6.389423	[311.7 336.7]
3	330.9696	7.491976	[316.3 345.7]
4	326.9957	7.264413	[312.8 341.2]
5	323.2144	7.696029	[308.1 338.3]
6	325.9903	7.6086	[311.1 340.9]
7	325.2459	8.141598	[309.3 341.2]
8	343.3756	9.501396	[324.8 362]
9	294.8427	9.070273	[277.1 312.6]
10	288.2616	9.763192	[269.1 307.4]

Figure 7. Relationship between Hospital Discharge Rates and Measure of Provider Supply



4.2 Methods for Financing Health System Payment

Patient Centered Medical Home Model

An opinion which has been widely published is that a focus on primary care is needed to make the U.S. healthcare delivery system more efficient. The patient-centered medical home (PCMH) has become the rallying cry of primary care specialists (i.e. the family medicine branch of health care providers) over the course of the last few years. There is a plethora of studies detailing how PCMH models have decreased specialty visits and improved patient's access to primary care.[51] Patient and provider satisfaction has been shown to increase after a PCMH model is implemented. With new payment structures many hope that increased provider satisfaction and pay will lead to an increase in the number of graduate medical students interested in the specialty of family medicine.[52] The long-term benefits of the current physician payment system refinement initiatives including disease registries, electronic medical records (EMRs), and care management are expected to not only improve the patient experience but also decrease outpatient costs which generally see an initial rise at PCMH implementation.[53]

A major focus of research into the outcomes of PCMH models has been measuring health care costs. In particular, Nielson et al. (2012) show outcome measures of 34 PCMH projects that have shown fewer ED/urgent care visits, reductions in hospital admission and length of stay, less specialist utilization and better health outcomes among patients with diabetes, heart disease, high cholesterol, women's health, immunizations and asthma care.[54] The majority of the studies on PCMH models point to possible ways in which the PCMH model can cut costs in our health care system.

Keckley et al. (2010) take a more pragmatic look at the PCMH model and note that there is large variability in model structure, scope of patient enrollment, disease mix and operating models.[55] The authors note that the need for dedicated care managers, expanded access to practitioners, and expanded health IT infrastructure all lead to difficult transitions for the average practitioner. The authors also express concern that the U.S. is facing a physician shortage, as by 2025 the U.S. is projected to have a 27 percent shortage in generalist physician.[56] While the Federal government and many state and private sector organizations are enthusiastic about the PCMH model of primary care delivery, significant investment needs to be made up front to ensure the projected outcomes are realized.

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[51] Fontaine, Patricia et al. "Is Consistent Primary Care Within a Patient-Centered Medical Home Related to Utilization Patterns and Costs?" J Ambulatory Care Manage. 34:1. 2011.

[52] Flottemesch, Thomas J, et al. Relationship of Clinic Medical Home Scores to Health Care Costs. J Ambulatory Care Manage 34:1. 2011.

[53] Rosser, Walter et al. Patient-Centered Medical Home in Ontario. NEJM 10.1056 2010

[54] Nielsen, Marci et al. Benefits of Implementing the Primary Care Patient-Centered Medical Home: A review of cost & quality results, 2012. Patient-Centered Primary Care Collaborative. 2012

[55] Keckley, Paul et al. "Medical Home 2.0: The Present, the Future" Deloitte Issue Brief. 2010.

[56] *Ibid*.

The increase in focus on transforming the way health care is delivered in the U.S. can be seen by the creation of many advocacy groups, think tanks, and researchers dedicating valuable resources to the topic. One group, the Patient-Centered Primary Care Collaborative (PCPCC) was founded in 2006 to advance an "effective and efficient health system build on a strong foundation of primary care and the patient-centered medical home (PCMH)."[57] The PCPCC uses five Stakeholder Centers that focus on issues of U.S. health care transformation including delivery reform, payment reform, patient engagement, and employee benefit redesign. Each center relies on primary care, particularly the medical home, experts and though leaders to advance policy efforts to build support for primary care in the U.S. and to disseminate findings from research into primary care transformation.

[57] See e.g., *http://www.pcpcc.net/who-we-are*.

Table 29. The Practice - State PCMH Initiatives & Impact on ER Visits/Hospitalizations

State	PCMH Trial	% Reduction ER visits	% Reduction in Hospitali-zations	Yrs Studied
Alaska	Alaska Native Medical Ctr	50.0%	53%	10 yr span, unspecified
California	BCBS of California ACO Pilot(2012)		15%	2012
Florida	Capital Health Plan, 2012	37.0%		2003-2011
Michigan	BCBS of Michigan	10.0%		Unspecified
Minnesota	Health Partners	39.0%	24%	2004-2009
Nebraska	BCBS of Nebraska	27.0%	10%	2011
New Jersey	BCBS of New Jersey	26.0%	21%	2011
New York	Capital District Physicians' Health Plan		24%	2008-2010
North Carolina	Blue Quality Physician's Prgram	70.0%		2011
North Carolina	Community Care of north Carolina	23.0%		2003-2010
North Dakota	BCBS of North Dakota- MediQHome Quality Program 2012	24.0%	6%	2005-2006
Ohio	Humana Queen City Physicians	34.0%		2008-2010
Pennsylvania	Geisinger Health System ProvenHealth Navigator PCMH model		25%	2005-2010
Pennsylvania	UPMC		13%	2009
South Carolina	BCBS of South Carolina	25.9%		2008-2011
Vermont	Vermont Medicaid	31.0%		2008-2010
Washington	Group Health of Washington	29.0%	11%	2006-2007, 2008

Integrated Systems (Accountable Care Organizations)

Fragmentation within the U.S. health care system has been cited as one of the major reasons the U.S. has little control over the rising cost of health care and patient/provider dissatisfaction.[58] In the 1990s the U.S. sought to address the health care system problems with the use of health management organizations (HMOs). However, the HMO model quickly lost favor among patients. Currently, the Federal government is advocating the Accountable Care Organization (ACO) model of health care payment. An ACO is "a set of physicians and hospitals that accept joint responsibility for the quality of care and the cost of care received by the ACO's panel of patients."[59] An ACO is made up of a group of providers who are responsible for the health care of a group of people. Generally the ACO looks to align incentives and accountability of providers across their continuum of care. Additionally the Medicare Payment Advisory Committee (MedPAC) regards medical homes as building blocks of effective ACOs.

[58] Shih, Anthony et al. "Organizing the U.S. Health Care Delivery System for High Performance" The Commonwealth Fund. August 2008.

[59] See e.g., Medicare Payment Advisory Committee (MedPAC), Chapter 2: Accountable Care Organizations, (in Report to the Congress: Improving Incentives in the Medicare Program), *available at http://medpac.gov/chapters/Jun09_Ch02.pdf*.

The group of PCMHs are considered the "community care team" with the hospital serving as the center for advanced care.

The ACO model differs from the HMO model in many ways; however, both attempt to coordinate care in a similar manner.[60] Models such as Kaiser Permanente, Geisinger of PA, Group Health of WA and Advocate medical of Illinois have shown that different levels of integration and accountability can lead to improved health outcomes, patient satisfaction and savings.[61] Integration and coordination take place at many levels, each of which needs addressing to see changes in the delivery of health care.[62]

Care coordination and integration are relatively new to the U.S. health care system. Investments in health information technology (IT) and recruitment or training of strong organizational leadership will be needed for the U.S. to begin to see improved patient health outcomes that have been associated with accountable care.[63] Thus continually evaluating integrated systems, demand innovation and improvements in health care will be necessary.[64] One group, Kaiser has been leading the charge in care coordination and integration. Kaiser's successes highlight the fact that if the U.S. were to bring other ACOs to the Kaiser level, total U.S. health care costs would decrease and outcomes with increase dramatically. However, one challenge is how to ensure that these ACOs continue to provide innovative solutions.[65]

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[60] Bodenheimer, Thomas "Coordinating Care – A Perilous Journey through the Health Care System" N Engl J Med 358:10. 2008.

Berenson, Robert & Burton, Rachel. "Accountable Care Organizations in Medicare and the Private Sector: A Status Update. Urban Institute. November 2011

[61] Shields, Mark et al. "A Model for Integrating Independent Physicians Into Accountable Care Organizations" Health Affairs 30:1. 2011.

Larson, Eric. "Group Health Cooperative – One Coverage-and-Delivery Model for Accountable Care" N Engl J Med 361:17. 2009.

McCarthy, Douglas et al. "Kaiser Permanente: Bridging the Quality Divide with Integrated Practice, Group Accountability, and Health Information Technology" The Commonwealth Fund Case Study. June 2009.

Lee, Thomas; Bothe, Albert; & Steele, Glenn "How Geisinger Structures its Physicians' Compensation to Support Improvements in Quality, Efficiency, and Volume" Health Affairs 31:9. 2012.

Weeks, William et al. "Higher Health Care Quality and Bigger Savings Found at Large Multispecialty Medical Groups" Health Affairs 29:5 2010.

[62] Curry, Natasha & Ham, Chris "Clinical and Service Integration: The route to improved outcomes" The King's Fund. 2010.

[63] Shields, Mark et al. "A Model for Integrating Independent Physicians Into Accountable Care Organizations" Health Affairs 30:1. 2011.

[64] Fisher, Elliot & Shortell, Stephen "Accountable Care Organizations: accountable for What, to Whom, and How" JAMA 304:15. 2010.

[65] Feachem, Richard; Neelam Sekhri; & White, Karen "Getting more for their dollar: a comparison of the NHS with California's Kaiser Permanente" BMJ 324. 2002; and Rittenhouse, Diane et al. "Physician Organization and Care Management in California: From Cottage to Kaiser" Health Affairs 23:6. 2004.

Integrated care can decrease costs and increase quality, especially for patients with chronic diseases. However, the mechanisms driving these outcomes are not clearly defined.[66] With the ACA's focus on ACOs and shared savings, the U.S. will benefit from a focus on following the results of the on-going pilot projects. These projects have delivered mixed results as far as savings and benefit to the organizations participating.[67] Although an increase in the quality of care is expected, the question of magnitude of decreases in the overall spending with decreases in hospitalizations, ED visits and re-hospitalizations remains?[68]

The ideal setting is one seeking patient-centered coordinated care for primary and secondary care across all setting – i.e. looking at systems of care and going beyond the PCMH model.[69] ACOs have been shown to not function properly without a strong foundation of primary care.[70] Both PCMHs and ACOs have their individual issues; however, the PCMH is often viewed as a building block necessary for ACO systems to realize the best outcomes in patient care.[71]

Primary Care Trusts and Population Health Models

In the early 2000s the United Kingdom (U.K.) decided to re-focus its health care efforts on primary care and to create a new structure in the National Health Service (NHS). Primary Care Trusts (PCTs) were created and have been held responsible to their local community to contract health services based on the needs of their specific community.[72] Over the course of the past decade, the U.K. discovered that the wide range of services offered by the PCTs led to equally wide variability in outcomes across the country, including the rate of emergency department (ED) admissions.[73] Some of this variability can be

[66] Miller, RH "Health System Integration: A means to an end" Health Affairs 15:2. 1996; and Tollen, Laura "Physician Organization in Relation to Quality and Efficiency of Care: A Synthesis of Recent Literature" The Commonwealth Fund. April 2008.

[67] Iglehart, John "Assessing an ACO Prototype – Medicare's Physician Group Practice Demonstration. N Engl J Med 364:3. 2011.

[68] Meyer, Harris. "Accountable Care Organization Prototypes: Winners and Losers?" Health Affairs 30:7. 2011; and Brown, Randall et al. "Six Features of Medicare Coordinated Care Demonstration Programs that Cut Hospital Admissions of High-risk Patients" Health Affairs 31:6. 2012.

[69] Higgins, Aparna et al. "Early Lessons From Accountable Care Models in the Private Sector: Partnerships between Health Plans and Providers" Health Affairs 30:9. 2011; and Cortese, Denis & Smoldt, Robert "Taking Steps Toward Integration" Health Affairs 26:1. 2007.

[70] Rittenhouse, Diane; Shortell, Stephen & Fisher, Elliott "Primary Care and Accountable Care – Two Essential Elements of Delivery-System Reform" N Engl J Med 361:24. 2009.

[71] Shields, Mark et al. "A Model for Integrating Independent Physicians Into Accountable Care Organizations" Health Affairs 30:1. 2011.

Phillips, Robert et al. "Case Study of a Primary Care-Based Accountable Care System Approach to Medical Home Transformation" J Ambulatory Care Manage 34:1. 2011

[72] Stevens, Simon "Reform Strategies for the English NHS" Health Affairs 23:3 2004.

[73] Purddy, Sarah "Avoiding Hospital Admissions: What does the research evidence say?" The Kings Fund. December 2010; and Badrinath, Padmanabhan et al. "Characteristics of Primary Care Trusts in Financial Deficit and Surplus – a

attributed to PCT specific enhancements; however, overall assigning specific outcomes to only one specific PCT initiative has been difficult.

PCTs were an attempt to integrate the delivery structure, quality improvement and finance systems so primary care could focus on the special needs of the local population with a strong sense of community accountability.[74] However, turnover has plagued the NHS over the last 20 years; particularly in terms of structure. Thus many authors have commented on the strains placed on delivering care in an ever-changing organizational system.[75] PCTs are responsible for 75 percent of NHS budget. Issues have arisen with management, health IT and central priorities that have not allowed PCTs to provide community-centered care.[76]

PCTs were created to allow local managers the ability to specifically care for their unique populations. Unfortunately, the central governing body has continued to ask PCTs to meet specific central measures that have led to managerial problems and an often disengaged environment for PCTs.[77] Furthermore, many of the local managers were not properly trained in health care commissioning and community engagement was often lost.[78] The organizational problems have been identified as one of the major barriers to effective PCT implementation.[79] Additionally few incentives were provided to PCTs to care for the local community needs. Ultimately and many believe PCTs have not lived up to their original vision.[80]

Spain adapted a system called Autonomous Communities (ACs) that is similar to the PCTs of the U.K.. The U.K. ACs have a strong base of primary care that is integrated into their secondary health care system and held responsible for the health of the local population. Although the ACs were an

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comparative study in the English NHS" BMC Health Services Research. 6:64. 2006; and Primary Care Trust Network "The Legacy of Primary Care Trusts" NHS Confederation Report. 2011; and Freemantle, Nick et al. "What factors predict differences in infant and perinatal mortality in primary care trusts in England? A prognostic model" BMJ 339. 2009; and Blunt, Ian; Bardsley, Martin; & Dixon, Jennifer "Trends in emergency admissions in England 2004-2009: is greater efficiency breeding inefficiency" The Nuffield Trust Briefing. July 2010; and Martin, Stephen & Smith Peter "Commissioning health. A comparison of English primary care trusts. Preliminary statistical analysis" The Health Foundation. 2010.

[74] Bindman, Andrew, Weiner, Jonathan & Majeed, Azeem. "Primary Care Groups in the United Kingdom: Quality and Accountability" Health Affairs 20:3 2001.

[75] Walshe, Kieran "Reorganisation of the NHS in England: There is little evidence to support the case for yet more structural change" BMJ 341 2010.

[76] Lewis, Richard; Dixon, Jennifer; & Gillam, Stephen. "Future Directions for Primary Care Trusts" King's Fund discussion paper. May 2003.

[77] Primary Care Trust Network "The Legacy of Primary Care Trusts" NHS Confederation Report. 2011; and Wilkin, David; Dowswell, Therese & Leese, Brenda "Modernising primary and community health services" BMJ 322. 2001.

[78] Ham, Chris "Competition and Integration in the English National Health Service" BMJ 336 April 2008.

[79] Bojke, Chris; Gravelle, Hugh; & Wilkin, David. "Is Bigger better for primary care groups and trusts?" BMJ 322. 2001.

[80] Lewis, Richard & Dixon, Jennifer "The Future of Primary Care" King's Fund. 2005; and Brereton, Laura & Vasoodaven, Vilashiny "The impact of the NHS market: an overview of the literature" CIVITAS: Institute for the Study of Civil Society. 2010.

investment in primary care, with an associated increase in *primary care* spending; the ACs have demonstrated a decrease in overall health spending.[81] The investment in a primary care infrastructure, care integration and local accountability has been able to provide health outcomes sought by U.S. stakeholders.

In Australia the Australian Medicare Local Alliance (AML Alliance) was recently created, with funding from the national government, to "spearhead an organised system for primary health care across the country through a network of 61 primary health care organisations called Medicare Locals (MLs)."[82] The AML Alliance and MLs were established under the National Health Reform and their pairing with Local Hospital Networks forms a critical part of new locally governing health arrangements. The AML Alliance's mission is "To promote the importance of primary health care nationally and to support a unified primary health care system that can link seamlessly to the social care sectors."

New Zealand district health boards have funded Primary Health Organisations (PHOs) to "support the provision of essential primary health care services through general practices to those people who are enrolled with the PHO."[83] New Zealand aims to better link general practitioner (i.e. primary care) services with other primary health service. Their goal is to ensure a "seamless continuum of care, in particular to better manage long term conditions." Both Australia and New Zealand have created geographic accountability, detailing and integrating primary care physician and teams with community resources.

Conclusion

Rhode Island has a lower than average percentage of NPs engaged in primary care, but an average percentage of PAs engaged in primary care. While Rhode Island's average primary care physician to population and specialist to population ratios are higher than the U.S. average, they are lower than most of the state's New England neighbors. Small geography analysis reveals many physician distribution gaps across the state. Rhode Island's health care providers are more likely to be female and to practice in larger practices than the U.S. average. On the other hand, Rhode Island has fewer very large (great than 25 provider) practices on average than the rest of the U.S. and most or their Northeast regional counterparts.

The Graham Center next looked at the extent to which physicians trained in-state, remain in-state. To inform this analysis the Graham Center investigated the extent to which Rhode Island relies on migration of physicians from other states. Overall these gap analysis help to inform policymakers on how well the current health workforce pipeline addresses the future needs of the population to access primary care services in their communities.

[81] Borkan, Jeffrey et al. "Renewing Primary Care: Lessons Learned from the Spanish Health Care System" Health Affairs. 29:8. 2010.

[82] See e.g., *http://amlalliance.com.au/about-us*.

[83] See e.g., *http://www.health.govt.nz/our-work/primary-health-care/about-primary-health-organisations*.

Primary care physician supply per resident is higher in Rhode Island than in many other states; Rhode Island has a smaller proportion of family medicine physicians than other states. Additionally, research indicates that the supply and organization of primary care physicians can greatly influence the demand for other medical services, including inpatient hospital services. Finally, in Rhode Island, the reduction in hospitalizations (and thus on bed need) from a more integrated primary care delivery system ranges from 3.8% and 10.5%.

In Rhode Island, health outcomes are driven more because of social deprivation than care delivery gaps. Potential solutions to Rhode Island's health care delivery gaps include organizing policy, payment and care delivery around smaller geographies; integrating social accountability measures and strategies that impact social determinants; and mitigating hospital utilization through the implementation of new models of primary care payment and delivery transformation.

The next few years are expected to bring many challenges with the increase in newly insured individuals stressing to primary care physician supply. Fortunately, analysis of Rhode Island's future primary care physician needs indicate that Rhode Island will face less of an issue with shortages of primary care physicians than their neighboring New England states. However, Rhode Island still faces increases in demand due to the aging of the population and other provisions of the ACA. Primary care supply will also be challenging for Rhode Island, particularly when viewed at the sub-state level (township and PCSA areas).

Data Appendix

Wellmed Analysis

The "Wellmed Scenario" for the Rhode Island project is based on a study conducted by the Robert Graham Center. A full description of this study is in the Final Report to AHRQ, entitled "Assessing the Impact of the Patient-Centered Medical Home (PCMH)," PBRN Master Contract # HHSA290200710008, Task Order No. 6 (September, 2011).

The WellMed Medical Group is a core group of 21 clinics in the San Antonio area that are the primary clinical network affiliated with the more diversified corporate structure of WellMed Medical Management. Neither WellMed Medical Group nor WellMed Medical Management own or operate a hospital, and they predominantly employ primary care physicians. WellMed operated under full risk capitation for most of 20 years and now almost exclusively cares for patients covered by a Medicare Advantage plan. This arrangement gives WellMed control of both funds and of data in committing to manage their patient panel. The flexibility afforded to WellMed by their current business model facilitated the evolution of the current system of care and benefit structure based upon identification of patient needs, and patient outcomes. WellMed employed continuous quality improvement and the Chronic Care Model long before consensus developed around the PCMH.

WellMed Medical Management serves more than 87,000 patients and plan members, mostly Medicare-eligible seniors in Texas, Arkansas, Florida and New Mexico. We focus this case study of the core 21 WellMed Medical Group practices in San Antonio and exclusively on its Medicare Advantage patients for whom its care model is most fully developed. WellMed ACO functions routinely monitor costs and outcomes and develop patient and system interventions in response to poor outcomes and cost variations. They regularly provide patient and panel quality measures to clinics and individual clinicians in the network, and select referral specialists and hospitals based on their outcomes. The duration and evolution of their model and robust monitoring of dollars and data made them good candidates for external evaluation of ACO and PCMH functions and outcomes.

Cohort Analysis:

We used WellMed administrative billing data and electronic health record data to create cross-sectional cohorts for the years 2000, 2003, and 2006. Comparative cohorts for the same years were extracted from Medicare Provider Analysis and Review (MEDPAR) data and a 1% sample of carrier claims data (Part B, Fee-For-Service), drawing from Texas or immediately adjacent states (the MEDPAR file contains data from inpatient claims for hospitals and skilled nursing facilities). The Medicare cohort data were drawn from random samples of 500,000 beneficiaries selected from the Medicare denominators files and using part B Carrier claims Data and MEDPAR files for 2000, 2003, 2006. We also analyzed 2008 data for WellMed without matching Medicare data. Patient matching between cohorts was based on age, gender, and absence or presence of one or more chronic conditions (diabetes, congestive heart failure, ischemic heart disease, and chronic obstructive pulmonary disease or asthma). We had originally

planned to use broader case-mix adjustment for matching but our initial study revealed that a change in payment incentives for Medicare Advantage plans in 2005 resulted in a significant increase in coding/capturing diagnoses in the WellMed patient population. For this same reason, this study focused statistical comparisons to later comparison years, after WellMed disease coding patterns stabilized. For comparing preventive screening, utilization, and health outcomes we created a matched analysis between Medicare patients in 2006 and WellMed patients in 2008. We did this to improve accuracy of WellMed disease coding capture, and because 2006 was the latest year for which we had Medicare data.

We assessed prevalence of chronic conditions between the comparison patient populations and the quality of patient care using prevention measures. In our pre-post study of WellMed we could report on success with achieving prevention goals such as hemoglobin A1C and LDL-cholesterol levels, for example, but Medicare claims data limit this analysis to prevalence of testing. The prevention measures include annual rates of cancer screening, hemoglobin A1C testing for patients with diabetes, and cholesterol screening generally and for patients with diabetes or ischemic heart disease, specifically. Health outcome and utilization measures include annual hospitalization rate, rate of live discharge, re-hospitalization rate, bed-days per 1000, and emergency department visits. The analysis is a quasi-experimental cohort comparison of cross-sectional point-in-time WellMed claims data to MedPAR and Part B claims data.

Medicare Fee for Service beneficiaries served as the control or comparison group in assessing the impact of WellMed care systems. The analysis is a quasi-experimental-control group comparisons of cross-sectional point-in-time WellMed claims data to MedPar and Part B claims data. The same health outcome measures were estimated from both the WellMed and Medicare claims data. We report first a simple comparison of the WellMed data to the Medicare data from Texas and 9 neighboring states (Arkansas, Louisiana, Oklahoma, Florida, Alabama, Mississippi, Arizona, Colorado and Nevada). We used 2:1 matching for Medicare:WellMed comparisons for all year except 2008 for which we used a 1: 1 match of 2006 Medicare data to those of WellMed (See tables). Matching was not always exact due to difficulty matching some WellMed patients. WellMed cohorts ranged from 14,411 – 17,643 and those for Medicare 28,822 – 35,284. All significance testing was done with Student's t-test statistic. All data management tasks were undertaken using SAS 9.2 and STATA 11.0 statistical software packages.

Findings

There were several important differences in preventive service delivery, utilization, and health outcomes in the age, gender, and disease matched cohorts (Table 1). Annual WellMed mammography rates were comparable for age-appropriate patients (45.2% WellMed vs. 41.0% Medicare) but colon cancer screening (by all modalities) for WellMed patients in a single year was significantly higher (27.7% vs. 17.6%) compared to Medicare. Annual hemoglobin A1C testing rates for patients with diabetes were similar and slightly higher for age-appropriate Texas Medicare patients (78.2% vs. 80.9%). WellMed had significantly higher cholesterol screening rates for the general population (69.7% vs. 48.9% Texas Medicare) but the difference was smaller for patients with diabetes (80.5% vs. 71.9% Texas Medicare) and for patients with ischemic heart disease (79.6% vs. 62.4% Texas Medicare) (Table 1).

WellMed patients in 2008 had substantially lower utilization rates in the following categories: emergency visits (17.8% vs. 32.9%), hospitalizations (14.4% vs. 26.7%), and re-hospitalizations (14.0% vs. 21.6%) (Table 2). Hospital bed-days for WellMed patients were substantially lower than for FFS Medicare patients (1002 vs. 3288 per thousand beneficiaries).

For the Rhode Island "Wellmed Scenario," we used the estimates from Table 2—namely differences in hospitalization rates for Wellmed patients to Texas Medicare beneficiaries. Our estimates are based on the assumption that the observed difference in a Medicare population in Texas would carry over to the entire population in Rhode Island. Taking the mean hospitalization rates across the four years for Texas (23.9%) and for Wellmed (14.2%), yields a decrease of 41% ((23.9-14.2)/23.9))

Table A1: Prevention Screening Rates and Chronic Disease Monitoring Rates

	Texas Region Medicare				WellMed			
	2000*	2003*	2006*	2006**	2000	2003	2006	2008
Mammography test rates (%)	31.50%	31.70%	33.30%	32.00%	19.40%	26.20%	33.00%	37.70%
Mammography test rates (%) ages 65-69	38.70%	38.50%	42.00%	41.00%	24.40%	26.00%	40.50%	45.20%
Colon cancer screening test rates (%)	18.60%	18.30%	16.30%	16.30%	±	30.40%	31.20%	25.60%
Colon cancer screening test rates (%) ages 65-80	19.60%	19.30%	17.70%	17.60%	±	31.30%	31.40%	27.70%
Hemoglobin A1c testing rates (%) for patients with Diabetes	65.60%	73.30%	78.30%	79.10%	56.70%	76.20%	79.90%	78.10%
Hemoglobin A1c testing rates (%) for patients with Diabetes ages 65-75	67.50%	75.10%	79.80%	80.90%	61.30%	78.70%	82.90%	78.20%
Cholesterol Screening rates (%)	34.00%	40.50%	46.40%	48.90%	46.50%	50.00%	69.00%	69.70%
Cholesterol Screening rates (%) for patients with Diabetes	54.00%	64.00%	71.00%	71.90%	54.80%	72.50%	84.20%	80.50%
Cholesterol Screening rates (%) for patients with ischemic heart disease	50.70%	55.90%	62.00%	62.40%	54.80%	67.20%	80.70%	79.60%
Number of Observations	28,822	32,606	35,284	18,400	14,411	16,303	17,643	17,643

*2:1 match for 2000, 2003, 2006 but 1:1 match for 2008 WellMed patients using 2006 Medicare data; matched on age, gender, and conditions

** No CPT data available

Table A2: Rates of Health Care Utilization and Outcomes Texas Region Medicare vs. WellMed

	Texas Region Medicare				WellMed			
	2000	**2003**	**2006**	**2006**	**2000**	**2003**	**2006**	**2008**
ER visit rates (%)	27.80%	29.00%	29.00%	32.90%	15.90%	14.40%	17.60%	17.80%
Hospitalization rates (%)	22.80%	23.30%	22.80%	26.70%	13.60%	11.80%	13.90%	14.40%
Re-hospitalization rates (30 days) (%)	18.50%	18.90%	19.20%	21.60%	14.50%	12.80%	13.50%	14.00%
Hospital Bed-Days/1000	2614	2734	2511	3288.8	699	763	1014	1002
Number of Observations*	28,822	32,606	35,284	18,400	14,411	16,303	17,643	17,643

*2:1 match for 2000, 2003, 2006 but 1:1 match for 2008 WellMed patients using 2006 Medicare data; matched on age, gender, and conditions with 2008 WellMed patients

Social Deprivation Index Construction

Understanding how socioeconomic status (SES) influences the use and access of health services, and how the use of measures of SES to guide the distribution of resources can reduce health disparities is bedded in a large body of literature and theory.[84] The relationship between health care need, demand, supply and access is complex. Health need can be understood to mean the requirement for health services, deemed reasonable or expected within society, taking into account factors such as the socioeconomic, age and health profile of a community. Demand reflects how services are used by the population, and not necessarily the underlying need. An imbalance between need, demand and supply can result in health care access inequity[85] and consequent poor health outcomes.[86] Poor health care access may be measured by self-report, inferred through rates of avoidable hospitalization (as an indirect measure of primary health care access) or by poor health outcomes such as morbidity, and mortality rates.

Variables of social deprivation were selected on the basis of literature review and international examples. Particularly important to this analysis is the work by Fields (2000) and Wang and Luo (2005). Fields identified predictors of access to health service based on a survey of doctors and patients in the UK. The model developed by Wang and Luo calculated physician supply rates for a novel geography based travel time to health service providers, then adjusted these rates for measures of health need, as defined by socioeconomic and demographic variables (selected also on the basis of Fields' works and Ricketts' HPSA designation methodology).[87] Our analysis includes the key socioeconomic and demographic variables identified by Fields (2000) and Wang and Luo (2005).

One of our intentions in constructing an SDI was to use readily available and easily updated national area-level data. With this approach, what is lost in specificity is gained in reproducibility. The main source of sociodemographic measures is from the Census Bureau, mainly the 2006-2010 American Community Survey (ACS) 5-year estimates.[88] These include percent living in poverty, black, less than 12 years of schooling, single parent households, and single occupant households. Following Wang and Luo (2005), we constructed a high needs measure, based on ACS data, consisting of the percent of the population (1) under the age of five and (2) female between the ages of 15 and 44. We considered models that also included persons over 65 but found this measure is negatively associated with other indicators of deprivation. We also considered measures from the Townsend index: percent living in overcrowded conditions (more persons in a dwelling unit than number of rooms), percent of households without a car, and percent of 18-64 year-olds that are unemployed, all of which are available from the ACS. Percent non-employed was also examined. The factor loading of percent non-employed was substantially higher, so the percent unemployed was dropped.

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[84] *See e.g.*, Andersen 1995; Field 2000; Hendryx et al. 2002; McGrail and Humphreys 2009; Penchasky and Thomas 1981; Wang and Luo 2005.

[85] *See e.g.*, Field 2000.

[86] *See e.g.*, Andersen 1995; Hendryx et al. 2002.

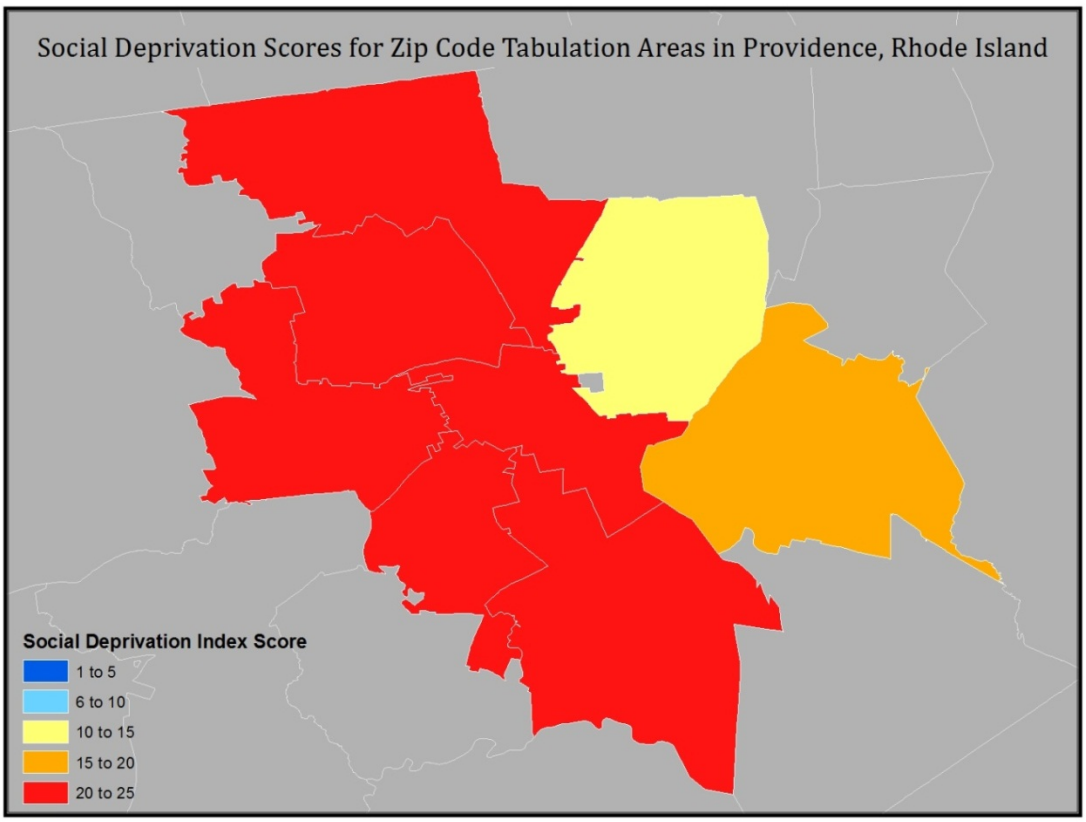
[87] *See e.g.*, Ricketts et al. 2007.

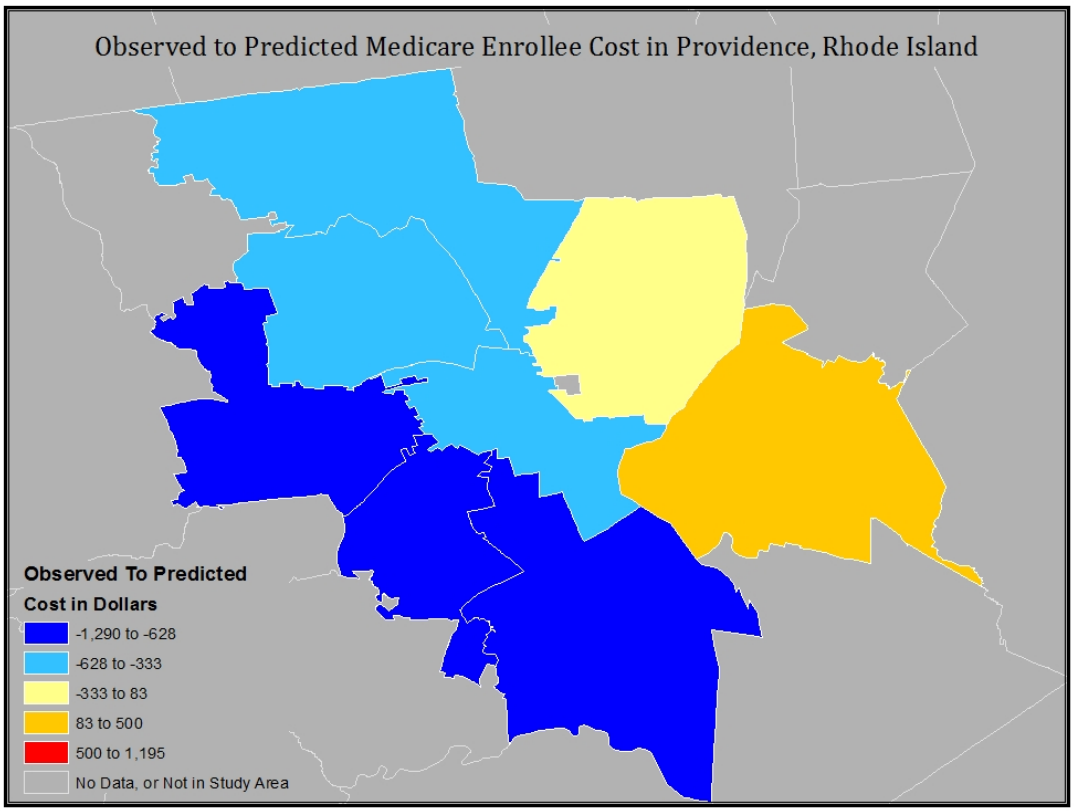
[88] *See e.g.*, *http://www.census.gov/acs/www/*.

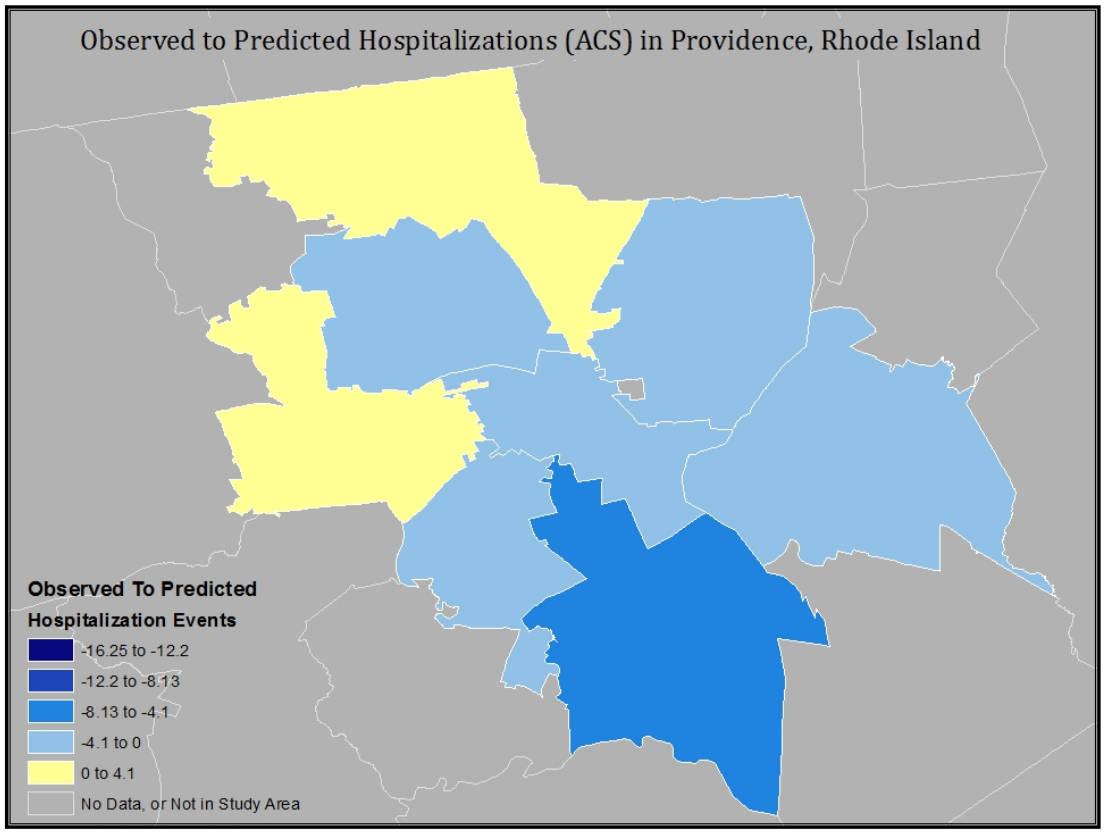
We used four health outcome measures: mortality, infant mortality, low birth weight rates and prevalence of diabetes. County-level mortality rates were obtained from the Center for Disease Control and Prevention (CDC) Wonder system.[89] We selected age-adjusted death rates for Hispanics and for non-Hispanic blacks, whites and other races based on data pooled across three years (2005-2007). For counties where race/ethnicity-specific rates are unavailable, the overall county mortality rate was used instead. Low birth weight and infant mortality rates are collected by the National Center for Health Statistics and available on an annual basis in the Area Resource File (ARF). From the 2008 ARF, we used 2003-2005 low birth weight rates reported separately for whites and non-whites and 2001-2005 infant mortality rates reported separately for whites, blacks and other race groups. As above, for counties where race/ethnicity-specific rates are unavailable due to no births for a particular group, the overall county rates were used. We first obtained block level rates by combining race/ethnicity specific rates at the county level with ACS population counts by race/ethnicity available at the block group level by assuming that these rates were similar at the block level. We then obtained ZCTA-level rates by aggregating block level information. The use of racial and ethnic specific rates is a possible limitation, but the choice is dictated by the available national data—mortality, infant mortality and low birth weight rates are not available by other parameters, such as income level or other demographic characteristics. County diabetes rates were used to define block rates, which were then aggregated to the ZCTA-level. The final step was to convert the four health measures to centile rankings.

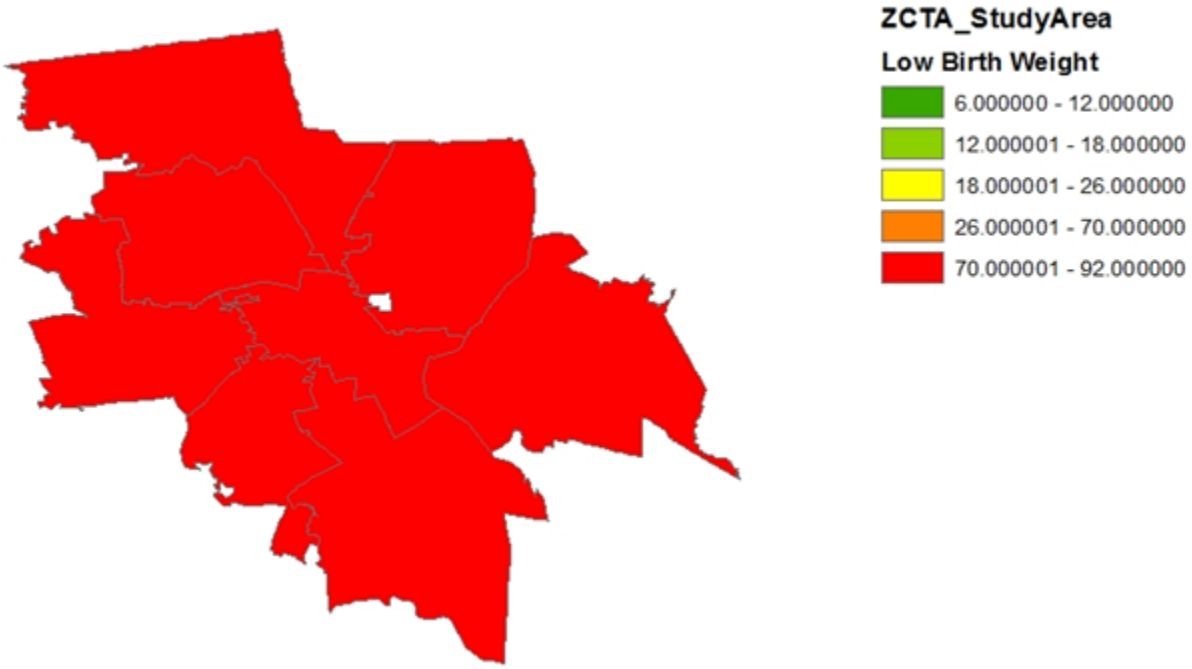
Next, we performed a factor analysis on the nine social deprivation measures identified. Factor analysis assumes a common dimension (unobserved) underlying all variables and creates a summary measure to capture this commonality. This requires variables to be correlated, and it is this degree of correlation which factor analysis is trying to capture. Due to the substantial variation in population size across ZCTAs, all analyses were weighted by ZCTA population. Based on the above analysis, we constructed a parsimonious index retaining items that had a partial correlation above 0.60. Our final step was to use the factor loadings to construct weighted factor scores for each index. Pairwise correlations indicate that this SDI is, as expected, positively and significantly ($p<.01$) associated with mortality, low birth weight, infant mortality, diabetes prevalence, and ambulatory care sensitive hospitalizations. The relationship between social deprivation and poor health outcomes and access is reliable and strong at this level of geography. Given efforts to improve shortage and underservice designations in the U.S., and the rational service area definitions to which these are tied, this composite SDI measure offers potential use as a geographic planning and resource-allocation tool that reflects how services are currently delivered and accessed.

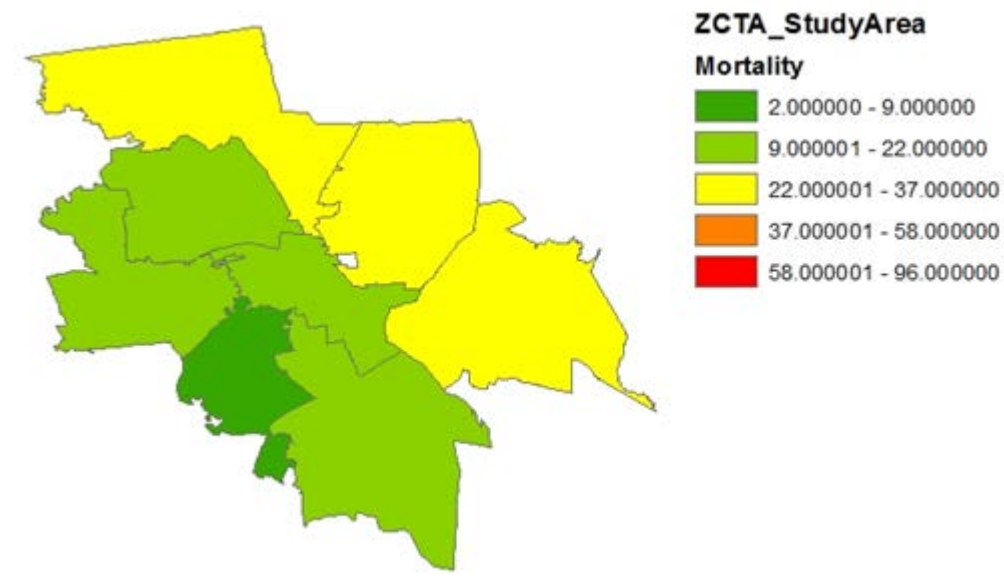
[89] *See e.g.*, *http://wonder.cdc.gov/wonder*.

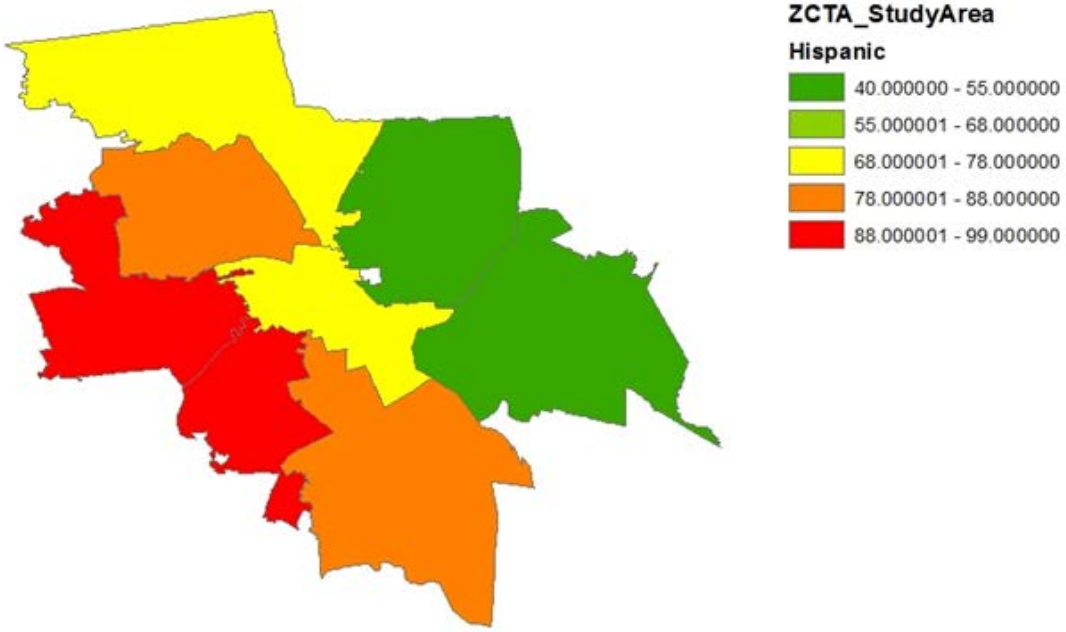

Social Deprivation Scores for Zip Code Tabulation Areas in Providence, Rhode Island
Social Deprivation Index Score
1 to 5
6 to 10
10 to 15
15 to 20
20 to 25

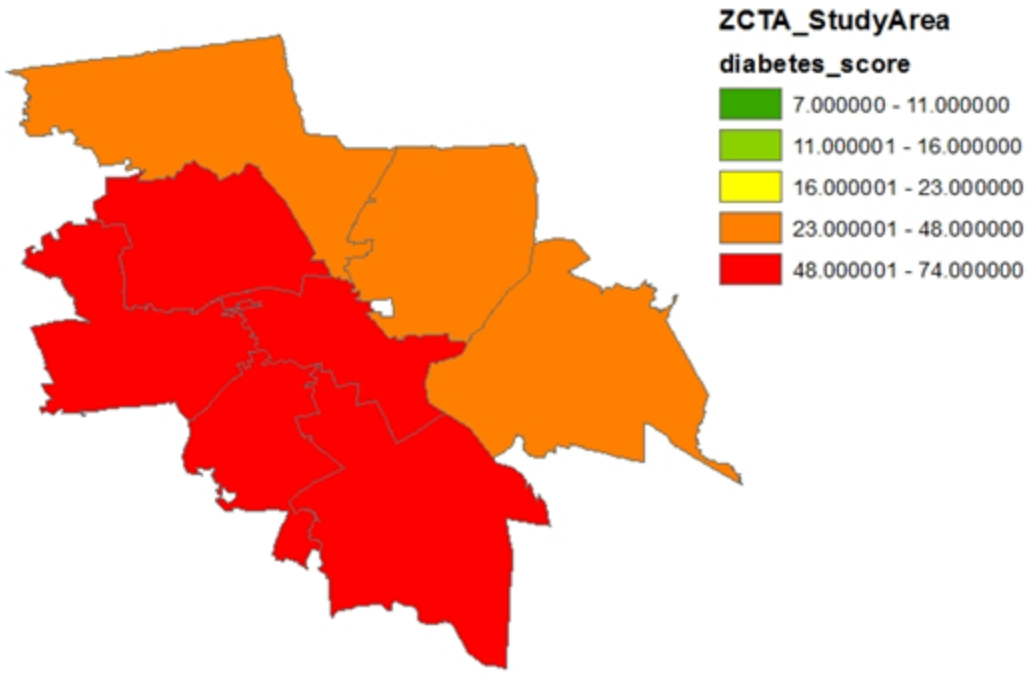

Observed to Predicted Medicare Enrollee Cost in Providence, Rhode Island
Observed To Predicted
Cost in Dollars
-1,290 to -628
-628 to -333
-333 to 83
83 to 500
500 to 1,195
No Data, or Not in Study Area


Observed to Predicted Hospitalizations (ACS) in Providence, Rhode Island
Observed To Predicted
Hospitalization Events
-16.25 to -12.2
-12.2 to -8.13
-8.13 to -4.1
-4.1 to 0
0 to 4.1
No Data, or Not in Study Area


ZCTA_StudyArea
Low Birth Weight
6.000000 - 12.000000
12.000001 - 18.000000
18.000001 - 26.000000
26.000001 - 70.000000
70.000001 - 92.000000


ZCTA_StudyArea
Mortality
2.000000 - 9.000000
9.000001 - 22.000000
22.000001 - 37.000000
37.000001 - 58.000000
58.000000 - 96.000000


ZCTA_StudyArea
Hispanic
40.000000 - 55.000000
55.000001 - 68.000000
68.000001 - 78.000000
78.000001 - 88.000000
88.000001 - 99.000000


ZCTA_StudyArea
diabetes_score
7.000000 - 11.000000
11.000001 - 16.000000
16.000001 - 23.000000
23.000001 - 48.000000
48.000001 - 74.000000