Target Workforce State Report for Adirondack Health Institute PPS

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TABLE OF CONTENTS

Executive Summary ..... **iv**

I. Background and Purpose **1**

II. Overview of Target Workforce State Modeling Approach **3**

Health Care Demand Microsimulation Model 4

Common Modeling Inputs and Assumptions across DSRIP Projects 7

III. Impact of Changing Demographics and Expanded Medical Insurance Coverage on Provider Demand Independent of DSRIP **11**

IV. Anticipated PPS Workforce Impacts by DSRIP Project **16**

Project 2.a.iv: Create a Medical Village Using Hospital Infrastructure 17

Project 2.b.viii: Hospital-Homecare Collaboration Solutions 21

Project 2.d.i: Implementation of Patient Activation Activities to Engage, Educate and Integrate the uninsured and low/non-utilizing Medicaid populations into Community Based Care 24

Project 3.a.i: Integration of Primary Care and Behavioral Health Services 27

Project 3.a.ii: Behavioral Health Community Crisis Stabilization Services 30

Project 3.a.iv: Development of SUD Withdrawal Management Capabilities 33

Project 3.g.i: Integration of Palliative Care into the PCMH Model 35

V. Summary Workforce Impact Tables **38**

DSRIP Future State Workforce Staffing Impact Analysis 39

VI. Conclusions and Implications of Target Workforce State Analysis Findings **42**

VII. Technical Appendix **44**

TABLE OF EXHIBITS

Exhibit 1: Health Care Demand Microsimulation Logic Model 5
Exhibit 2: Summary of AHI PPS's Inpatient Market Share in NYS (2014) 8
Exhibit 3: Model Inputs: PPS Provider Staffing Patterns and Productivity 9
Exhibit 4: Nine County Projected Impact of Changing Demographics on Physician Demand, 2015 to 2020 12
Exhibit 5: Projected Impact of Changing Demographics FTE Physician Demand within AHI PPS's Network, 2015 to 2020 14
Exhibit 6: Projected Growth in Demand for Select Health Workers Between 2015 to 2020 Based on Changing Demographics and Expanded Insurance Coverage 15
Exhibit 7: Create a Medical Village: Projected Workforce Impact 20
Exhibit 8: Hospital-Homecare Collaboration: Projected Workforce Impact 23
Exhibit 9: Patient Activation Activities: Projected Workforce Impact 26
Exhibit 10: Integration of Behavioral Health into Primary Care: Projected Workforce Impact 29
Exhibit 11: Behavioral Health Community Crisis Stabilization Services: Projected Workforce Impact 32
Exhibit 12: Development of SUD Withdrawal Management Capabilities: Projected Workforce Impact 34
Exhibit 13: Integration of Palliative Care: Projected Workforce Impact 36
Exhibit 14: Total DSRIP Related PPS Workforce Impacts 38
Exhibit 15: Total Workforce Impact of DSRIP (2020) 40

EXECUTIVE SUMMARY

Goals of the DSRIP Target Workforce State Analysis

The Delivery System Reform Incentive Payment ("DSRIP") program aims to transform and redesign the existing health care system via the creation of integrated care delivery systems across the continuum of care, implementation of a value-based payment system and facilitation of workforce realignment and training. It is expected that DSRIP will achieve a number of improvements in the health care system, and one of the state goals is to reduce avoidable hospital admissions by 25%.

To reach these goals, Adirondack Health Institute (AHI) PPS requires information on the current adequacy of health workforce supply in its service area, including how the demand for health care services and health professions is projected to evolve in relation to current supply and the development needs of DSRIP projects. Identifying the gap between current supply and projected future target state workforce needs will inform implementing a transition road map to guide workforce realignment and training to close the gap.

AHI PPS engaged the Center for Health Workforce Studies (CHWS), in collaboration with IHS, Inc. (IHS), to define the target workforce state through the analysis of workforce impacts as a result of system transformation and implementation of clinically integrated programs. The PPS's target workforce state was created in collaboration with the PPS's Workforce Governance Body and included input from providers within the PPS's partner network.

AHI PPS plans to implement eleven projects under DSRIP, focusing on the provision of high quality, integrated primary, specialty and behavioral health care services in outpatient and community settings with acute care hospitals used primarily for emergent and acute care service delivery. Based on findings from the PPS-sponsored community needs assessment (CNA) the PPS selected five system transformation projects (Domain 2), four clinical improvement projects (Domain 3), and two population-wide prevention projects (Domain 4).

The primary research questions that guided modeling the workforce impact of each DSRIP project include:

1. How many patients will be affected by this intervention?
2. What are the current health care utilization patterns of affected patients, and how will this initiative change care utilization patterns?
3. What mix of providers will be used to implement the intervention and meet future patient demand for services?
4. Will the project as designed materially impact the region's healthcare delivery workforce?

Key Target Workforce State Analysis Findings

Through 2020, the demand for health workers within the AHI PPS network will change as individual DSRIP components are implemented and select trends external to DSRIP evolve. As a result, it is worth noting that although this analysis has been conducted using the most topical data and sophisticated modeling tools, the materiality of these potential impacts given the multitude of factors impacting future healthcare workforce remains uncertain.

Exhibit ES 1 below summarizes estimated target workforce state staffing impacts by 2020 of DSRIP-related projects and demographic and healthcare coverage changes independent of DSRIP across select AHI PPS care settings and key job categories. In some cases non-DSRIP impacts offset or moderate the effects of DSRIP while in other cases they magnify DSRIP workforce impacts. Notable projected impacts across the AHI PPS include:

- By 2020, the combined impacts of a growing and aging population, expanded medical insurance coverage under ACA and DSRIP implementation will increase demand for health care providers modeled by approximately 695 FTEs
    - Independent of DSRIP workforce demand is projected to grow by approximately 403 FTEs
    - The projected impact of DSRIP implementation alone is estimated to increase demand for health providers modeled by approximately 292.5 FTEs
- The largest workforce impacts of both DSRIP and changes independent of DSRIP are projected to take place among registered nurses in hospital inpatient settings, and non-nursing care coordinators and primary care providers and medical support staff in outpatient and community-based settings. Estimated changes in demand among other health professions are less significant.
    - Net demand for registered nurses is estimated to decrease by about 49 FTEs, as anticipated DSRIP related declines of about 162 FTEs, primarily in hospital inpatient settings, are offset by growth in demand for registered nurses due to non-DSRIP related environmental factors (113 FTEs)
    - DSRIP related demand for non-nursing care coordinators is projected to rise by about 134 FTEs
    - In the home health setting, the analysis indicates an increase of approximately 45 FTEs for registered nurses and a 52 FTE increase for home health aides. For personal care aides, a projected increase of approximately 60 FTEs due to DSRIP is expected
    - In the long term and residential care setting, the increase in demand is driven by the non-DRSIP effects, and includes a 94 FTE increase in demand for nurse aides
    - An estimated additional 104 FTE administrative support staff and 115 FTE medical assistants may also be required in primary care and other outpatient settings to support primary care providers, psychiatrists and other medical and behavioral health specialties meet both DSRIP related needs and those associated with population growth and aging and expanded medical insurance coverage under ACA.

Target Workforce State Analysis Conclusions

The purpose of this report is to describe the anticipated system transformation and to quantify the estimated DSRIP and non-DSRIP related impacts on future AHI PPS workforce needs. AHI PPS is implementing projects under DSRIP based to a large extent on population healthcare needs identified by the PPS community needs assessment.

The demand for health care services and providers within the AHI PPS network will change over time independent of any DSRIP impact. Independent of DSRIP, demand for physicians and other health professions in AHI PPS's service area will grow. As a result, these projections suggest that any DSRIP-related changes in demand need to be taken into account in the context of broader trends affecting the demand for health care services and providers within AHI PPS's service area. In some cases non-DSRIP impacts will likely offset or moderate the effects of DSRIP while in other cases they may magnify DSRIP workforce impacts.

Under DSRIP, large increases are anticipated in numbers of care coordinators, and primary care providers and support staff which reflects the enhanced demand for these professions within a transformed delivery system. There will likely also be opportunities to redeploy and train hospital nursing and other staff currently in inpatient and ED settings where service demand is projected to decline to assume roles in outpatient and community-based settings where demand is projected to grow.

Although the estimated workforce impacts of several DSRIP projects do not appear significant, they help explain how DSRIP goals, including reductions in potentially preventable use, might be achieved through improved access to primary care, behavioral health services, and care coordination for patients with chronic conditions. Additionally, this analysis does not take into account current existing provider shortages in the AHI PPS network.

In conclusion, based on the best available modeling inputs and assumptions, results suggest that implementing DSRIP as designed will likely materially impact the AHI PPS network and healthcare delivery workforce, especially when combined with the projected impacts of demographic shifts and expanded health insurance coverage. This information will be used to inform development of a workforce transition plan and gap analysis intended to guide attainment of the AHI PPS future state.

ES 1: AHI PPS Summary of Projected DSRIP Staffing Impacts (DY1 to DY5)

Target State Analysis			
Setting and Job Category	**Non-DSRIP change in FTE demand**	**DSRIP change in FTE demand**	**Total change in FTE requirements**
Primary care and community-based clinics			
Primary care providers	18.5	47.5	66
Cardiologists	4	0	4
Endocrinologists	1	0	1
Psychiatrists/psych nurses	-0.5	4	3.5
Psychologists	0	0	0
Clinical social workers	0	37.5	37.5
Registered nurses	13.5	40.5	54
Medical assistants	32.5	82	114.5
Administrative support staff	23	81	104
Emergency department			
Emergency physicians	0.5	-3.5	-3
Nurse practitioners & physician assistants	0	0	0
Registered nurses	2	-14.5	-12.5
Hospital inpatient			
Hospitalists	1	-19	-18
Registered nurses	69	-222.5	-153.5
Licensed practical nurses	9	-12	-3
Nurse aides/assistants	15.5	-56.5	-41
Home health			
Registered nurses	9.5	35	44.5
Licensed practical nurses	2.5	0	2.5
Home health aides	20.5	31	51.5
Personal care aides	39.5	59.5	99
Long term and residential care			
Registered nurses	19	0	19
Licensed practical nurses	22.5	0	22.5
Nurse aides	94	0	94
Advanced practice palliative care provider (NP & PA)	0	39.5	39.5
Pharmacists	6.5	0	6.5
Care managers/coordinators/ navigators/coaches			
Youth and family therapists	0	7	7
Addiction counselors	0	3	3
Care coordinators (non-RN/navigators/CHWs)	0	133.5	133.5
Peer support staff	0	20	20
Maintenance/IT support staff	0	2.5	2.5
Total FTEs	403	292.5	695.5
Registered nurse total change	113	-161.5	-48.5

I. BACKGROUND AND PURPOSE

The goal of the Delivery System Reform Incentive Payment (DSRIP) Program is to encourage health care system redesign and promote collaboration across providers and community-level partners to improve patient health and reduce avoidable inpatient admissions and emergency department (ED) visits. The New York State DSRIP target is to achieve a 25% reduction in avoidable hospital use among the Medicaid population by 2020. Of the 6.4 million emergency visits in New York in 2013, an estimated 4.6 million (72%) were potentially preventable.[1]

Driven by a community needs assessment, each Performing Provider System (PPS) selected DSRIP-approved projects. Gaps identified in community needs are the result of workforce related challenges including the inequitable distribution of health care resources, a lack of access to primary care and behavioral health providers, a lack of coordination across providers and community based organizations, and insufficient cultural and linguistic competencies in place to serve the needs of demographically diverse populations.

Many DSRIP projects have been developed to address identified health care service gaps with a number of projects specifically addressing the provision of improved access to outpatient primary care and behavioral health providers, as well as substance abuse treatment programs, outside of the hospital setting. As a result, the target workforce state is expected to see an investment in and the expansion of resources and programs for the provision of primary care, behavioral health, and substance abuse services that will increase the number of physicians and staff needed to support the expanded care offerings.

Each PPS consists of a partner network of health care providers across multiple care delivery settings involving a mix of health occupations, medical specialties, and support staff. In addition to addressing workforce shortages, the DSRIP program requires each PPS to undergo system transformation that will inherently impact the health care workforce including the retraining and redeployment of existing staff and, the hiring of new staff. The goal of modeling the target workforce state is to inform the PPS's workforce strategy for ensuring a smooth transition from the current workforce state to the target workforce state in line with DSRIP goals and the proposed implementation of PPS's specific DSRIP projects.

The purpose of this report is to describe the anticipated transformation of the existing health care system as the PPS implements the chosen DSRIP projects and to quantify the anticipated implications on the PPS's workforce needs. The target workforce state analysis described here is part of the DSRIP Workforce Strategy Milestones. This analysis identifies new positions and staffing needs, and informs the PPS's overall workforce strategy throughout the five year program.

Adirondack Health Institute (AHI) PPS engaged the Center for Health Workforce Studies (CHWS), in collaboration with IHS, Inc. (IHS), to define the target workforce state through the analysis of workforce

[1] New York State Department of Health. New York State All Payer Emergency Room Visits, 2013. Published March 2015. https://www.health.ny.gov/statistics/sparcs/sb/docs/sb8.pdf

impacts as a result of system transformation and implementation of clinically integrated programs. The PPS's target workforce state was created in collaboration with the PPS's Workforce Committee and included input from project managers within the PPS's partner network.

The target workforce state as defined within this report has been developed to align with DSRIP program goals. It takes into consideration the current state of the workforce as well as the demand for health care services and providers in the AHI PPS service area as a result of general population growth and aging over the next five years. The target workforce state will be used in a detailed gap analysis between the PPS's identified current and target workforce state to inform development and implementation of the workforce transition roadmap. The approach used to define the PPS's target workforce state as well as summary findings, observations, and considerations are detailed within the body of this report and a technical appendix.

II. OVERVIEW OF TARGET WORKFORCE STATE MODELING APPROACH

Modeling the future workforce required under system transformation and taking into account other external trends was accomplished using a combination of existing workforce modeling tools, original data analysis, findings from the published literature, information on the population served and current health care use patterns within New York State and the PPS service area, and expert opinion from PPS project leads and the modeling team. The analysis required modeling the likely impact of each DSRIP project individually and jointly (as many DSRIP projects overlap in terms of participating patients and health utilization goals). The modeling tools and analyses were adapted to reflect the characteristics of the DSRIP target population and the nature of each DSRIP project.

Four key dimensions for modeling the future workforce needs required under the target state include:

1. **Health care services providers and support staff.** The right mix of health care providers and support staff is needed to ensure that patients have access to services and the efficient delivery of such services. Hence, modeling efforts require understanding the types of services that patients will require and the staffing patterns for care delivery. The occupation categories modeled are defined by the Department of Labor's Standard Occupational Classification (SOC) system.

2. **Care delivery settings.** The level of services used and staffing by care delivery setting helps inform where providers and support staff are needed to meet patient service needs and help control health care costs. Key settings include hospital inpatient, emergency, and outpatient/clinic care; ambulatory care at provider offices; and home-based care.

3. **Geography.** The geographic location of providers should be consistent with patient needs to ensure access to care. For the AHI PPS, the relevant geographic area Clinton, Essex, Franklin, Fulton, Hamilton, St. Lawrence, Saratoga, Warren and Washington counties.

4. **Evolving needs.** Workforce needs will evolve over time (2015 through 2020) as a result of general population growth and aging. Identifying how these needs will evolve helps to inform the appropriate timing for transitioning from the PPS's current state to the target workforce state.

While the PPS's performance metrics are measured on services provided to the Medicaid population, the PPS partner network (e.g., hospitals, clinics, and participating physicians) serves a broader patient population that encompasses Medicaid, Medicare, commercially insured, and uninsured/self-pay patients. Likewise, some DSRIP initiatives will impact both Medicaid and non-Medicaid patients as systematic changes in care delivery are implemented. Therefore, modeling future workforce needs requires understanding how both DSRIP and non-DSRIP trends will affect the entire patient population.

The target workforce state modeling effort was conducted in collaboration with the PPS's Workforce Committee, Project Leads, and Project Managers and included the review of supporting PPS literature, the PPS's DSRIP Project and Organizational Applications, and quarterly implementation reports submitted to the NYS Department of Health. Through the synthesis and application of all collected data inputs, the target workforce state was modeled to project DSRIP impacts on the current workforce and identify future state workforce needs to reflect proposed PPS system transformation initiatives under DSRIP. Preliminary results were shared with PPS stakeholders and refined based upon informed feedback.

The complexity of this modeling effort required the use of data from multiple sources and the use of modeling tools. Data used in the analysis comes from local, state and national surveys (e.g., Behavioral Risk Factor Surveillance System [BRFSS]), medical claims databases (e.g., New York's Statewide Planning and Research Cooperative System [SPARCS]), published literature, and IHS's Health Care Demand Microsimulation Model (HDMM). An overview of the HDMM and key data sources is provided below, with additional detail on modeling individual DSRIP projects discussed in a technical appendix.

Health Care Demand Microsimulation Model

The workforce model described within this subsection is unique in its approach, breadth and complexity. Health workforce projection models have been used for decades to assist with workforce planning and to assess whether the workforce was sufficient to meet current and projected future demand (or need) at the local, regional, state, and national levels. The model described applies a microsimulation approach where individual patients are the unit of analysis. This model is used by the Federal Bureau of Health Workforce to model physicians, advanced practice nurses, physician assistants, nurses, behavioral health providers, and other health occupations at the national and state level.[2] The model has been used by states to assess the adequacy of provider supply at the state, regional, and county level.[3]

The model has also been used by professional associations and other organizations to analyze trends and policies with workforce implications.[4] In addition, the model has been used at the local level to help hospitals and health systems with market assessment and workforce planning.

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[2] See various reports published at http://bhpr.hrsa.gov/healthworkforce/supplydemand/index.html

[3] See, *Florida Statewide and Regional Physician Workforce A: Estimating Current and Forecasting Future Supply and Demand*. Prepared for the Safety Net Hospital Alliance of Florida. 2015. http://safetynetsflorida.org/wp-content/uploads/Jan-28-IHS-Report-PDF.pdf

[4] Examples include:

The Complexities of Physician Supply and Demand: Projections from 2013 to 2025. Prepared for the Association of American Medical Colleges. Washington, DC: Association of American Medical Colleges; 2015. https://www.aamc.org/download/426242/data/ihsreportdownload.pdf

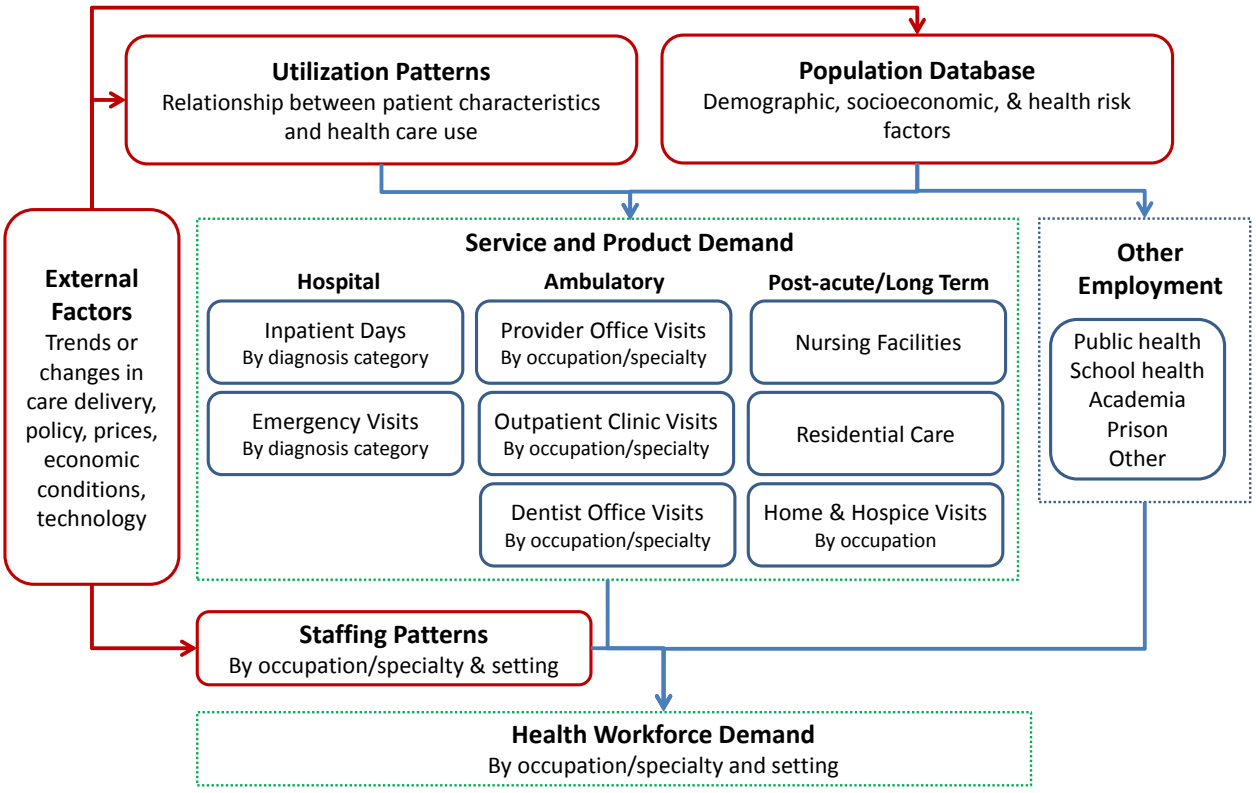
Dall TM, Gallo PD, Chakrabarti R, West T, Semilla AP, Storm, MV. An Aging Population and Growing Disease Burden Will Require a Large and Specialized Health Care Workforce by 2025. *Health Affairs*. 2013; 32:2013-2020.

Dall TM, Chakrabarti R, Storm MV, Elwell EC, and Rayburn WF. Estimated Demand for Women's Health Services by 2020. *Journal of Women's Health*. 2013; 22(7): 643-8.

Dall TM, Storm MV, and Chakrabarti R. Supply and demand analysis of the current and future US neurology workforce. *Neurology*. 2013; 81(5): 470-478.

The HDMM models demand for health care services and providers. Demand is defined as the health care services (and providers) that are likely to be used based on population characteristics, care use, and delivery patterns. The logic model describing the HDMM and a summary description of its major components are depicted below. The HDMM is comprised of three major components: (1) a population database with demographic, socioeconomic and information regarding health risks and disease prevalence for each person in a representative sample of the population being modeled; (2) health care utilization patterns that reflect the relationship between patient characteristics and health care use; and (3) staffing patterns that convert estimates of health care service demand to estimates of provider demand.

Exhibit 1: Health Care Demand Microsimulation Logic Model



1. **Preparing the Population Database.** The database prepared for the HDMM contains a representative sample of the population in each county. The population profile in this representative sample is comprehensive of all insurance types (Medicare, Medicaid, commercial, and uninsured); population demographics (age, sex, race, and ethnicity); household income level; health risk factors including body weight status (normal, overweight, and obese); current smoker status; and presence or history of chronic disease (hypertension, coronary heart disease, diabetes, arthritis, asthma, history of heart attack, history of stroke, and history of cancer). For modeling purposes, estimates for the Medicaid population were scaled to the approximately 143,640 Medicaid beneficiaries attributed to the PPS.

Estimates for the Medicare, commercially insured, and uninsured populations were scaled using estimates of the PPS's market share for each payer type.

Information to create this database comes from both New York-specific sources such as SPARCS, New York's Department of Health, and national sources such as the Center for Disease Control and Prevention's Behavioral Risk Factor Surveillance System[5] and the Census Bureau's American Community Survey (ACS)[6]. Summary prevalence statistics of health risk factors for the created population file were compared to published sources to ensure the sample is representative of the population. Population projections (by county) through 2020 are from the Cornell Program on Applied Demographics in Ithaca, NY.[7]

2. **Developing health care utilization forecasting equations.** Patterns of health care services utilization behavior reflect patterns for people with similar demographics, insurance status and health risk factors in the pooled 2009-2013 files (n~169,000) of the Agency for Health Care Research and Quality's Medical Expenditure Panel Survey (MEPS). MEPS is nationally representative of the U.S. non-institutionalized population. Several hundred prediction equations are built into the simulation model. Each prediction equation was estimated using regression[8] analysis, with separate prediction equations for each combination of care delivery setting, medical specialty, and children versus adults. The dependent variables in the regressions reflect annual use of health care services, while the explanatory variables consists of the demographic characteristics, health risk factors, medical conditions, and socioeconomic factors described previously. Applying these prediction equations to the population in the nine counties AHI PPS serves produces estimates of the current and projected future demand for health care services by care delivery setting, given the characteristics and health risk factors among the community modeled.

   Aggregating these estimates across individuals provides an estimate of the level of health care services that would be used by a national peer group of the population in each county. Estimates of health care utilization from this national peer group were compared to actual health care use statistics to calibrate the model (reflecting that health care use patterns of people in the nine counties can differ from national patterns, controlling for demographics, disease prevalence, and other health risk factors). Also, the population in each county might receive some care outside the county and some care provided in the PPS service area is for patients who reside outside of the counties AHI PPS serves.

[5] http://www.cdc.gov/brfss/

[6] https://www.census.gov/programs-surveys/acs/

[7] https://pad.human.cornell.edu/counties/projections.cfm

[8] Poisson regression was used to model annual numbers of physician office and outpatient visits with a particular provider type, inpatient days per hospitalization and annual home health/hospice visits. Logistic regression was used to model annual probability of hospitalization and emergency department use for approximately 24 diagnosis categories defined by primary diagnosis code (e.g., hospitalization for a cardiovascular condition).

3. **Modeling Full Time Equivalent (FTE) Staffing to Meet Demand for Health Care Services.** The number and mix of health care professionals required to provide the level of health care services demanded is influenced by how the care system is organized, how care is reimbursed, provider scope of practice requirements, economic constraints, and technology as well as other factors. The HDMM applies staffing patterns measured in terms of provider-to-workload measures (e.g., FTE family physicians per 1,000 office visits, or FTE emergency physicians per 1,000 ED visits). The model was further adapted to New York State by calibrating (scaling) demand projections by physician specialty to equal the state average level of care in 2014. Hence, the baseline demand projections reflect the level and mix of services in each county if that county's population had care use and delivery patterns consistent with the average across New York for a similar patient mix. Staffing levels associated with individual DSRIP projects, described later, came from the published literature and PPS documents.

Common Modeling Inputs and Assumptions across DSRIP Projects

While each DSRIP project has its unique modeling assumptions and data inputs, common modeling assumptions and inputs apply across some projects. These include parameters for identifying the PPS's market share of service utilization and provider staffing patterns and productivity.

Parts of the future state analysis were modeled at the county level due to availability of data on the population and prevalence of disease and other health risk factors. AHI PPS provided inpatient and outpatient discharges for their service area, sourced from New York State's Statewide Planning and Research Cooperative System (SPARCS). Exhibit 2 summarizes AHI PPS's market share information by inpatient and outpatient in the counties served by the PPS network. For the analysis, inpatient market share was used for providers who work primarily in an inpatient setting, and outpatient market share was used for providers who work primarily in an outpatient setting.

Exhibit 2: Summary of AHI PPS's Inpatient Market Share in NYS (2014)

Inpatient		Medicare	Medicaid	Other	Totals
	Clinton	97%	96%	91%	95%
	Essex	92%	90%	86%	90%
	Franklin	95%	88%	92%	93%
	Fulton	41%	49%	23%	36%
	Hamilton	52%	50%	41%	48%
	Saratoga	12%	14%	9%	11%
	St. Lawrence	53%	50%	61%	55%
	Warren	84%	79%	69%	79%
	Washington	77%	75%	58%	71%

Outpatient[9]		Medicare	Medicaid	Other	Totals
	Clinton	76%	94%	92%	90%
	Essex	80%	82%	72%	74%
	Franklin	91%	94%	90%	91%
	Fulton	56%	78%	30%	40%
	Hamilton	67%	67%	45%	51%
	Saratoga	12%	15%	9%	10%
	St. Lawrence	50%	43%	58%	55%
	Warren	88%	88%	77%	81%
	Washington	81%	84%	69%	74%

Exhibit 3 summarizes information about anticipated staffing patterns and provider productivity used for modeling these impacts across DSRIP projects. The PPS was the primary data source used to model the workforce implications of various DSRIP projects. When PPS-specific data was unavailable, other data sources were used including the National Ambulatory Medical Care Survey (NAMCS, national data), the National Hospital Ambulatory Medical Care Survey (NHAMCS, national data), and the Medical Group Management Association (MGMA).

[9] Hospital only clinic data

Exhibit 3: Model Inputs: PPS Provider Staffing Patterns and Productivity

Modeling Input	Parameter	Source
Proportion of primary care office visits seen by		
Primary care doctor	97.1%	1
Nurse practitioner	3.1%	1
Physician assistant	4.6%	1
Proportion of emergency visits seen by		
Emergency physician	92.4%	2
Nurse practitioner	3.5%	2
Physician assistant	4.6%	2
Annual patient visits per FTE provider (productivity)		
Primary care doctor	3,741 (2,993*)	3
Office-based nurse practitioner	3,185 (2,548*)	3
Office-based physician assistant	3,670 (2,936*)	3
Emergency physician	1,973	3
ED-based nurse practitioner	2,572	3
ED-based physician assistant	1,910	3
Hospitalist (assume 1 patient encounter/day)	2,008	3
Annual ratio of total patient visits/days per FTE provider (note: not all patients will necessarily see this provider during their visit/stay)		
Office-based visits per FTE registered nurse	4,469	4
ED visits per FTE registered nurse	612	4
Inpatient days per FTE registered nurse	168	4
Inpatient days per FTE licensed practical nurse	2,939	4
Inpatient days per FTE nurse aide	667	4
Support staff		
Direct medical support	1.75 x PCP	5
Direct admin support	1.25 x PCP + 0.75 x BHP	5

Notes: FTE=full time equivalent, PCP=primary care provider, BHP=behavioral health provider. Sources: [1] 2012 National Ambulatory Medical Care Survey; [2] 2011 National Hospital Ambulatory Medical Care Survey; [3] 2014 Medical Group Management Association median visits/FTE provider (with * indicating the number was scaled by 80% to reflect differences in average panel size between MGMA providers and PPS desired panel size). [4] National health care use (visits, days) ÷ FTE providers in that setting, 2013. [5] Cherokee Health Systems.
http://c.ymcdn.com/sites/www.tnpca.org/resource/resmgr/Leadership_Conference_2014/IntegrationofBehavioralHealt.pdf

Based on analysis of the NAMCS, patients who visit a primary care provider are seen by a physician in 97.1% of visits, by a nurse practitioner (NP) in 3.1% of visits, and by a physician assistant (PA) in 4.6% of visits. Note that the sum of these percentages exceeds 100%, reflecting that some patients will be seen by multiple providers during the visit. Analysis of the NHAMCS provides estimates of the providers seen by a patient during each emergency department (ED) visit.

The MGMA reports that median patient encounters per year by one family medicine physician providing ambulatory services in the Eastern Region of the U.S. was 3,741. This number suggests that every 3,741 office visits equates to approximately one physician FTE.[10] Note that a general pediatrician in the Eastern Region has a similar number of annual patient encounters of 3,725 per year. Likewise, MGMA data suggest that the median number of patient encounters per emergency physician in the Eastern Region is 1,973 patient encounters per year. Estimates for NPs and PAs in primary care settings are based on MGMA estimates in the Eastern Region, while NP and PA productivity in emergency care settings are based on national medians as the sample size was too small to obtain estimates for the Eastern Region.

Feedback from PPS leadership found that the MGMA data might overstate the number of patient encounters in the PPS for primary care providers. First, patients cared for by PPS providers might be higher acuity than the typical patient panel of providers covered by the MGMA survey. Second, and related, the recommended panel size for the typical MGMA primary care physician is 1,900-2,000, whereas for PPS providers under a patient-centered medical home model the recommended panel size is 1,500-1,800. To help address this issue, for modeling purposes we scaled the MGMA productivity numbers for primary care providers by 80%.

For some occupations we used national ratios to estimate staffing levels. For example, dividing total national office visits by estimates of FTE registered nurses (RN) practicing in an office setting suggests that one FTE nurse is required for every 4,469 visits (reflecting that not every patient visit will involve a nurse). Similar national ratios were estimated for staffing levels of nurses in hospital settings.

[10] Provider compensation: 2014 report based on 2013 data. Data extracted from MGMA DataDive.

III. IMPACT OF CHANGING DEMOGRAPHICS AND EXPANDED MEDICAL INSURANCE COVERAGE ON PROVIDER DEMAND INDEPENDENT OF DSRIP

The demand for health care services and providers within the PPS network will change over time independent of the anticipated DSRIP impact. A growing and aging population will impact health care utilization and care delivery over time and will influence how the PPS and its partners provide care to patients within the network.

Using the HDMM, we simulated the projected change in demand for physician specialties and other health occupations in each NYS county included in AHI PPS's service area based on projected population characteristics independent of DSRIP across all patients regardless of insurance status. These projections were then scaled to the PPS based on its estimated market share (in each of nine counties, according to the portion AHI PPS is responsible for) of inpatient discharges by payer.

Much of the growth is driven by the growing and aging Medicare population. Exhibit 4 summarizes the projected total impact on physician demand between 2015 and 2020, across the entirety of the nine counties served by AHI PPS, of changing demographics and expanded medical insurance coverage resulting from the Affordable Care Act. The projections illustrate that across the nine relevant counties total physician demand is projected to grow by approximately 112 FTEs between 2015 and 2020 independent of the effects of DSRIP. AHI PPS's share of this total physician demand growth (driven by utilization in AHI PPS's share in each of the nine counties) is projected to be approximately 50 FTEs (Exhibit 5). AHI PPS's demand for primary care specialties independent of DSRIP is projected to grow by approximately 13 FTEs based on current market share assumptions. These projections suggest that any DSRIP-related changes in physician demand need to be understood in the context of broader trends affecting the demand for health care services and providers.

Exhibit 4: Nine County Projected Impact of Changing Demographics on Physician Demand, 2015 to 2020

	Specialty	Clinton	Essex	Franklin	Fulton	Hamilton	Saratoga	St. Lawrence	Warren	Washington	Total
Primary Care	Total primary care	2.4	0.9	1.8	1.9	0	16	1.5	3.1	2.6	30.2
	Family medicine	0.7	0.3	0.6	0.5	0	4.1	0.3	0.7	0.7	7.9
	Internal medicine	2.1	0.8	1.5	1.5	0.1	10.8	1.4	2.2	2.3	22.7
	Pediatrics	-0.5	-0.2	-0.4	-0.2	-0.1	0.6	-0.3	0.1	-0.6	-1.6
	Geriatrics	0.1	0	0.1	0.1	0	0.5	0.1	0.1	0.1	1.1
	Hospitalists (primary care trained)	0.3	0.1	0.3	0.3	0	2.2	0.3	0.5	0.4	4.4
Medical Specialties	Allergy and immunology	0	0	0	0	0	0.4	-0.1	0	0	0.3
	Cardiology	0.8	0.3	0.5	0.5	0.1	4.1	0.6	1	0.8	8.7
	Critical care/pulmonology	0.2	0.1	0.2	0.2	0	1.3	0.2	0.3	0.2	2.7
	Dermatology	0.3	0.1	0.2	0.2	0	1.6	0.2	0.3	0.3	3.2
	Endocrinology	0.2	0.1	0.1	0.1	0	0.8	0.1	0.2	0.2	1.8
	Gastroenterology	0.3	0.1	0.2	0.2	0	1.5	0.1	0.2	0.3	2.9
	Infectious disease	0.1	0.1	0.1	0.1	0	0.8	0.1	0.2	0.2	1.7
	Hematology and oncology	0.3	0.1	0.2	0.2	0	1.4	0.2	0.3	0.3	3
	Nephrology	0.2	0.1	0.1	0.1	0	0.7	0.2	0.2	0.2	1.8
	Pediatric subspecialty	-0.2	-0.1	-0.1	-0.1	0	0.2	-0.1	0	-0.2	-0.6
	Rheumatology	0.2	0.1	0.1	0.1	0	0.6	0.1	0.1	0.1	1.4
Surgery	General surgery	0.3	0.1	0.2	0.2	0	1.7	0.2	0.3	0.3	3.3
	Colorectal surgery	0	0	0	0	0	0.1	0	0	0	0.1
	Neurological surgery	0.1	0	0	0	0	0.4	0	0.1	0.1	0.7
	Ophthalmology	0.5	0.2	0.4	0.4	0	2.6	0.4	0.6	0.6	5.7
	Orthopedic surgery	0.5	0.2	0.3	0.3	0	2.1	0.2	0.4	0.4	4.4
	Otolaryngology	0.1	0.1	0.1	0.1	0	0.9	0	0.1	0.1	1.5
	Plastic surgery	0.1	0	0.1	0.1	0	0.6	0	0.1	0.1	1.1
	Thoracic surgery	0.1	0	0	0	0	0.3	0	0.1	0.1	0.6
	Urology	0.3	0.1	0.2	0.2	0	1.4	0.2	0.3	0.3	3
	Vascular surgery	0.1	0	0	0	0	0.3	0	0.1	0.1	0.6
	Obstetrics and gynecology	-0.2	0	0	-0.1	-0.1	1.5	-0.2	0	-0.1	0.8

	Specialty	Clinton	Essex	Franklin	Fulton	Hamilton	Saratoga	St. Lawrence	Warren	Washington	Total
Other	Anesthesiology	1.1	0.4	0.6	0.6	0	4.6	0.4	0.9	1	9.6
	Emergency medicine	0	0	0.1	0.1	0	1.1	0	0.1	0	1.4
	Neurology	0.3	0.1	0.2	0.2	0	1.5	0.1	0.3	0.3	3
	Other medical specialties	0.3	0.1	0.2	0.2	0	2	0.1	0.4	0.3	3.6
	Pathology	0.1	0	0.1	0.1	0	0.9	0.1	0.2	0.1	1.6
	Physical med and rehab.	0.2	0.1	0.1	0.1	0	1.1	0.1	0.2	0.2	2.1
	Psychiatry	-0.1	-0.1	0.2	0	-0.1	1.6	-0.6	-0.1	0	0.8
	Radiology	0.7	0.3	0.5	0.4	0	3.5	0.3	0.6	0.7	7
	Total	17.7	6.7	13.4	12.8	-0.2	119.6	8	22.2	19.1	112.3

Exhibit 5: Projected Impact of Changing Demographics FTE Physician Demand within AHI PPS's Network, 2015 to 2020

	Specialty	FTEs
Primary Care	Total primary care	13
	Family medicine	3.5
	Internal medicine	10.5
	Pediatrics	-1.5
	Geriatrics	0.5
	Hospitalists (primary care trained)	1
Medical Specialties	Allergy and immunology	0
	Cardiology	4
	Critical care/pulmonology	1.5
	Dermatology	1.5
	Endocrinology	1
	Gastroenterology	1.5
	Infectious disease	1
	Hematology and oncology	1.5
	Nephrology	1
	Pediatric subspecialty	-0.5
	Rheumatology	1
Surgery	General surgery	1.5
	Colorectal surgery	0
	Neurological surgery	0.5
	Ophthalmology	2.5
	Orthopedic surgery	2
	Otolaryngology	0.5
	Plastic surgery	0.5
	Thoracic surgery	0.5
	Urology	1.5
	Vascular surgery	0.5
	Obstetrics and gynecology	0
Other	Anesthesiology	4.5
	Emergency medicine	0.5
	Neurology	1.5
	Other medical specialties	1.5
	Pathology	0.5
	Physical med and rehab.	1
	Psychiatry	-0.5
	Radiology	3
	Total	49.5

Exhibit 6 summarizes projected growth in FTE demand between 2015 and 2020 for select health professions, as well as the growth in demand for providers in the AHI PPS network. Similar to the

approach for developing PPS-specific physician FTE demand projections, these were also scaled to the AHI PPS based on its estimated market share across settings.

Independent of the effects of DSRIP, demand for registered nurses in the PPS service area is projected to be strong, growing by approximately 240 FTEs between 2015 and 2020. Strong growth in demand is also likely among nurse aides and home health aides and various therapist and licensed practical nurse titles. Applying the PPS market share to applicable settings, registered nurse demand will grow by approximately 113 FTEs (with nurse aides and home health aides growing by about 135 FTEs combined). Smaller impacts on future PPS demand across care settings are likely to be seen for a range of health occupations (e.g., technicians, technologists, therapy aides and assistants). The demand for psychologists is projected to decline by about 22-23 FTEs. This reflects that the population that has higher use of psychologist services (children and younger adults) is declining within the service area while the population that is growing (i.e., the elderly) uses fewer psychologist services.

Exhibit 6: Projected Growth in Demand for Select Health Workers Between 2015 to 2020 Based on Changing Demographics and Expanded Insurance Coverage

Health Profession	Service area total[a]	AHI PPS Network Impact						
		Inpatient	Emergency	Ambulatory	Home Health	Nursing Homes	Residential Care	Total
Registered nurse	240	69	2	13.5	9.5	14.5	4.5	113
Licensed practical nurse	87	9	0	4	2.5	21.5	1	38
Nurse aide	266	15.5	0	4.5		75	19	114
Home health aide	41.5	0	0	0	20.5	0	0	20.5
Pharmacist	16.5	0	0.5	6	0	0	0	6.5
Pharmacy technician	21	0	0.5	8	0	0	0	8.5
Pharmacy aide	3	0	0	1	0	0	0	1
Psychologist	-23	0	0	-22.5	0	0	0	-22.5
Chiropractor	4.5	0	0	1	0	0	0	1
Podiatrist	3	0	0	1.5	0	0	0	1.5
Dietitian	5.5	1	0	0.5	0	1	0	2.5
Optician	1	0	0	0	0	0	0	0
Optometrist	0.5	0	0	0	0	0	0	0
Occupational therapist	27.5	14.5	0	-2	0.5	1	0	14
Occupational therapist aide	4.5	2.5	0	-0.5	0	0	0	2
Occupational therapy assistant	4.5	2.5	0	-1.5	0	1	0	2
Radiation therapist	1.5	0.5	0	0	0	0	0	0.5
Radiological technologist	8	0	0	3	0	0	0	3
Respiratory therapist	6	1.5	0	1	0	0	0	2.5
Respiratory therapy technician	0.5	0	0	0	0	0	0	0
Medical clinical technician	4	0	0	1.5	0	0	0	1.5
Medical clinical lab technologist	13.5	5	0	1.5	0	0	0	6.5
Medical sonographer	12.5	5.5	0	1	0	0	0	6.5
Nuclear medicine technologist	21	1.5	3.5	0.5	0	0	0	5.5

Note: [a] Total across the following counties: Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, St. Lawrence, Warren, and Washington.

IV. ANTICIPATED PPS WORKFORCE IMPACTS BY DSRIP PROJECT

AHI PPS is implementing eleven projects under DSRIP. These projects support the DSRIP goals summarized above by focusing on the provision of high quality, integrated primary, specialty and behavioral health care in outpatient and community settings with acute care hospitals used primarily for emergent and acute care service delivery. Based on findings from the PPS-sponsored community needs assessment (CNA) the PPS selected five system transformation projects (Domain 2), four clinical improvement projects (Domain 3), and two population-wide prevention projects (Domain 4).

Transformation project 2.a.i involves creating a more integrated delivery system. A review of the literature on this topic suggests that better integration can allow some services currently performed by specialists to instead be performed by generalists; some services currently performed by physicians to instead be performed by non-physicians, and reduced duplication of tests.11 For purposes of this future state analysis we assume that better integration of the delivery system does not have an independent effect on health workforce needs. However, integrating the delivery system is necessary for other DSRIP projects to be successful in identifying patients for intervention and coordinating and managing care for these patients.

Project 2.a.ii focuses on the transformation of all safety net providers in primary care practices into NCQA (National Committee for Quality Assurance) 2014 Level 3 Patient Centered Medical Homes (PCMHs) or Advanced Primary Care Models by the end of demonstration year 3. Literature indicates that PCMH's improve quality of care, care coordination efforts and have a positive impact on patient health outcomes.[12] However, similar to project 2.a.i mentioned above, for the purpose of the future state analysis, we assume that efforts to achieve PCMH certification does not have an independent workforce impact, and that the flow down effects of successful PCMH conversion will not have an immediate impact on the workforce.

At this time, our analysis does not explicitly model the two population-wide prevention projects. One project involves strengthening mental health and substance abuse infrastructure (Project 4.a.iii). While 4.a.iii is not explicitly modeled, the goals and impacts of this project are in some cases aligned with other clinical improvement projects that are modeled (e.g., with Project 3.a.i: integrating primary care and behavioral health services, Project 3.a.ii: behavioral health community crisis stabilization centers and Project 3.a.iv: development of withdrawal management capabilities) including strengthening team settings and care coordination. Therefore the assumption is that workforce impacts associated with 4.a.iii will be captured in these projects mentioned above, and detailed below. The second population-wide prevention project, 4.b.ii: increasing access to high quality chronic disease care and management,

[11] Weiner, JP, Blumenthal, D, Yeh, S. The Impact of Health Information Technology and e-Health on the Future Demand for Physician Services. Health Affairs. November 2013. 32:11
http://www.michigan.gov/documents/mdch/The_Impact_of_Health_Information_Technology_and_e-Health_on_the_Future_Demand_for_Physician_Services_441001_7.pdf

[12] https://pcmh.ahrq.gov/sites/default/files/attachments/The%20Outcomes%20of%20Implementing%20Patient-Centered%20Medical%20Home%20Interventions.pdf

focuses on chronic obstructive pulmonary disease (COPD). AHI PPS's project plan application details the need for a community COPD coordinator and a team who will develop a COPD education program, as well as train and staff providers to implement it. Additionally, outreach educators are required. The assumption is that developing the COPD education programs will have minimal immediate workforce impact, and at present, there is minimal information around the patient caseloads that the outreach educators will be responsible for. Additionally, the project plan application indicates that this project will be implemented alongside project 2.a.ii, which may not have an immediate workforce impact. Thus, although AHI PPS does anticipate that 4.b.iii will have significant workforce impact (AHI PPS estimates that this project could decrease COPD admissions by approximately 23%) 13, this effect may not manifest in the short term.

This section of the report describes modeling of the remaining system transformation and clinical improvement projects and presents results. A technical appendix contains additional information on the data and assumptions. The primary research questions that guide modeling the workforce impact of each DSRIP project include:

1. How many patients will be affected by this intervention?
2. What are the current health care utilization patterns of affected patients, and how will this initiative change care utilization patterns?
3. What mix of providers will be used to implement the intervention and meet patient demand for services?

Summarized results include projected target state impacts on use of health care services by patients participating in each intervention, and level of care specific changes in how future care delivery will be staffed to meet patient care needs.

Project 2.a.iv: Create a Medical Village Using Hospital Infrastructure

AHI PPS plans to create three Medical Villages to take advantage of existing infrastructure to realign health system capacity and support the behavioral health, substance abuse and outpatient services needed in the communities.

UVM Health Network—CVPH in Plattsburgh:

1. Adult Mental Health Unit: Redesign hospital space of the Main Floor to create site to provide mental health services and meet State requirements.
2. Behavioral Health Transition Services: Renovate unneeded hospital space to create a site for post-discharge outpatient Transitional Behavioral Health Services in collaboration with

[13] AHI PPS communication to IHS

community behavioral health and addiction agencies/services. Warm handoffs from the acute phase will be established.

3. Outpatient Pharmacy: Renovate hospital vacated space for outpatient pharmacy services upon discharge from the inpatient mental health unit or ER setting.
4. Patient Navigator: Patient Navigators will assist with the patient transition of inpatient to outpatient and follow-up appointments to allow for a smooth transition of care.

Moses Ludington Hospital (MLH) in Ticonderoga:

3 Pillars:

1. Hospital 9M Renovation: MLH will de-certify all 15 inpatient beds and will renovate the existing MLH stand-alone ER and will also create an outpatient services center on the ILH outpatient campus under the new operation of The University of Vermont Health Network - Elizabethtown Community Hospital (ECH). The renovated space at ILH will have a new Emergency Department, 3 observation beds, and 4 treatment areas for emergency care, pharmacy services, laboratory services and radiology testing.
2. Primary Care: Expand primary care services and behavioral health integration by co-locating with HHHN. New addition and/or renovation to take place at Inter-Lakes Health.
3. LTC: Long Term Care Services will be provided by a new owner and operator (independent party) that Inter-Lakes Health is selling Heritage Commons Residential Health Care to.

Glens Falls Hospital in Glens Falls: Renovate existing hospital space into a community-based crisis care center, including 23-hour crisis stabilization beds and decertify 4 beds to establish space for outpatient resource. Create readily accessible behavioral health crisis services to adults and adolescents, supporting a rapid de-escalation of the crisis facilitated by the appropriate level of service and providers.

1. Support evaluation, triage and management for patients (adults and youth) that are experiencing acute psychotic episodes or otherwise unstable behavioral health.
2. Provide critical crisis stabilization services through clinical-community linkages.
3. Coordinate specialty care management for complex adult and pediatric patients, with clear linkages to the emergency department, hospital services, Health Home care coordination and community-based agencies.

The Medical Villages will support the DSRIP Project Plans by converting underutilized space to develop behavioral health, substance abuse and outpatient services needed in the communities. This will repurpose the physical assets and begin the transformation of traditional inpatient hospital space.

Behavioral health and substance abuse conditions are top drivers of ER visits throughout the PPS. By better utilizing existing infrastructure and developing stronger partnerships between providers, the Medical Villages will expand programing to mitigate the identified potentially preventable inpatient and emergency department utilization. The behavioral health programs will develop crisis stabilization and inpatient detoxification programs that do not currently exist in the region. The expansion of primary care will be PCMH certified and expand care management for chronic condition.

The following inputs and assumptions are used in this analysis:

- Three sites will participate in the program[14]
- Each patient may have 4 visits a year. This means the targeted engagement population could have approximately 20,000 visits a year[15]
- Assume national nurse productivity patterns in an office setting apply, an estimated 4.4 FTEs of nurses are required for 20,000 visits a year[16]
- Assume 0.5 care manager FTEs for every 1 PCP FTE[17]
- A demonstration that connected different types of organizations and providers as well as community resources via IT infrastructure reported the following outcomes, compared to the year before project implementation:[18]
    - Baseline average annual rates per patient of 1.1 ED visits, 0.5 hospitalizations, and 5.7 days/hospitalization
    - 29.7% reduction in ED visits
    - 28.5% reduction in hospital admissions

Examining the FTE effect by setting, changes in utilization suggest the following workforce implications to AHI PPS by 2020 (Exhibit 7):

- Approximately 3-4 FTE increase in care managers across the 3 facilities.
- **Office/outpatient setting**: Significant estimated workforce implications, including approximately 12-13 direct medical support FTEs that includes therapists and LCSWs to serve the village's focus on behavioral health. An estimated 7 primary care provider FTEs and approximately 4 RN FTEs may also be required.
- **In the inpatient and emergency settings:** FTEs associated with RNs are expected to decrease by approximately 24 FTEs and nurse aide FTEs reduce by 5-6 FTEs, with smaller changes seen in hospitalist, emergency physician and licensed practical nurse FTEs.

[14] AHI PPS communication
[15] IHS assumption informed by experience from similar analysis done in the same area
[16] For reference, national productivity pattern data is reported in Exhibit 3 of the report
[17] IHS assumption: care managers will also carry out the patient navigation tasks for this project
[18] https://www.pcpcc.org/initiative/newyork-presbyterian-regional-health-collaborative

The analysis suggests that project 2.a.iv's greatest impact on the PPS workforce will be on nurses and the FTEs associated with direct medical support. In the office and outpatient settings, there may be an additional 12.5 direct medical support FTEs required by 2020. Workforce FTEs in the ED and inpatient settings are anticipated to decline by about 33 FTEs, with a greater impact on the inpatient setting and specifically on the RNs, owing to this population receiving more care in the office and outpatient settings.

Exhibit 7: Create a Medical Village: Projected Workforce Impact

	2017	2018	2019	2020
Number of engaged patients	900	3,150	4,470	4,470
Projected DSRIP impact				
Emergency visits	-290	-1,030	-1,460	-1,460
Hospitalizations	-130	-450	-640	-640
Inpatient days	-730	-2,560	-3,630	-3,630
Workforce FTE implications				
Office/Outpatient				
Primary care providers	2	5.5	7	7
Direct medical support[19]	3	9	12.5	12.5
Direct admin support	2	6.5	9	9
Registered nurses	1	3	4	4
Care managers	1	2.5	3.5	3.5
Emergency Department				
Emergency physicians	0	-0.5	-0.5	-0.5
NPs & PAs	0	0	0	0
Registered nurses	-0.5	-1.5	-2.5	-2.5
Inpatient				
Hospitalists	-0.5	-1.5	-2	-2
Registered nurses	-4.5	-15	-21.5	-21.5
Licensed practical nurses	0	-1	-1	-1
Nurse aides	-1	-4	-5.5	-5.5
Care Managers	0	0	1.5	3.5

[19] IHS assumption that direct medical support includes therapists and LCSWs

Project 2.b.viii: Hospital-Homecare Collaboration Solutions

The Hospital to Home Care Collaborative Solutions project is designed to meet the needs of persons with chronic conditions, who are at high-risk of re-hospitalization following discharge. More than 100,000 residents in the largely rural service area are over age 65, many suffer from chronic conditions and lack adequate family or other care-giver supports. The target population is specifically defined as:

1. Patients determined to be high-risk for readmission based on predictive modeling software and/or provider/care manager referral.
2. Patients discharged from an acute care hospital following an inpatient stay, observation stay, or emergency room visit with one or more of the following conditions: diagnosed hypertension, CHF, pneumonia, diabetes, COPD/asthma, hearth failure, mental health or substance abuse disorders.
3. Patients readmitted within 30 days or 3 admissions within a six-month period.

The project will establish Rapid Response Teams to facilitate patient discharge to home and assure needed home care services are in place. Team members, including care managers and home care staff, will receive training in how to support evidence-based medicine and chronic care management, and how to identify and respond to patient risks for readmission. Some PPS partners have adopted the INTERACT model.

All PPS hospitals will address the medical conditions targeted for this project; however, each will phase-in interventions based on the prevalence of their respective readmission trends. To support the project AHI PPS will retrain and redeploy staff as care managers, navigators, and care coordinators. Care managers will assist with arranging follow-up appointments with primary care providers through expanded and enhanced centralized scheduling systems.

For modeling we make the following assumptions:

- Patients will receive on average 4.5 additional home visits per hospital discharge[20]
- AHI PPS project implementation plan indicates that this initiative will be carried out by a RN care managers/home health providers and home health aides[21]
- Using national patterns for home health staffing and care coordination, we assume each RN will care for approximately 217 patients per year and each home health aide for approximately 245 patients per year[22,23]

[20] Coalition for Evidence-Based Policy. Transitional Care Model – Top Tier http://evidencebasedprograms.org/1366-2/transitional-care-model-top-tier

[21] IHS assumes that care managers includes a blended staff such as LPNs, medical assistants, registered nurses

[22] http://www.nahc.org/assets/1/7/10hc_stats.pdf

[23] Home health care staffing productivity source: https://aharesourcecenter.wordpress.com/2013/09/04/home-health-productivity-in-average-visits-per-day/

- Based on a similar published intervention, we assume that patients would have 0.58 readmissions per year in the absence of the intervention, and 0.28 readmissions per year with the intervention (for a 52% reduction in readmissions)[20]; we assume 50% of avoided readmissions would have been through the emergency department (thus having workload implications for the emergency department as well as workers in an inpatient setting)
- Assumption around Personal care aides: The services from a PCA is approximately double that of a home health aide, reflecting patterns of national care[24]

Exhibit 8 details the potential impact of this program, upon complete implementation, by 2020:

- Readmissions will decrease by approximately 2,300
- Inpatient days will decline by approximately 11,700 days
- ED visits will reduce by 1,100 visits
- Home health visits will increase by 33,900 (reflecting an average of 4.5 visits per engaged patient)

[24] http://www.bls.gov/ooh/personal-care-and-service/personal-care-aides.htm IHS calculated the ratio of PCA to HHA

Exhibit 8: Hospital-Homecare Collaboration: Projected Workforce Impact

Year	2017	2018	2019	2020
Number of actively engaged patients	0	2,740	5,230	7,540
Projected DSRIP impact				
Readmissions	0	-800	-1,600	-2,300
Inpatient days	0	-4,300	-8,100	-11,700
Emergency visits	0	-400	-800	-1,100
Home health visits	0	12,300	23,500	33,900
Workforce FTE implications				
Emergency Department				
Emergency physicians	0	0	-0.5	-0.5
Nurse practitioners and physician assistants	0	0	0	0
Registered nurses	0	-0.5	-1.5	-2
Inpatient				
Hospitalists	0	-2	-4	-6
Registered nurses	0	-25.5	-48.5	-69.5
Licensed practical nurses	0	-1.5	-3	-4
Nurse aides	0	-6.5	-12	-17.5
Home health intervention				
RN care coordinators/home health	0	12.5	24	35
Home health aides	0	11	21.5	31
Personal care aides	0	21.5	41.5	59.5

Examining the FTE effect by setting, changes in utilization suggest the following:

- Findings suggest approximately 35 FTE RN care coordinators/home health providers and an additional 31 FTE home health aides to implement this intervention
- **In the ED setting**: No change to small decreases in FTEs associated with nurse practitioners and physician assistants, RNs and emergency physicians
- **In the inpatient setting:** FTEs associated with RNs are expected to decrease by approximately 69, and nurse aide FTEs reduce by 17 FTEs, with smaller changes seen in hospitalist (-6) and licensed practical nurse (-4) FTEs

According to the analysis, this projects greatest impact on workforce FTEs will be on the inpatient setting, and particularly on RNs and nurse aides, reflective of decreasing readmissions, which leads to a

reduction in inpatient days. The impact on the ED is expected to be minimal, while care coordination and home health services will require approximately 66 FTEs.

Project 2.d.i: Implementation of Patient Activation Activities to Engage, Educate and Integrate the uninsured and low/non-utilizing Medicaid populations into Community Based Care

This project focuses people not utilizing or underutilizing the health care system and works to engage and activate those individuals to utilize primary and preventive care services. AHI PPS will focus on engaging any individuals within the target population who are utilizing services in community based settings or are participating in community events. The main project goal is increasing access to care, and in support of that goal, closing gaps in care identified by the PPS community needs assessment and improving outcomes of uninsured and low and non-utilizing Medicaid beneficiaries in the AHI PPS service area will be important. Across the nine county regions, through the implementation of this project the subset of the total attributed population that is projected to be actively engaged is 66,230 patients by 2020.

To achieve these goals, the PPS will employ a multi-pronged approach including: outreach and patient identification; eligibility determination for, and enrollment in, healthcare coverage; and, patient activation, patient education, and linkages to care for all patients, regardless of insurance status. The project approach will leverage existing provider and community-based staff to improve patient engagement, as well as strengthen existing, and develop new, partnerships with entities providing primary care and preventive services to increase use of these services.

New access will likely increase service demand for primary care and preventive services and some specialty care and reduce inappropriate ED use and hospitalizations. In the short term (1-5 years) this initiative will likely increase use of health care services. In the long term the goal is to reduce avoidable disease onset and the associated use of health care services associated with such disease. Projected project effects by care setting include:

- **Ambulatory care settings (Health Homes, FQHCs, other)**: Staffing among PCPs, PCMH care managers, behavioral health counselors and other care coordinators likely will rise to accommodate increased numbers of enrolled uninsured and Medicaid patients at PCMHs, Health Homes and other ambulatory care settings.
- **Primary care physician settings**: Increased numbers of referrals due to better care management will require staffing increases among PCP providers to accommodate increased numbers of new patients.
- **Emergency department settings**: Outreach to establish a usual source of care with a primary care provider can help reduce avoidable emergency visits.

- **Inpatient care settings**: In the longer term, prevention has the potential to reduce or delay onset of chronic disease and the associated use of health care services associated with such disease
- **Community based organizations/non-clinical providers**: Involvement in community navigation activities and collaboration with clinical provider organizations for referral purposes could result in a need for increased staffing.

Findings from Greene and Hibbard's study on the relationship of patient activation and health-related outcomes were used for modeling assumptions and inputs for this project, as follows:[25]

- The study group in the lowest income tercile ($10,618 - $22,653) was used as a proxy for the Medicaid and uninsured population. Results for this specific group were used as inputs
- The difference in health-related outcomes between a patient who was level 1 activated (the lowest: individual does not believe patient role in care is important) and one who was level 2 activated (the second lowest level of activation) was used to present more conservative projections. Impacts were as follows
    - A decline of 15.3% in ED visits
    - A 19.1% decline in hospitalizations

Separate from Green and Hibbard's study, we assume the following:

- Approximately 30% of participating patients currently do not have a primary care provider and will have 2 additional primary care visits per year; and the remaining 70% of participating patients do have a primary care provider and will have 1 additional primary care visit per year.
- PPS communication indicates that community based organization (CBO) providers, such as care managers, CHWs, will be used to carry out this initiative. We assume the following:
    - Each CBO based provider will take care of 60 patients at any given time.[26] There are 40 hours in a work, this means that each community navigator works with each patient 2.7 hours per month, for a total of 720 patients a year

Exhibit 9 summarizes modeling results and projected target state impacts of this DSRIP clinical improvement project. By 2020 the net projected annual utilization impact associated with this DSRIP initiative is the following:

- Approximately 2,600 fewer inpatient days
- Approximately 2,400 fewer emergency visits
- Approximately 86,100 additional primary care visits

[25] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3326094/
[26] IHS assumption informed by experience from similar analysis done in the same area.

The projected workforce impacts by 2020 include:

- **In community based settings**: An estimated 92 FTEs associated with care management and patient navigation may be required to provide services to the 66,230 patients projected to participate in this intervention. The projected change in demand for community based services suggests an additional 39 primary care provider FTEs, 68 direct medical support and 48 admin support FTEs, and 19 staff RN FTEs will be required.
- **In the ED setting:** Small decrease in demand for emergency department staff FTEs, including a 1 FTE fewer emergency physicians and 4 fewer FTE RNs will be required.
- **In the inpatient setting:** An expected decline in demand for inpatient staff ranging from a 1 drop in licensed practical nurse FTEs to a 15-16 drop in staff RN FTEs

Exhibit 9: Patient Activation Activities: Projected Workforce Impact

	2017	2018	2019	2020
Number of actively engaged patients	8,000	40,000	56,000	66,230
Projected DSRIP impact				
Inpatient days	-300	-1,600	-2,200	-2,600
ED visits	-300	-1,400	-2,000	-2,400
Primary care visits	10,400	52,000	72,800	86,100
Workforce FTE implications				
Office/Outpatient				
Primary care providers	4.5	23.5	33	39
Direct medical support	8	41	57.5	68
Direct admin support	6	29.5	41	48.5
Registered nurses	2.5	11.5	16.5	19.5
Emergency Department				
Emergency physicians	0	-0.5	-1	-1
NPs and PAs	0	0	0	0
Registered nurses	-0.5	-2.5	-3.5	-4
Inpatient				
Hospitalists	0	-1	-1	-1.5
Registered nurses	-2	-9.5	-13	-15.5
Licensed practical nurses	0	-0.5	-0.5	-1
Nurse aides/assistants	-0.5	-2.5	-3.5	-4
Community based organization providers (care managers/ navigators/CHWs)	11	56	78	92

Increased patient activation is expected to increase screening and preventive services, as well as enable patients to better manage existing conditions. Therefore, the results indicate a corresponding rise in primary care service demand and additional FTEs to meet this need.

Project 3.a.i: Integration of Primary Care and Behavioral Health Services

To address the needs of individuals with co-morbid physical and behavioral health needs, AHI PPS intends to better integrate behavioral health and primary care services by pursuing two related initiatives: (1) increasing the physical co-location of behavioral health providers into primary care sites, and (2) integrate primary care into the behavioral health setting. This will bring services to a traditionally difficult to reach population, particularly the persistently mentally ill.

The following assumptions and inputs, from sources such as literature and published reports, are used in this analysis:

- Approximately 10% of the Medicaid population has unmet behavioral health needs (i.e., not receiving specialty mental health services), and these unmet needs largely consist of mild-to-moderate depressive/anxiety disorders or substance abuse. This 10% might be a conservative number. New York State added 320,000 beneficiaries to Medicaid in 2014, and an estimated 48,000 (15%) had behavioral health issues (though the portion of these beneficiaries whose behavioral health issues were undiagnosed and unmet is not known)
- Approximately 80% of Medicaid population visits a primary care provider during the year. (Nationwide, 86.5% of adult and 93.5% of child Medicaid beneficiaries had contact with a health care professional in the past year).[27]
- Absent DSRIP, 50% of patients with unmet behavioral health needs would have been successfully diagnosed by a PCP and referred to a behavioral health provider.[28] With this DSRIP project, PCPs will receive additional training and we assume 80% of patients with unmet needs will be diagnosed and referred.
- Absent DSRIP, 25% of referred patients will complete the referral.[29] Under DSRIP we assume this referral completion rate will double to 50%. Geisinger reports that after integrating behavioral health across the continuum of care, 85% of patients attended their first office visit with a behavioral health specialist.[30]

[27] http://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2014_SHS_Table_A-18.pdf

[28] Montano CB. Recognition and treatment of depression in a primary care setting. Journal of Clinical Psychiatry, Vol 55(12, Suppl), Dec 1994, 18-34.

[29] Becker AL. In some primary care offices: The social worker will see you now, Sep 8, 2015. http://ctmirror.org/2015/09/08/in-some-primary-care-offices-the-social-worker-will-see-you-now/

[30] American Hospital Association (2014, February). Integrating behavioral health across the continuum of care. Chicago, IL: Health Research & Educational Trust. http://www.hpoe.org/Reports-HPOE/Behavioral%20health%20FINAL.pdf

Changes in utilization as a result of program implementation may include the following:

- 150 fewer BH-related ED visits
- A 240 reduction in BH-related inpatient days

Based on modeling results summarized above, by 2020 the net projected PPS-wide workforce impact associated with this DSRIP initiative will likely include (Exhibit 10):

- **In the outpatient/office setting:** includes approximately 22 FTE increase in licensed clinical social workers, an increase of 2 in psychiatrists/psych NPs FTES and a 6 FTE increase in staff RNs
- **In the ED setting**: Minimal anticipated impact on the providers in this setting
- **In the inpatient setting**: Minimal anticipated impact

The project goals will increase access to behavioral health services and the results indicate a corresponding rise in BH care providers and associated support staff FTEs. Psychiatrist/psychiatric NP FTEs are expected to increase by 2, and while this appears minimal, our analysis does not take into account current existing shortages in BH providers. While a reduction in workforce FTEs in the ED and inpatient settings is also anticipated, the projected impact is in these settings is small, supporting the project goal that most of the care in this project will be received in primary care and behavioral health settings.

Exhibit 10: Integration of Behavioral Health into Primary Care: Projected Workforce Impact

	2017	2018	2019	2020
Population modeled (Medicaid + Uninsured)	74,900	74,900	74,900	74,900
Population with unmet BH needs	7,500	7,500	7,500	7,500
Population with unmet BH needs visiting PCP	6,000	6,000	6,000	6,000
Population screening positive for BH needs absent DSRIP	3,000	3,000	3,000	3,000
Population screening positive for BH needs with DSRIP	3,000	3,800	4,300	4,800
Screened population completing BH referral absent DSRIP	600	600	600	600
Screened population completing BH referral with DSRIP	600	2,100	2,900	3,800
Change in population receiving BH counseling	0	1,500	2,300	3,200
Health care use impact of DSRIP				
Encounters with BH care manager	0	4,170	6,350	9,060
Primary care visits	0	510	770	1,100
BH-related ED visits	0	-70	-100	-150
BH-related inpatient days	0	-110	-170	-240
Workforce FTE implications				
Office setting				
Licensed clinical social worker	0	10	15	21.5
Psychiatrists/psych NPs	0	1	1.5	2
Primary care providers	0	0	0.5	0.5
Direct medical support	0	0	1	1
Direct admin support	0	4	7	9.5
Emergency Department				
Emergency physicians	0	0	0	0
Nurse practitioners or physician assistants	0	0	0	0
Staff registered nurses	0	0	0	0
Inpatient				
Hospitalists	0	0	0	0
Staff registered nurses	0	-0.5	-1	-1.5
Licensed practical nurses	0	0	0	0
Nurse aides/assistants	0	0	-0.5	-0.5

Project 3.a.ii: Behavioral Health Community Crisis Stabilization Services

Project 3.a.ii aims to provide readily-accessible behavioral health crisis services that will allow access to appropriate levels of service and providers, for a rapid de-escalation of the episode. It is anticipated that anyone who is having a behavioral health crisis would be a potential client for crisis services. The crisis stabilization centers and mobile crisis teams will serve the following counties: Fulton, Franklin, Warren, Washington, Saratoga, Clinton and Essex.

In Fulton County, the Family Counseling Center is considering an Assertive Community Team (ACT) program, which is a self-contained service delivery system, to provide the following services:

- Crisis intervention program
- Developing an Assertive Community Team
- Setting up a 24 hour crises hotline and warm line
- Developing crisis respite beds

In Franklin County:

- Malone to serve Franklin and Northern Essex counties, as well as develop ambulatory detox services at the Malone Outpatient Clinic and in a new Malone Crisis Stabilization Center

For Warren, Washington and Saratoga counties, a team of behavioral health providers will provide:

- 24 hour Crisis Engagement-facilitate direct connections with crisis intervention resources and outpatient providers and dispatch the mobile crisis team
- Mobile Crisis Interventions-24 hour crisis engagement services including mental health professionals. Respond to a call within 2-3 hours, prescribe and administer medication in the field
- Site Based Interventions-Hospital based crisis unit providing 23 hours of supervised care
- Continuum of care-care navigators and care management reams would be connected to assist after a crisis
- Establishment of a crisis access system to serve our region-Glens Falls Hospital
- Expanding a mobile crisis team-Parsons with collaboration of PEOPLe
- Crisis Care Center through the Medical Village Project-Glens Falls Hospital
- Collaboration with law enforcement
- Integration and coordination with Care Navigators and Care Managers through Health Home
- Development of increased Access to outpatient clinical services
- The main partners are Liberty House, PEOPLe, Inc., GFH and Parsons Child and Family Center.

In Clinton County:

- 10 bed community crisis stabilization program-offer Crisis Stabilization and short term respite treatment for adults with behavioral health crisis, including those with a co-occurring substance abuse concerns with Behavioral Health Services North.
- Adult Mobile Crisis Team-(1-2 teams with a case manager and clinician)
- Intensive in home crisis service in the community utilizing an evidence based model like (MST-Multi-Systemic Treatment), will be available for families where youth is at risk for out of home placement.

In Essex County-

- Mobile Crisis Team operated by Mental Health Association of Essex County combined with a short term crisis respite facility.

The following assumptions and inputs, from sources such as literature and published reports, are used in this analysis:

- Modeling inputs from a study that implemented behavioral crisis stabilization include the following:[31]
    - Estimated 2.5 ED visits annually per patient without crisis stabilization
    - ED service use reduced by 13%
    - 64% decrease in behavioral health–related hospitalization
    - A 15% increase in mental health services use
- Staffing requirements are as follows and are sourced from AHI PPS' project implementation documents:[32]
    - 16 licensed behavioral health providers (1 of these FTES provides care 24hrs/day, 7 days a week)
    - Psychiatric NP (provides care 24hrs/day, 7 days a week)
    - Psychiatric RN (provides care 24hrs/day, 7 days a week)
    - 10 administration/food service staff
    - 8 Registered Nurses
    - 14 case managers
    - 7 youth therapists
    - 2-3 maintenance/IT support staff
    - 12 peer advocates[33] (2 of these provides care 24hrs/day, 7 days a week)
    - 16 social workers[34]

Based on modeling results summarized above, by 2020 the net projected PPS-wide workforce impact associated with this DSRIP initiative will likely include (Exhibit 11):

[31] https://www.wilder.org/Wilder-Research/Publications/Studies/Mental%20Health%20Crisis%20Alliance/Crisis%20Stabilization%20Claims%20Analysis%20-%20Technical%20Report.pdf

[32] Combines all the FTEs laid out for the project in the AHI PPS project plan applicaton

[33] IHS assumption as no specific number was provided

[34] LCSW

Exhibit 11: Behavioral Health Community Crisis Stabilization Services: Projected Workforce Impact

	2017	2018	2019	2020
Number of actively engaged patients	0	5,530	6,020	8,260
Projected DSRIP impact				
BH outpatient visits	0	1,700	1,800	2,500
ED visits	0	-1,400	-1,500	-2,100
Hospitalizations	0	-1,400	-1,500	-2,100
Inpatient days	0	-10,200	-11,100	-15,200
Workforce FTE implications				
Crisis Stabilization Center				
Psychiatric NP	0	0.5	0.5	1
Behavioral health providers (LCSWs, addiction counselors)	0	10.5	11.5	16
Psychiatric RN	0	0.5	0.5	1
Registered nurses	0	5.5	6	8
Social workers	0	10.5	11.5	16
Youth and family therapists	0	4.5	5	7
Case managers	0	9.5	10	14
Community health worker (peer support)	0	8	8.5	12
Maintenance/IT support staff	0	1.5	2	2.5
Administrative staff	0	6.5	7.5	10
Emergency Department				
Emergency physicians	0	-0.5	-0.5	-1
Nurse practitioners and physician assistants	0	0	0	0
Staff registered nurses	0	-2	-2.5	-3.5
Inpatient/psychiatric				
Hospitalists	0	-5	-5.5	-7.5
Staff registered nurses	0	-60.5	-66	-90.5
Licensed practical nurses	0	-3.5	-4	-5
Nurse aides/assistants	0	-15	-16.5	-23

The projected workforce impacts by 2020 include:

- **Crisis stabilization center setting:** Approximately 87 FTEs to provide the required services as detailed above.
- **In the ED setting:** Small decrease in staff RNs (3-4 FTEs) and emergency physicians (-1 FTE).

- **In the inpatient setting:** An expected 126 FTE decline in demand for inpatient staff—ranging from a 5 drop in licensed practical nurse FTEs to about a 91 FTE drop in staff RNs.

Project 3.a.ii appears to have the greatest impact in the inpatient/psychiatric setting, and particularly on RN FTEs. This is expected, as the program aims to decrease the need for patients to be admitted by providing stabilization services, which translates into a potential reduction in inpatient/psychiatric provider FTEs. This reduction may be offset by the increased need in the stabilization center.

Project 3.a.iv: Development of SUD Withdrawal Management Capabilities

AHI PPS aims to develop withdrawal management services within community-based addiction treatment programs. Doing so will allow for the efficiencies of medical supervision, and simultaneous transfer of stabilized patients into the SUD services as well access to care management services. AHI PPS's target population for ambulatory detox is adults age 18 and over. The PPS is focusing on developing two detox programs which will serve Clinton, Franklin and Essex counties. The geography would cover a radius of 25-40 miles from the Plattsburgh community, and a similar region surrounding Malone and Saranac Lake (thus encompassing Franklin, Clinton and Essex Counties). Individuals with an opioid and/or alcohol dependence diagnosis rating from mild/moderate would be potentially candidates for ambulatory detox. The PPS is focusing on developing two detox programs which will serve Clinton, Franklin and Essex counties. These include:

- Plattsburgh Program to serve Clinton County: Developing detox services including ambulatory detox, short-term respite beds for detox patients, and an outpatient SUD site with integrated primary care and care management.
- Malone to serve Franklin and Northern Essex Counties, as well as develop ambulatory detox services at the Malone Outpatient Clinic and in a new Malone Crisis Stabilization Center.

The following assumptions and inputs are used in this analysis:

- AHI PPS estimates that the following new staff is required:
    - 7 RNs
    - 9 certified recovery coaches/care managers
    - 3 credentialed alcoholism & substance abuse counselors (CASAC)
    - 1 social worker
    - 0.5 medical director
    - 1 nurse practitioner
    - 4 administrative/food service staff
    - 1 psychiatric nurse practitioner

- 8 peer support staff

Exhibit 12 summarizes modeling results and projected target state impacts of this DSRIP project. By 2020 the net projected annual utilization impact associated with this DSRIP clinical initiative is potentially the following:

- **Withdrawal program workforce requirements:** Workforce FTE requirements in this setting are summarized above.
- **In the ED setting:** Minimal impact on emergency physicians, NPs, PAs and RNs.
- **In the inpatient setting:** An expected decline in demand for inpatient staff including a potential 12 FTE drop in RNs.

Exhibit 12: Development of SUD Withdrawal Management Capabilities: Projected Workforce Impact

	2017	2018	2019	2020
Number of actively engaged patients	0	350	680	990
Projected DSRIP impact				
Inpatient days	0	-700	-1,360	-1,980
Emergency visits	0	-350	-680	-990
Workforce FTE implications				
Emergency Department				
Emergency physicians	0	0	-0.5	-0.5
NPs and PAs	0	0	0	0
Registered nurses	0	-0.5	-1	-1.5
Inpatient				
Hospitalists	0	-0.5	-0.5	-1
Registered nurses	0	-4	-8	-12
Licensed practical nurses	0	0	-0.5	-0.5
Nurse aides	0	-1	-2	-3
Program				
Nurse practitioners	0	0.5	0.5	1
Psychiatric nurse practitioners	0	0.5	0.5	1
Substance abuse counselors (addiction counselors)	0	1	2	3
Registered nurses	0	2.5	5	7
Social workers	0	0.5	0.5	1
Medical directors (admin direct)	0	0	0.5	0.5
Certified recovery coaches/care managers	0	3	6	9
Peer support staff	0	3	5.5	8
Administrative support (indirect)	0	1.5	2.5	4

The majority of the workforce implications for this project are related to the implementation of the program, where various providers will be required. The increased demand in this setting will offset the potential decrease in FTE demand in the inpatient setting.

Project 3.g.i: Integration of Palliative Care into the PCMH Model

Palliative care is a specialized form of medical care, specifically for individuals with serious illnesses, with the goal to provide relief from the symptoms and stress of their condition to develop improved quality of life for both patients and their families. Focusing on pain and symptom control, communication and coordination, family/caregiver and emotional support, palliative care allows patients and their families to understand their treatment options and develop end of life plans as necessary.

This project was chosen for implementation as findings from the CNA indicated that many residents hospitalized with at least one chronic condition could benefit from palliative services. The CNA also concluded that the prevalence of chronic conditions that could benefit from palliative services outweighs the availability of such services, a deficiency that will only worsen with time, given the aging population.

The target population will be attributed patients, aged 18 and older, who are eligible for a primary palliative care intervention, with eligibility criteria specified by diagnosis based on ICD-9 codes of chronic diseases that could benefit from palliative care (e.g., cancers, advanced depression, stroke, etc.). The main focus is on training and education for PCPs and staff on palliative care.

The following assumptions and inputs are used in this analysis:

- We assume a 24.5% all cause readmission rate[35]
- 50% of the readmissions come through the ED[36]
- We assume 6.1 days as the average length of stay [37]
- Readmission rates in the target population may decrease by 31% following the intervention[38]
- Currently, palliative services in the AHI PPS service area are being provided by a staff mix that includes the following: 1 FTE Nurse Practitioner for Inpatient Palliative Care, a PT Nurse Practitioner for Outpatient/Home Palliative Care and a PT Physician Assistant for Home Palliative Care. We assume that any additional FTEs required for this project will be composed of a staffing mix similar to this
- Once project is implemented, we assume that each patients receives 7 visits after discharge

[35] Calculated from the literature, see Exhibit A-6 for more information

[36] IHS assumption

[37] This reflects the national average hospital length of stay for Medicaid "super-users." http://www.hcup-us.ahrq.gov/reports/statbriefs/sb184-Hospital-Stays-Medicaid-Super-Utilizers-2012.pdf

[38] http://www.ncbi.nlm.nih.gov/pubmed/26270277

- From the literature, on average, a palliative care provider has 758 encounters with a patient per year[39]

Exhibit 13 summarizes modeling results and projected target state impacts of this DSRIP clinical improvement project. By 2020 the net projected annual utilization impact associated with this DSRIP clinical initiative is potentially the following:

- 320 fewer readmissions
- 2070 fewer inpatient days
- 160 fewer ED visits

Exhibit 13: Integration of Palliative Care: Projected Workforce Impact

	2017	2018	2019	2020
Number of actively engaged patients	0	2,560	3,420	4,270
Projected DSRIP Impact				
Readmissions	0	-190	-260	-320
Inpatient days	0	-1,240	-1,660	-2,070
ED visits	0	-100	-130	-160
Workforce FTE implications				
Emergency Department				
Emergency physicians	0	0	0	0
Nurse practitioners and physician assistants	0	0	0	0
Staff registered nurses	0	-0.5	-1	-1
Inpatient				
Hospitalists	0	-0.5	-1	-1
Staff registered nurses	0	-7.5	-10	-12.0
Licensed practical nurses	0	-0.5	-0.5	-0.5
Nurse aides/assistants	0	-2	-2.5	-3
Health coach (palliative care trainer)	0	1.5	1.5	2
Advanced practice palliative care providers (NP & PA)	0	23.5	31.5	39.5

The projected workforce impact by 2020 overall is likely to include:

- Approximately 2 additional FTEs for the palliative care training for existing staff
- An estimated 40 FTEs of NP and PA to provide palliative care services
- **In the ED setting**: Minimal change in demand for emergency department staff
- **In the inpatient s**etting: A possible decline in FTEs of 13 RNs, 3 nurse aide/assistants

[39] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3905688/

Palliative care services are generally lacking in the AHI PPS service area. Although the analysis suggests a decrease in FTEs counterintuitive to the goals of the project (to increase palliative care services), these are FTEs that are potentially associated with caring for patients who may have had readmissions or longer stays due to poor management of their serious illnesses. As readmissions and LOS decrease, some inpatient FTEs can be redeployed to providing more palliative care.

V. SUMMARY WORKFORCE IMPACT TABLES

Through 2020, the demand for health workers will change within the AHI PPS provider network as individual DSRIP components are implemented and based on trends external to DSRIP (such as changing demographics and expanded medical insurance coverage under the Affordable Care Act).

The combined impact of a growing and aging population and expanded medical insurance coverage will increase demand for health providers—with much of this increase driven by the growing needs of the Medicare population. While the DSRIP projects are largely targeted at the Medicaid and uninsured populations, many providers in the PPS network also provides services to the Medicare and commercially insured populations. In addition, DSRIP has the potential to increase demand for some types of providers (e.g., primary care and behavioral health); decrease demand for other types of providers (e.g., hospital-based providers); and increase demand for both licensed and unlicensed care coordinators, social workers, patient navigators, and health educators.

In this section we summarize the projected health workforce impact from DSRIP-related activities, and combine the estimated DSRIP impact with projected impacts of changing demographics and expanded medical coverage under the Affordable Care Act.

Exhibit 14 summarizes the estimated PPS health workforce impact of DSRIP projects across professions and settings. The largest projected workforce impacts of DSRIP will likely take place among nursing staff and care managers, care coordinators/navigators. Demand for staff registered nurses is projected to have a net decline by approximately 162 FTEs with the impacts primarily affecting those employed in hospital inpatient settings where demand declines of approximately 223 FTEs is offset by increases in RNs in care coordinator and coordinator manager roles and RNs in office/clinic settings.

Large increases are expected in the numbers of non-RN care managers (134 FTEs), primary care providers (48 FTEs), and clinical social workers providing behavioral health counseling (38 FTEs) which reflects the important roles of these professions in a transformed healthcare environment. Demand for clinical and administrative support staff is expected to grow by approximately 82 and 81 FTEs, respectively, by 2020. Projected changes in demand among other health professions are smaller. For example, demand for addiction counselors is expected to increase by approximately 3 FTEs and psychiatrist/psychiatric nurse demand may increase by 4 FTEs. However, these small increases do not take into account currently existing shortfalls, which may require significantly greater FTEs to address.

Exhibit 14: Total DSRIP Related PPS Workforce Impacts

Occupation and Setting	2017	2018	2019	2020
Primary care providers	7	31	41	47.5
Specialist Physicians				
Emergency physicians	0	-1.5	-3	-3.5
Hospitalists	-0.5	-10.5	-14	-19

Nursing				
Staff registered nurses	-4.0	-94.0	-123.0	-161.5
Hospital inpatient	-6.5	-122	-167.5	-222.5
Emergency	-1	-7.5	-12	-14.5
Office/clinic	3.5	23	32.5	40.5
RN care coordinators/home health	0	12.5	24	35
Licensed practical nurses				
Hospital inpatient	0	-7	-9.5	-12
Nurse aides/assistants				
Hospital inpatient nurse aides	-1.5	-31	-42.5	-56.5
Home health aides	0	11	21.5	31
Personal care aides	0	21.5	41.5	59.5
Clinical Support (e.g., medical assistants)	12	53.5	71.5	82
Administrative support staff				
Administrative staff	9	50.5	67	81
Maintenance/IT support staff	0	1.5	2	2.5
Behavioral health				
Psychiatrists/psychiatric nurse practitioners	0	2	2.5	4
Licensed clinical social workers	0	20.5	26.5	37.5
Addiction counselors	0	1	2	3
Youth and family therapists	0	4.5	5	7
Peer support	0	11	14	20
Advanced practice palliative care provider (NP & PA)	0	23.5	31.5	39.5
Care managers/coordinators/navigators/coaches				
Non-RN care coordinators (CHWs, LPNs, social workers, medical assistants)	12	82.5	108.5	133.5

DSRIP Future State Workforce Staffing Impact Analysis

Exhibit 15 depicts the combined effects on workforce demand in 2020 of both DSRIP impacts and the impacts of changing demographics and expanded insurance coverage under the Affordable Care Act. In some cases non-DSRIP impacts offset or moderate the effects of DSRIP while in other cases they magnify projected DSRIP workforce impacts.

For example, the largest anticipated workforce impact, in terms of FTEs involved with patient care is on care managers, registered nurses working in hospital inpatient settings and on clinical support staff (medical assistants). The expected decline in inpatient RN FTEs will be partially offset for greater demand for nurses in care coordination/ home health, office and long term and residential care settings, so the DSRIP effect is a decline of approximately 162 FTEs. However, growth of approximately 113 FTEs will be required to meet the needs of a growing and aging population (and in particular the Medicare

population). As a result, the net effect on demand for RNs in the PPS network is a decrease of approximately 49 FTEs. (Exhibit ES-1)

Relative to 2015, the AHI PPS network will require approximately 67 additional FTE primary care providers. This includes approximately 19 FTEs to meet the additional demand for services due to demographic and insurance trends external to system transformation by all patients (Medicaid, Medicare, commercial, uninsured/self-pay) and 48 FTEs due to the DSRIP impact on the Medicaid population. An additional 104 FTE administrative support staff and 115 FTE medical assistants will also be required.

Exhibit 15: Total Workforce Impact of DSRIP (2020)

Occupation and Setting	Non-DSRIP impact on demand (FTEs)	DSRIP impact on demand (FTEs)	Total impact on demand (FTEs)
Primary care providers	18.5	47.5	66
Specialist physicians			
Emergency physicians	0.5	-3.5	-3
Hospitalists	1	-19	-18
Cardiologists	4	0	4
Endocrinologists	1	0	1
Advanced practice palliative care provider (NP & PA)	0	39.5	39.5
Nursing			
Staff registered nurses	113	-161.5	-48.5
Hospital inpatient	69	-222.5	-153.5
Emergency	2	-14.5	-12.5
Office/clinic	13.5	40.5	54
RN coordinator/home health	9.5	35	44.5
Long term and residential care	19	0	19
Licensed practical nurses	38	-12	26
Hospital inpatient	9	-12	-3
Office/clinic	4		4
Long term and residential care	22.5		22.5
Home health	2.5		2.5
Aides/assistants	134.5	-25.5	-36.5
Hospital inpatient nurse aides	15.5	-56.5	-41
Office/clinic nurse aides	4.5	0	4.5
Long term and residential care nurse aides	94	0	94
Home health aides	20.5	31	51.5
Personal care aides	39.5	59.5	99
Clinical support			

Medical assistants	32.5	82	114.5
Administrative support staff	23	81	104
Behavioral health			
Psychiatrist/psychiatric nurse practitioners	-0.5	4	3.5
Psychologists	0	0	0
Licensed clinical social workers	0	37.5	37.5
Peer support	0	20	20
Pharmacists	6.5	0	6.5
Care managers/coordinators/navigators/coaches			
Care coordinators (non-RNs, including social workers, community health workers, and licensed practical nurses)	0	133.5	133.5
Maintenance/IT support staff		2.5	2.5

VI. CONCLUSIONS AND IMPLICATIONS OF TARGET WORKFORCE STATE ANALYSIS FINDINGS

Modeling the future state of the workforce following the implementation of various DSRIP projects is an immensely complex analysis involving inputs from AHI PPS, the literature, PPS anticipated targets and the best modeling assumptions currently available. A question arises to what extent a five year projection horizon is adequate to implement and assess impacts of DSRIP projects. This may not be enough time to capture the effect of most projects given realistic implementation phase-in assumptions, uncertainty in existing and future capacity, budget constraints and availability of data sufficiently robust to evaluate results.

The results presented in this report are conservative projections based, in part, on outcomes from literature that may not be completely generalizable to AHI PPS's patient population and assumptions that may change, and are contingent on project implantation proceeding as planned. The findings of this report must therefore be examined while taking these influencing factors into account.

A major contributor to achieving AHI PPS's DSRIP goals will likely be the Implementation of Patient Activation Activities program. We calculate that implementing this model will have a potential impact on health care use and workforce demand greater than the calculated impact of any other PPS DRSIP project due to the large demand for community based organization providers for the program (approximately 92 FTEs associated with various providers).

AHI PPS has selected a number of projects that focus on behavioral health, reflecting the needs of their patient population. Project 3.a.i, which aims to integrate behavioral health and primary care, is expected to require approximately 33 FTEs (combination of different types of patient care provider and administration FTEs) while achieving patient stabilization after a crisis (project 3.a.ii) indicates a reduction of 43 FTEs (combination of different types of patient care provider and administration FTEs). This case is an example of reductions in FTEs in one DSRIP project being offset by increased demand in another.

In some cases non-DSRIP impacts will likely offset or moderate the effects of DSRIP while in other cases they may magnify DSRIP workforce impacts. For example, PPS-wide full DSRIP project implementation is anticipated to reduce RN demand by approximately 162 FTEs. However, offsetting growth of approximately 113 RN FTEs will be required to meet the needs of a growing and aging population so the net impact is a projected 49 FTE decrease in RN demand.

In conclusion, based on the best available modeling inputs and assumptions, these results suggest that implementing DSRIP as designed will likely materially impact the AHI PPS network and healthcare delivery workforce, especially when combined with the projected impacts of demographic shifts and expanded health insurance coverage. This information will be used to inform development of a workforce transition plan and gap analysis intended to guide attainment of the AHI PPS future state.

VII. TECHNICAL APPENDIX

APPENDIX I. HEALTHCARE DEMAND MICROSIMULATION MODEL

HEALTHCARE DEMAND MICROSIMULATION MODEL

This appendix provides technical documentation of the Health Care Demand Microsimulation Model (HDMM) developed by IHS Inc. with contributions to the model development from the Center for Health Workforce Studies at SUNY-Albany and the various organizations for which studies have been conducted using this model. This model was used for several parts of the DSRIP analysis—including estimation of the growing demand for health workers by occupation and medical specialty in the PPS service area independent of DSRIP (e.g., in response to population growth and aging across payer types) to help inform a gap analysis and forthcoming workforce transition roadmap. The model also provided information on average length of stay, average patient use of health care services by setting, and measures of provider productivity (e.g., provider-to-service use ratios) when data from the PPS providers was unavailable. This DSRIP analysis relies on a combination of use of the HDMM, information from the PPS regarding the number and characteristics of the Medicaid lives attributed to the PPS and the health care use patterns of this population, published findings in the literature, and data from external sources such as NY SPARCS.

We provide background information and an overview of the workforce model. Then, we document the data, methods, assumptions and inputs for the three main components of the demand model: the population file, the health care use equations, and the provider staffing parameters. The final section describes work to validate the model and model strengths and limitations. Additional documentation of the model is available online.[40]

This model is the primary source of workforce projections for the federal Bureau of Health Workforce for physicians, nurses, behavioral health providers, allied health providers, and other health occupations.[41] The model has also been adapted to make supply projections for many states (including ongoing work with the New York Department of Health in collaboration with the Center for Health Workforce Studies), health plans and hospital systems, and professional associations.[42]

Overview

The HDMM, as its name implies, models demand for health care services and providers. Demand is defined as the level and mix of health care services (and providers) that are likely to be used based on population characteristics and economic considerations, such as price of services and people's ability

[40] The most detailed information on the model is available at https://cdn.ihs.com/www/pdf/IHS-HDMM-DocumentationApr2016.pdf.

[41] http://bhpr.hrsa.gov/healthworkforce/supplydemand/simulationmodeldocumentation.pdf

[42] An example of a recent application of the model is physician workforce projections for the Association of American Medical Colleges. https://www.aamc.org/download/458082/data/2016_complexities_of_supply_and_demand_projections.pdf

and willingness to pay for services. The HDMM was designed to also run a limited set of scenarios around "need" for services. Need is defined as the health care services (and providers) required to provide a specified level of care given the prevalence of disease and other health risk factors. Need is defined in the absence of economic considerations or cultural considerations that might preclude someone from using available services.

The HDMM has three major components: (1) a population database with information for each person in a representative sample of the population being modeled, (2) health care use patterns that reflect the relationship between patient characteristics and health care use, and (3) staffing patterns that convert estimates of health care demand to estimates of provider demand. Demand for services is modeled by employment setting. Demand is also modeled by (a) diagnosis category for hospital inpatient care and emergency department visits, and (b) health care occupation or medical specialty for office and outpatient visits. The services demand projections are workload measures, and demand for each health profession is tied to one or more of these workload measures. For example, current and future demand for primary care providers is tied to demand for primary care visits, demand for dentists is tied to projected demand for dental visits, etc. External factors—such as trends or changes in care delivery—can influence all three major components of HDMM.

Population Input Files

The population files contain person-level data for a representative sample of the population of interest. As adapted for modeling DSRIP, we created a population file for each New York county where for each person we identify their insurance type, demographics, and health risk factors. Creation of the population files starts with merging the following publicly available data:

- **Population files** for each county in New York and population projections through 2020 as obtained from the Cornell Program on Applied Demographics in Ithaca, NY.[43]
- **American Community Survey (ACS)**.[44] Each year the Census Bureau collects information on approximately three million individuals grouped into approximately one million households. For each person, information collected includes: demographics, household income, medical insurance status, geographic location (e.g., state and sub-state [for multi-year files]), and type of residency (e.g., community-based residence or nursing home). Each year HDMM is updated with the latest available file, and HDMM was updated with the 2014 ACS (n=3,132,610 observations) in November 2015. We used ACS data for the population in New York State.
- **Behavioral Risk Factor Surveillance System (BRFSS)**.[45] The Centers for Disease Control and Prevention (CDC) annually collects data on a sample of over 500,000 individuals. This survey is conducted in concert with each state's Department of Health. Similar to the ACS, the BRFSS includes demographics, household income, and medical insurance status for a stratified random

[43] https://pad.human.cornell.edu/counties/projections.cfm

[44] https://www.census.gov/programs-surveys/acs/

[45] http://www.cdc.gov/brfss/

sample of households in each state. The BRFSS, however, also collects detailed information on presence of chronic conditions (e.g., diabetes, hypertension) and other health risk factors (e.g., overweight/obese, smoking). One limitation of BRFSS is that as a telephone-based survey it excludes people in institutionalized settings (e.g., nursing homes) who do not have their own telephone. We combined the two latest BRFSS files (2013 and 2014) to create a joint file with close to one million individuals. HDMM was updated with the BRFSS files in November 2015. We used BFRSS data for the population in New York State.

- **National Nursing Home Survey (NNHS)**.The Centers for Disease Control and Prevention collected data on a national sample of 16,505 nursing home residents in 2004 (the latest year for which individual data were collected). In addition to demographics, the NNHS collects information on chronic conditions and health risk factors of this population. Use of data on nursing home **residents** is important because this institutionalized population has much poorer health and different health care use patterns compared to their peers living in the community. The statistical match process that combines NNHS with the institutionalized population in ACS, as well as model calibration using current estimates of the size of the nursing home population helps ensure demographic representativeness of the current nursing home population.
- **EpiQuery: NYC Interactive Health Data**. EpiQuery is a web-based tool that provides access to health data collected by New York's Department of Health and other organizations. One of these sources is the New York City Community Health Survey—a telephone survey conducted annually by the DOHMH, Division of Epidemiology, Bureau of Epidemiology Services. This source provides data on the health and health risk factors of New Yorkers. This information was used to calibrate the disease prevalence and health risk factor prevalence rates used in the HDMM.

The HWSM population database merges information from these sources using a statistical matching process that combines patient health information from the BRFSS and NNHS with the larger ACS file that has a representative population in New York. Using information on residence type, we stratified the ACS population into those residing in nursing facilities to be matched to people in the NNHS, and those not residing in nursing facilities to be matched to people in BRFSS (Exhibit A-1). For the non-institutionalized population, we statistically matched each individual in the ACS with someone in the BRFSS from New York from the same gender, age group (15 groups), race/ethnicity, insured/uninsured status, and household income level (8 levels). Individuals categorized as residing in a nursing home were randomly matched to a person in the NNHS in the same gender, age group, and race-ethnicity strata. Under this approach, some BRFSS or NNHS individuals might be matched multiple times to similar people in the ACS, while some BRFSS or NNHS individuals might not be matched. The metropolitan and non-metropolitan subsamples from this New York database were then combined with population data for each county based on demographics. Statistics for each county were generated for prevalence of chronic disease and behavioral risk factors, and compared to New York data (from EpiQuery) for model calibration.

Exhibit A-1: Population Database Mapping Algorithm

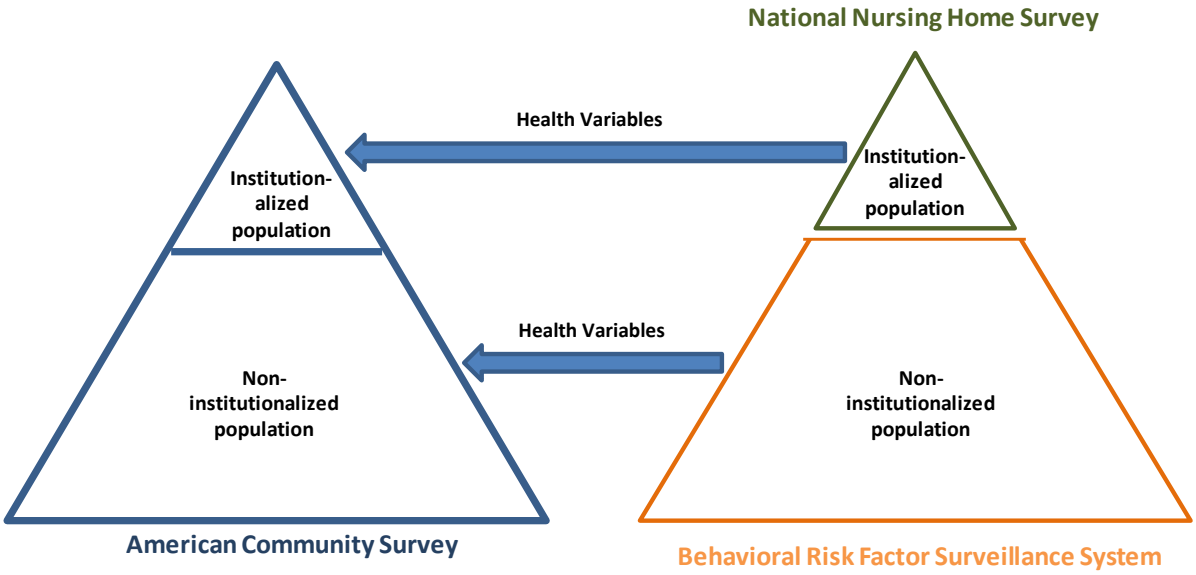


Exhibit A-2 summarizes the population characteristics in the final population database created for each county. This detailed information for each person captures systematic geographic variation in demographics, socioeconomic characteristics, and health risk factors (e.g., obesity, smoking, diabetes and cardiovascular disease prevalence).

Exhibit A-2: Summary of Population Characteristics

Race-Ethnicity: Hispanic, Non-Hispanic black, Non-Hispanic white, Non-Hispanic other race
Gender
Age Group: 0-4, 5-13, 14-17, 18-34, 35-44, 45-64, 65-74, 75+ years
Current smoker
Diagnosed with or history of:
Arthritis
Asthma
Coronary heart disease
Diabetes
History of cancer
History of heart attack
History of stroke
Hypertension
Insured (from any source)
Medicaid (insured through Medicaid)
Managed care (insurance plan type)
Family Income: <$10,000, $10,000 to <$15,000, $15,000 to < $20,000, $20,000 to < $25,000, $25,000 to < $35,000, $35,000 to < $50,000, $50,000 to < $75,000, $75,000 or higher
Body Weight: Normal, Overweight, Obese
Metro area

Health Care Use

Projected future use of health care services, based on population characteristics and patterns of health-seeking behavior, produce workload measures used to project future demand for health care providers. HDMM uses prediction equations for health care use based on recent patterns of care use, but also can model scenarios where health care use patterns change in response to emerging care delivery models or other factors.

Demand Determinants and Prediction Equations

Health seeking behavior is generated from econometrically estimated equations using data from ~170,000 participants in the pooled 2009-2013 files of the Medical Expenditure Panel Survey (MEPS). We pooled multiple years of data to provide a sufficient sample size for regression analysis for smaller health professions and diagnosis categories. Over time, as a new year of data becomes available and is added to the analytic file the oldest year in the analysis file is dropped. We used the 2013 Nationwide

Inpatient Sample (NIS), with ~8 million discharge records, to model the relationship between patient characteristics and length of hospitalization by primary diagnosis category.

Poisson regression was used to model annual office visits, annual outpatient visits, annual home health/hospice visits and inpatient days per hospitalization. These regressions were estimated separately for children versus adults. Separate regressions were estimated by physician specialty or non-physician occupations—e.g. dentists, physical therapists, psychologists—for office-based care. Likewise, separate regressions were estimated for occupations providing home health care. The dependent variable was annual visits (for office, outpatient, and home health) and inpatient days per hospitalization (for hospitalizations). The explanatory variables were the patient characteristics available in both MEPS or NIS for hospital length of stay and the constructed population file.

Exhibit A-3 is provided as an example of the regression specifications, with this example showing how patient characteristics are correlated with use of cardiology-related health care services by care delivery setting. The numbers in this table reflect rate ratios (for office and outpatient visits, or inpatient days) or odds ratios (for ED visits and hospitalizations). For all types of cardiology-related care there is a strong correlation with patient age (controlling for other patient characteristics modeled) and being in Medicaid. Having any medical insurance is associated with much greater use of ambulatory care, and if the insurance is Medicaid then there is even greater use of cardiology services across all care delivery settings. For example, compared to their commercially insured counterparts with similar demographics and health risk factors, patients with Medicaid average 35% more office visits to a cardiologist annually, 42% more cardiology-related outpatient visits, have 64% higher odds of a cardiology-related emergency visit, and have 71% higher odds of a cardiology-related hospitalization. These estimates for the Medicaid population are statistically different from 1 (where a ratio of 1 would indicate no statistical difference with the comparison category).

Obesity increases use of cardiology-related services. Smoking is associated with fewer office and outpatient visits to a cardiologist but higher rates of ED visits (likely reflecting correlation rather than causality in the case of ambulatory care, as smoking is a risk factor for heart disease but could be correlated with aversion to visit a doctor). Lower income is associated with less use of ambulatory care and more use of ED visits and hospitalization. The presence of chronic medical conditions—and especially heart disease, hypertension, and history of heart attack—are associated with much greater use of cardiology services across care delivery settings. When modeling the Medicaid population in each county the HDMM takes into consideration that the Medicaid population often has much greater prevalence of a host of chronic conditions and risk factors relative to their non-Medicaid peer group.

Exhibit A-3: Sample Regressions: Adult Use of Cardiology Services

	Parameter	Office Visits	Outpatient Visits	Emergency Visits	Hospitalization
Race-Ethnicity	Hispanic	0.81**	0.73**	13	0.87**
	Non-Hispanic Black	0.78**	0.98	1.45**	1.41**
	Non-Hispanic White	10	10	10	10
	Non-Hispanic Other race	0.92**	0.82**	19	16
	Male	1.11**	1.48**	0.97*	17
Age	18-34 years	0.12**	0.13**	0.63**	0.37**
	35-44 years	0.23**	0.52**	0.98	0.80**
	45-64 years	0.52**	0.74**	1.10	1.14*
	65-74 years	0.87**	0.95*	1.12	1.57**
	75+ years	10	10	10	10
	Smoker	0.74**	0.75**	1.11	16
Diagnosed with	Hypertension	1.56**	1.15**	3.85**	2.71**
	Coronary heart disease	8.54**	9.60**	2.93**	3.96**
	History of heart attack	1.69**	1.63**	2.41**	2.59**
	History of stroke	1.11**	1.18**	3.11**	2.97**
	Diabetes	1.11**	1.37**	11	1.16**
	Arthritis	19**	1.23**	12	0.99
	Asthma	18**	1.10**	0.95	18
	History of cancer	18**	0.98	0.99	0.93
	Insured	2.48**	1.88**	0.89	12
	Medicaid	1.35**	1.42**	1.64**	1.71**
	Managed Care	0.97**	16**	11	0.99
Household Income	<$10,000	0.84**	15	1.20**	1.16**
	$10,000 to <$15,000	0.89**	0.72**	1.10	1.11
	$15,000 to < $20,000	0.90**	16	0.86	12
	$20,000 to < $25,000	0.84**	0.72**	1.15	19
	$25,000 to < $35,000	0.89**	18**	1.18**	15
	$35,000 to < $50,000	0.89**	0.96**	0.92	0.94
	$50,000 to < $75,000	0.93**	1.24**	0.89	0.82**
	$75,000 or higher	10	10	10	10
Body Weight	Normal	10	10	10	10
	Overweight	16**	12	1.16**	1.22**
	Obese	1.11**	18**	1.13**	1.26**
	Metro Area	1.31**	12	14	0.89

Logistic regression was used to model annual probability of hospitalization and annual probability of an emergency department visit for approximately two dozen categories of care defined by primary diagnosis code. The dependent variable for each regression is whether the patient had a hospitalization (or ED visit) during the year for each of the condition categories.

Estimating Health Care Use by Care Setting

As noted above, the HDMM generates health seeking behavior from econometrically estimated equations in the pooled 2008-2013 files of the Medical Expenditure Panel Survey. Forecasting equations for healthcare use are then applied to produce estimates of numbers of patient visits and hospitalizations by specialty, occupation and diagnosis by care setting. For example, when modeling demand for psychiatrists the HDMM projects current and future office and outpatient visits to a psychiatrist and emergency visits and hospitalizations for patients with ICD-9 primary diagnosis codes in the 290-319; and 94.1-.59 range under Major Diagnostic Category 19: Mental Diseases and Disorders.

These health care service demand projections, when combined with provider staffing and productivity estimates, provide the basis for estimating current and projecting future demand for FTE behavioral health and other health occupations modeled. To illustrate, below are presented information on methods, workload drivers and data sources for modeling hospital inpatient service demand.

Hospital Inpatient Service Demand

The 2008-2013 MEPS and the 2012 Nationwide Inpatient Sample (NIS) are used to model demand for hospital inpatient services in short-term general acute care hospitals as well as specialty hospitals. Logistic regression quantifies the probability of a person with given characteristics experiencing hospitalization during the year for a wide range of medical conditions, including mental health and substance abuse conditions based on ICD-9 primary diagnosis code groupings (Exhibit A-4).

To model inpatient length of stay the 2012 NIS discharge records were analyzed. Because of the large sample size (over 8 million hospital stays) estimates derived from the NIS are stable. Estimated Poisson regressions generated the expected number of days spent in the hospital conditional on a hospitalization. Explanatory variables consisted of patient age group, sex, race/ethnicity, insurance type, presence of chronic diseases and risk factors among the diagnosis codes, and residence in a metropolitan area. Separate regressions were estimated for each of the mental health and substance abuse condition categories. Combining information on condition specific hospitalization risk and length of stay per hospitalization, HDMM computed each person's expected number of inpatient days during the year for different types of medical conditions.

Exhibit A-4: Hospital Inpatient Demand Drivers by Condition Code and Profession

Medical condition codes (ICD-9 CM)		Specialty/NPC Profession
Allergy & immunology	001-139, 477, 995.3	Allergy & immunology
Diseases of the circulatory system	390-459; 745-747; 785	Cardiology
Diseases of the circulatory system	426, 427, 780, 785; 3726 <= pr02 <=3734	Clinical Cardiac Electrophysiology
Diseases of the circulatory system	pr02 IN (0060, 3600, 3950)	Interventional Cardiology
Colon & rectal surgery	17.31-17.36, 17.39, 453, 45.26, 45.41, 45.49, 45.52, 45.71-45.76, 45.79, 45.81-45.83, 45.92-45.95, 463, 464, 46.10, 46.11, 46.13, 46.14, 46.43, 46.52, 46.75, 46.11, 46.13, 46.14, 46.43, 46.52, 46.75, 46.76, 46.94, 153-154	Colon & rectal surgery
Diseases of the skin and subcutaneous tissue	680-709; 757; 782	Dermatology
Endocrine, nutritional and metabolic diseases, and immunity disorders	240-279; 783	Endocrinology
Diseases of the digestive system	520-538; 555-579; 751; 787; 42-54	Gastroenterology
General surgery	860-869; 870-904; 925-939; 958-959; 996-999	General surgery
Neoplasms, diseases of the blood and blood-forming organs	140-239, 280-289; 790	Hematology & oncology
Neoplasms, diseases of the blood and blood-forming organs	195.2, 188.9, 174.9, 156, 164.1, 209.24, 155, 162.9, 183; 92.2 (http://www.donself.com/documents/ICD-10-for-Radiation-Oncology.pdf)	Radiation Oncology
Infectious and parasitic diseases	001-139, 477, 40.11, 40.3, 40.9	Infectious diseases
Nephrology	580-589; 55.2-55.8	Nephrology
Conditions originating in perinatal period	760-779	Neonatal-perinatal medicine
Neurological surgery	850-854; 950-957; 01-05; 89.13	Neurological surgery
Diseases of the nervous system and sense organs	320-359; 742; 781; 784; 800-804	Neurology
Complications of pregnancy, childbirth, and the puerperium	614-679, V22,V23,V24, 72-75	Obstetrics & gynecology 72-75
Ophthalmology	360-379; 8-16; 95-95.4	Ophthalmology
Diseases of the musculoskeletal system and connective tissue; injury and poisoning	710-719; 720-724; 730-739; 805-848; 754-756; 76-84	Orthopedic surgery
Otolaryngology	380-389; 744; 18-29	Otolaryngology
Plastic surgery	904-949; 749; 18.7, 21.8, 25.59, 26.49, 27.5, 27.69, 29.4, 31.7, 33.4, 46.4, 64.4, 78.4, 81-81.99, 82.7, 82.8, 83.8, 85.8, 86.84	Plastic surgery
Mental disorders	290-319; 94.1-.59	Psychiatry
Diseases of the respiratory system	460-519; 748; 786; 35-39	Pulmonology

Medical condition codes (ICD-9 CM)		Specialty/NPC Profession
Diseases of the musculoskeletal system and connective tissue	725-729	Rheumatology
Thoracic surgery	426, 427, 780, 785); 32.6, 34.9, 40.6, 90.4, 35-37	Thoracic surgery
Diseases of the genitourinary system	590-608; 753; 788; 789; 791; 55-64	Urology
Vascular surgery	440-448; 0.4-00.5, 17.5, 35-39	Vascular surgery
Physical Medicine/Rehabilitation	0.4-00.5, 17.5, 35-39; 93	Physical Medicine/Rehabilitation

Health Care Use Calibration

MEPS is a representative sample of the non-institutionalized population, and although the health care use prediction equations are applied to a representative sample of the entire U.S. population parts of the model require calibration to ensure that the predicted health care use equals actual use. Applying the prediction equations to the population for 2011 through 2013 creates predicted values of health care use in those years (e.g., total hospitalizations, inpatient days, and ED visits by specialty category, and total office visits by physician specialty). For model calibration, we compared predicted national totals to estimates of national total hospitalizations and inpatient days, by diagnosis category, derived from the 2013 NIS. National ED visits and office visits came from the 2011 NHAMCS and 2012 NAMCS, respectively. Multiplicative scalars were created by dividing national estimates by predicted estimates. For example, if the model under-predicted ED visits for a particular diagnosis category by 10% then a scalar of 1.1 was added to the prediction equation for that diagnosis category. Applying this approach to diagnosis/specialty categories, the model's predicted health care use was consistent with national totals for most settings. Setting/category combinations where the model predicted less accurately (and therefore required larger scalars) tended to cluster around diagnosis categories in the ED characterized by lower frequency of visits likely due to a combination of small sample size in both MEPS and NHANES.

For DSRIP modeling, the health care use patterns were further calibrated to the populations in each New York county modeled (using SPARCS data or data from the PPS where available) to reflect that patients in New York can have care use patterns that differ from national peer group.

Health Workforce Staffing Patterns

This section discusses the assumptions and methods used to convert demand for services into demand for health care workers. Demand for health care workers is derived from the demand for health care services. Services provided (e.g., visits, hospitalizations, procedures, or prescriptions written) or demand drivers for services for which there are no survey data (e.g., total population, population over age75, and school aged children) in each setting were compared with the number of providers working in that setting. For professions that provide services across a wide array of setting (e.g., nurses and therapists), information on the employment distribution of the care providers in the base year from the BLS was used to determine the number of individuals working in each setting.

Assuming that the base year demand for services in each setting was fully met by the available professionals in that setting, the base year staffing ratio was calculated by dividing the volume of service used by the number of health care professionals employed in each setting. For professions that provide services in a single setting, base year utilization was divided by the base year supply to derive the staffing ratio for that profession. The staffing ratio was then applied to the projected volume of services to obtain the projected demand for providers in every year after the base year.

The baseline scenarios in HDMM (used for modeling how care use in each New York county would change over time in the absence of DSRIP) assumed that care delivery patterns remained unchanged over time given the demand for health care services. However, the number and mix of health professionals required to provide the level of health care services demanded is influenced by how the care system is organized and care is reimbursed, provider scope of practice requirements, economic constraints, technology, and other factors. Emerging health care delivery models and advances in technology may alter future health care delivery, changing the relationship between patient characteristics and the probability of receiving care in a particular setting. The DSRIP modeling used information from the published literature and from the PPS's internal planning documents) to identify how care delivery and staffing will change with implementation of individual DSRIP projects.

HDMM VALIDATION, STRENGTHS, AND LIMITATIONS

Model validation activities continue on an ongoing basis as a long term process evaluating the accuracy of the model and making refinements as needed. For each of four primary types of validation deployed, key short term and long term activities include the following:

- **Conceptual validation**: Through reports, presentations at professional conferences and submission of peer-reviewed manuscripts the model described here continue to undergo a peer-review evaluation of its theoretical framework. Contributors to these models include health economists, statisticians and others with substantial modeling experience; physicians, nurses, behavioral health providers and other clinicians; health policy experts; and professionals in management positions with health systems. Conceptual validation requires transparency of the data and methods to allow health workforce researchers and modelers to critique the model. This report is an attempt to increase the transparency of these complex workforce projection models where work is ongoing to improve the theoretical underpinnings, methods, assumptions, and other model inputs.
- **Internal validation**: The model runs using SAS software. As new capabilities are added to the model and data sources updated, substantial effort is made to ensure the integrity of the programming code. Internal validation activities include generating results for comparison to published statistics used to generate the model (e.g., ensuring that population statistics for the input files are consistent with published statistics).
- **External validation**: Presenting findings to subject matter experts for their critique is one approach to externally validate the model. Intermediate outputs from the model also can be

validated. For example, the HDMM has been used to project demand for health care services for comparison to external sources not used to generate model inputs. Results of such comparisons across geographic areas indicate that more geographic variation in use of health care services occurs than is reflected geographic variation in demographics, presence of chronic disease, and health risk factors such as obesity and smoking.

- **Data validation**: Extensive analyses and quality review have been conducted to ensure data accuracy as model data inputs were prepared. Most of the model inputs come from publically available sources (e.g., MEPS, BRFSS, and ACS).

HDMM Strengths and Limitations

The main strengths of the HDMM includes use of recent data sources and a sophisticated microsimulation approach that has substantial flexibility for modeling changes in care use and delivery by individuals or by the health care system. Compared to population-based modeling approaches used historically, this microsimulation model takes into account more detailed information on population characteristics and health risk factors when making national and state-level demand projections. For example, rates of disease prevalence and health related risk factors and household income can vary significantly by geographic area. Such additional population data can provide more precise estimates of service demand at State and county levels compared to models that assume all people within a demographic group use the same level of services.

HDMM simulates care use patterns by delivery setting. Certain populations have disproportionately high use of specific care delivery settings (e.g., emergency care) and lower use of other settings. Setting-specific information on patient characteristics and use rates provides insights for informing policies that influence the way care is delivered. Because the microsimulation approach uses individuals as the unit of analysis, the HDMM can simulate demand for health care services and providers to care for populations in low income categories, populations in select underserved areas, or populations with certain chronic conditions. Using individuals as the unit of analysis creates flexibility for incorporating evidence-based research on the implications of changes in technology and care delivery models that disproportionately affect subsets of the population with certain chronic conditions or health-related behaviors and risk factors. This information also leads to more accurate projections at state and local levels. The microsimulation approach also provides added flexibility for modeling the workforce implications of changes in policy and emerging care delivery models under ACA, important areas of ongoing research.

Limitations of the workforce model largely stem from current data limitations. For example, one limitation of the BRFSS as a data source for modeling demand is that as a telephone-based survey it tends to exclude people in institutionalized settings who typically do not own telephones. Hence, when creating the population files that underlie the demand projections BRFSS data is combined with National Nursing Home Data. Other current data limitations associated with these models include: (1)

information on the influence of provider and payer networks on consumer service demand and migration patterns, and (2) information on how care delivery patterns might change over time in response to emerging market factors.

ADDITIONAL INFORMATION

Project 2.b.viii: Hospital-Home Care Collaboration

Exhibit A-6: Summary of 30-day Readmission Intervention Impact

Study #	Condition	Pre-Intervention Readmission Rate	Post-Intervention Readmission Rate	% Reduction in Readmission Rate	Source
1	CHF [1]	22.5%	7.7%	-66%	St. Mary's Medical Center (LB) http://www.ahrq.gov/policymakers/case-studies/201522.html
2	CHF [1]	7.6%	5.5%	-28%	St. Mary's Medical Center (SF) http://www.ahrq.gov/policymakers/case-studies/201522.html
3	CHF [1]	15.4%	9.1%	-41%	Memorial Hospital http://www.ahrq.gov/policymakers/case-studies/201507.html
5	CHF, acute myocardial infarction, and pneumonia [1]	26%	15%	-42%	VBMC-Harlington http://www.ahrq.gov/policymakers/case-studies/201420.html
4	CHF [1]		14-16%		
6	COPD [1]	19%	11.7%	-38%	Penn Medicine Chester County Hospital http://www.ahrq.gov/policymakers/case-studies/201506.html
7	COPD [1]	20.6%	11.8%	-43%	Memorial Hospital http://www.ahrq.gov/policymakers/case-studies/201507.html
8	Pneumonia [1]	10%	9.7%	-3%	Memorial Hospital http://www.ahrq.gov/policymakers/case-studies/201507.html
9	Diabetes	16%	11%	-31%	Healy et al. (2013) http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3781555/
10	Diabetes	1.79/patient	1.18/patient	-34%	Naylor et al. (2004)[46]

[46] The transitional care intervention developed by Naylor et al. (2004) targeted patients who were hospitalized for CHF and used highly trained advanced practice nurses (APNs) to administer the intervention.2 Naylor's intervention was highly structured and effective. The APNs met with patients in the hospital and in their home shortly after discharge to provide intense coaching and education on medications, self-care, and symptom identification. The intervention lasted a total of 12 weeks, and patients were followed for one year. http://www.champ-program.org/static/BROWN%20FULL%20REPORT%203%2013%2009v2_ah2.pdf

Study #	Condition	Pre-Intervention Readmission Rate	Post-Intervention Readmission Rate	% Reduction in Readmission Rate	Source
11	Mixed [1]			-32%	
12	Mixed [1]	18.6%	16.6%	-11%	Nacogdoches Memorial Hospital http://www.ahrq.gov/policymakers/case-studies/201501.html
13	Mixed [1]	23.3%	15%	-36%	VBMC-Brownsville http://www.ahrq.gov/policymakers/case-studies/201420.html
14	Mixed (All Payer) [1]	7.5%	6.5%	-13%	Bakersfield Memorial http://www.ahrq.gov/policymakers/case-studies/201522.html
15	Mixed (Medicare) [1]	25%	11.3%	-55%	Bakersfield Memorial http://www.ahrq.gov/policymakers/case-studies/201522.html