Target Workforce State Report for

Albany Medical Center Hospital Performing Provider System

Delivery System Reform Incentive Payment Program

Workforce Strategy Deliverable

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BDO

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Executive Summary

The goal of the Delivery System Reform Incentive Payment ("DSRIP") program is to reduce avoidable hospitalizations and Emergency Department ("ED") visits by the New York State ("NYS") Medicaid population by 25%. The DSRIP program aims to transform and redesign the existing health care system through the creation of integrated delivery systems across the care continuum, implement a value-based payment system, and facilitate workforce realignment and training to support system transformation, among other goals.

Albany Medical Center Hospital ("Albany Medical Center") engaged BDO Consulting ("BDO"), in collaboration with IHS, Inc. ("IHS"), as its workforce vendor on behalf of the Albany Medical Center Hospital Performing Provider System ("AMCH PPS", or "the PPS") to define the PPS's target workforce state. To achieve the goals of the DSRIP program as well as to facilitate workforce planning needs, information on AMCH PPS's target workforce state including the demand for health care services and professionals, was projected to identify workforce needs and ultimately inform AMCH PPS's overall DSRIP program planning and project implementation.

The Target Workforce State report identifies AMCH PPS's projected workforce needs by the end of the DSRIP program in 2020 and will be leveraged by the PPS to identify gaps between the reported current workforce state and the projected target workforce state to inform the development of a workforce transition roadmap. The transition roadmap will be used by AMCH PPS to inform workforce planning and training to address any identified workforce gaps as a result of the DSRIP program.

AMCH PPS's stakeholders including DSRIP Project Managers and Clinical Leads provided significant input into the DSRIP project impacts and assumptions made to inform the projection of the PPS's target workforce state. Further, data from external databases including local, state and national surveys; medical claims databases; published literature; and IHS's Health Care Demand Microsimulation Model ("HDMM") were leveraged to inform the target workforce state projections. An additional important stakeholder that assisted in the development of this report is AMC PPS's Workforce Coordinating Council, comprised of representative organizations throughout the PPS.

It should be noted that concurrent with the development of the target state workforce report, the AMCH PPS completed a Bed Reduction Plan, as required by the Population Health workstream, and thus the results of this plan were not available as input for consideration within the modeling of the target state workforce at the time in which it was prepared. Inclusion of information contained in the Bed Reduction Plan is relevant to the complex issues associated with predicting future workforce needs across the PPS. It is important to include the outcome of this plan, as it would have had direct and significant impact on the projections provided within this document.

Most notably, without this plan and without market share projections for the PPS' three hospital partners, the target state workforce report projects decreases for inpatient registered nurses (-111.5, Exhibit ES-1). Inclusion of this plan would have resulted in a smaller decrease due to anticipated growth based on patient transfers and shifts in market share at all three hospitals, most notably at Albany Medical Center. This projected growth in inpatient volume includes the assumed 25% reduction in Medicaid-driven admissions through the efforts of DSRIP and so would minimize the projected inpatient staffing reductions, which include decreases in registered nurses, nursing aides and assistants, and Hospitalists (Exhibit ES-1). As such, at the request of the AMCH PPS Board, this addendum has been included within the Executive Summary to ensure the reader understands that the projected inpatient staffing decreases are overstated. Based on the additional data provided by the Bed Reduction Plan, the PPS anticipates a significantly smaller reduction in the aforementioned positions during the lifetime of the DSRIP initiative.

AMCH PPS has been approved by DOH and CMS to implement eleven DSRIP projects to inform the development of an Integrated Delivery System ("IDS") through the coordination of high quality primary, specialty, behavioral, long-term and post-acute care services. The PPS-sponsored Community Needs Assessment ("CNA") was used to inform the selection of the eleven projects which includes five system transformation projects ("Domain 2 Projects"), four clinical improvement projects ("Domain 3 Projects"), and two population-wide prevention projects ("Domain 4 Projects").

To model and project the estimated workforce impacts of the DSRIP projects on AMCH PPS's workforce, we considered the following primary research questions:

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 those 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 impact the region's healthcare delivery workforce?

Target Workforce State Summary Findings

As the DSRIP program progresses over the five years, the demand for health care workforce within AMCH PPS's network will continue to evolve as DSRIP projects are implemented, impacts of those projects are realized, and as external factors outside of the DSRIP program evolve. As a result, it is worth noting that although this analysis was conducted using best efforts and project implementation assumptions to model workforce impacts over the DSRIP program, that the target workforce state described within this report is a projection of the target workforce state to inform AMCH PPS's workforce planning but that workforce needs will be continually reevaluated as project impacts are realized overtime.

Exhibit ES-1 below summarizes the PPS's estimated target workforce state staffing impacts by 2020 taking into account the anticipated results of the DSRIP program as well as anticipated demographic and health care coverage changes independent of DSRIP across the AMCH PPS's

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 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 providers modeled by approximately 272 FTEs across several provider types to include primary care providers, specialists, behavioral health providers, substance use providers, nursing, patient navigators, care coordinators, social workers, pharmacists, as well as front end support staff:
  - o Independent of DSRIP, workforce demand is projected to grow by approximately 94 FTEs.
  - o The projected impact of DSRIP implementation is estimated to increase demand for health providers modeled by approximately 178 FTEs.
- Some of the largest workforce impacts of both DSRIP, and changes independent of DSRIP, are projected to take place among registered nurses ("RNs"), primary care providers, behavioral health providers, and medical and administrative support staff in outpatient and community-based settings.
- The largest workforce impacts of DSRIP implementation alone are estimated to take place among registered nurses:
  - o Net demand for registered nurses is estimated to decrease by approximately 93 FTEs, as anticipated non-DSRIP related increase in demand of approximately 40 FTEs are offset by decline in demand for registered nurses, primarily in hospital inpatient settings, of approximately 133 FTEs
- DSRIP related demand for non-nursing care coordinator is projected to rise by approximately 98 FTEs.
- An estimated additional 92 FTE administrative support staff and 74 FTE medical assistants (or similar direct medical support staff) also are likely to be required in non-acute care settings to support primary care providers, psychiatrists and other medical and behavioral health specialties in meeting both DSRIP related needs and those associated with population growth and aging.
- Projected workforce impacts by 2020 associated with implementation of individual DSRIP programs vary greatly:
  - o The impact of the Implementation of Patient Activation Activities such as the PAM tool, for Uninsured and Low/Non-utilizing Medicaid Populations on projected health care use and workforce demand is greater than the impact of any other AMCH PPS DRSIP project due largely to the Community Health Worker (CHW)/Care Coordinator FTEs required to staff this initiative.
  - o The estimated impacts on future workforce demand of other AMCH PPS DSRIP initiatives, particularly those focusing on behavioral health, are also likely to be significant.

Exhibit ES-1: AMCH PPS Summary of Projected DSRIP Staffing Impacts (DY1 to DY5)

Setting and Job Category	Non-DSRIP change in FTE demand	DSRIP change in FTE demand	Total change in FTE requirements
Target State Analysis			
Primary care and community-based clinics			
Primary care providers	9.5	40.5	50
Cardiologists	2	1	3
Endocrinologists	0.5	0	0.5
Psychiatrists/psych nurse practitioners	0.5	7	7.5
Psychologists	-4.5	5	0.5
Licensed clinical social workers	0	37	37
Addiction counselors	0	8.5	8.5
Paraprofessionals/psychiatric technicians	0	3	3
Non-licensed psychiatric technician/paraprofessional or certified peer specialist	0	4	4
Registered nurses	7.5	24.5	32
Licensed practical nurses	3	0	3
Nurse aides/assistants	2	0	2
Medical assistants	17	57	74
Administrative support staff	12.5	83	92
Emergency department			
Emergency physicians	0	-4.5	-4.5
Nurse practitioners & physician assistants	0	-1	-1
Registered nurses	2	-16	-14
Hospital inpatient			
Hospitalists	1	-12	-11
Registered nurses	30	-141.5	-111.5
Licensed practical nurses	4	-7.5	-3.5
Nurse aides/assistants	7	-36	-29
Pharmacists	3.5	0	3.5
Care managers/coordinators/ navigators/coaches			
Care coordinators (non-RN/navigators/CHWs/behavioral health)	0	98	98
Asthma educators/health coaches	0	2	2
CVD educators/health coaches	0	7.5	7.5
Peer support (behavioral health)	0	6	6
Security guards (for crisis intervention centers)	0	12	12
Total FTEs	94	177.5	271.5
Registered nurse total change	39.5	-133	-93.5

Target Workforce State Analysis Conclusions

As previously described, the purpose of the Target Workforce Report is to analyze and project AMCH PPS's anticipated future workforce needs as a result of system transformation through the DSRIP program in addition to non-DSRIP related impacts.

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

As a result of the DSRIP program, there is an anticipated increase in the numbers of care coordinators, RNs, medical assistants, clinical social workers, 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 demand is projected to decline to assume roles in outpatient and community-based settings where demand is projected to grow.

While the estimated workforce impacts for several of the PPS's DSRIP projects are not projected to have a large impact on the workforce, the projections do indicate how DSRIP program goals, including reductions in avoidable care use, might be achieved through counseling, improved access to primary and behavioral health services, and better care management for patients with chronic conditions.

Thus, based on the available data as well as DSRIP project inputs and assumptions provided by key PPS stakeholders, the projected workforce impacts modeled suggest that the impacts of the DSRIP program over the five years are unlikely to negatively impact AMCH PPS's healthcare delivery workforce, especially when evaluated alongside the projected workforce impacts of trends external to the program.

I.   Background and Purpose

The Albany Medical Center Hospital Performing Provider System ("AMCH PPS") is a partner network of health care providers across multiple care delivery settings, involving a mix of health occupations, medical specialties, and support staff, working in concert to create wellness in its upstate New York service area. The PPS's Lead Entity, Albany Medical Center Hospital ("Albany Medical Center"), serves as the overall driver and coordinator of the PPS's DSRIP program and projects.

The AMCH PPS spans a five county catchment area: Albany, Columbia, Greene, Saratoga, and Warren. Three hospitals are in the PPS: Albany Medical Center Hospital, Columbia Memorial Hospital and Saratoga Hospital. AMCH PPS has partnered with more than 175 organizations across many different provider types including behavioral health, clinics, community based organizations ("CBOs"), health home and care management, local government units, hospices, hospitals, non-PCP practitioners, pharmacies, PCPs, skilled nursing facilities ("SNFs") and nursing homes.

Albany Medical Center Hospital PPS engaged BDO, in collaboration with IHS, as its workforce vendor on behalf of AMCH PPS to define the target workforce state for the PPS through the analysis of workforce impacts as a result of system transformation and implementation of clinically integrated programs. AMCH PPS's target workforce state was created in collaboration with the PPS's leadership and experts, and included input from AMCH PPS's workforce governing body, the Workforce Coordinating Council, which is made up of representatives from several large key stakeholder organizations.

The target workforce state for AMCH PPS, 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 PPS's service area as a result of general population growth and aging over the next five years. AMCH PPS's 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 the technical appendix.

The results of the target workforce are estimates that are based on a combination of inputs, including the PPS's estimates around potential staffing and anticipated project impacts, PPS patient population demographics and health care service utilization, as well as data points from the literature and published outcomes from similar demonstrations. Several DSRIP projects, however, are innovative and there is limited information on their possible impacts. In such instances, assumptions around potential impacts were made in collaboration with the AMCH PPS, based on the best information currently available. As such, the estimates in this report are based on assumptions that may change over time, as they are dependent on successful project implementation and funding and budget considerations. Additionally,

although the use of workforce models has been prevalent in estimating workforce planning, models have several limitations, one of which is that their results are based on data that doesn't reflect the real time environment of the scenario they are projecting. When the complexity of the market is taken into consideration as well, it must be understood that the findings of this report are best estimates and are subject to change.

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 AMCH PPS service area, and expert opinion from PPS project leads and IHS. The analysis modeled 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 estimated future workforce needs 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 AMCH PPS the relevant geographic area covers the population living in Warren, Saratoga, Albany, Greene and Columbia counties, with recognition of the fact that individuals living in adjacent counties like Schenectady and Rensselaer may utilize services within our geographic area.

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 may help to inform the appropriate timing for transitioning from AMCH 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 AMCH PPS partner network (e.g. hospitals, clinics, participating physicians and other care settings) 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 AMCH PPS Workforce Coordinating Council, Project Leads, and Project Managers and included the review of supporting PPS literature, the PPS's DSRIP Project Implementation and Organizational Applications, and quarterly implementation reports submitted to the NYS Department of Health ("DOH"). 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 AMCH 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 such as the Behavioral Risk Factor Surveillance System ("BRFSS"); medical claims databases such as 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 the *Technical Appendix*.

A. 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.[1] The model has been used by states to

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

assess the adequacy of provider supply at the state, regional, and county level.[2] The model has also been used by professional associations and other organizations to analyze trends and policies with workforce implications.[3] In addition, the model has been used at the local level to help hospitals and health systems with market assessment and workforce planning.

The HDMM models demand for health care services and providers. Demand is defined as the health care services (and workforce) 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 in Exhibit 2. The HDMM is comprised of three major components: (1) a population database with demographic characteristics, socioeconomic factors and information regarding health risks and disease prevalence for each person in a representative sample of the population being modeled (e.g., the service area population); (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.

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[2] See, for example, *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

[3] Examples include: *The Complexities of Physician Supply and Demand: Projections from 2014 to 2025.* Prepared for the Association of American Medical Colleges. Washington, DC: Association of American Medical Colleges; 2016. https://www.aamc.org/download/458082/data/2016_complexities_of_supply_and_demand_projections.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.

Exhibit 2: Health Care Demand Microsimulation Logic Model
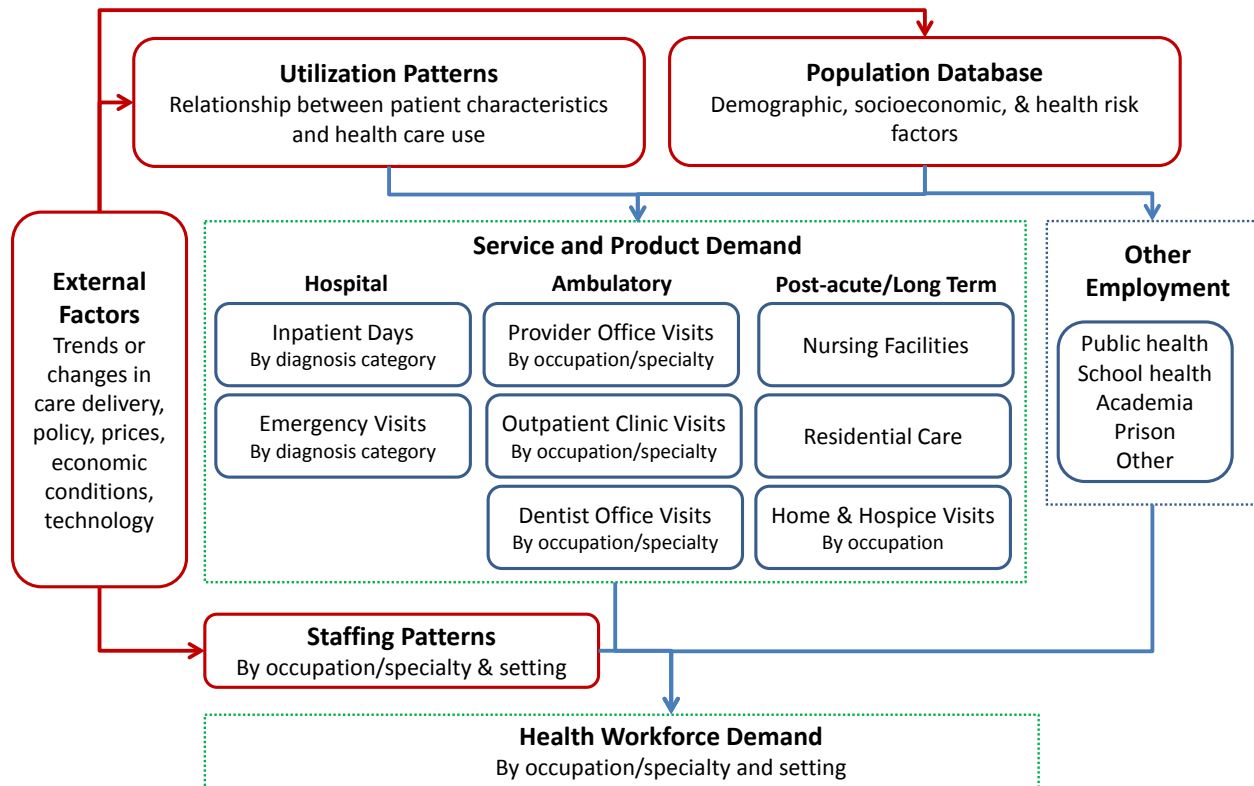
1. Preparing the population database

The database prepared for the HDMM contains a representative sample of the service area population. 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; presence of chronic disease (hypertension, coronary heart disease, diabetes, arthritis, and asthma); and history of adverse health events (heart attack, stroke, and cancer). For modeling purposes, estimates for the Medicaid population were scaled to the number of 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 and validate this database comes from both New York-specific sources such as New York State's Department of Health and national sources such as the Center for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BRFSS)[4] and the Census Bureau's American Community Survey (ACS)[5]. 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 in the service area. Population projections (by county) through 2020 are from the Cornell Program on Applied Demographics in Ithaca, NY.[6]

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 data 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[7] 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 service area population 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 the AMCH service area. 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 service area can differ from national patterns, controlling for demographics, disease prevalence, and other health risk factors).

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

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

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

[7] 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 State for a similar patient mix. Staffing levels associated with individual DSRIP projects, described later, came from the published literature and PPS documents.

B. 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 AMCH 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. We calculated AMCH PPS's market share by payer type (Medicaid, Medicare, and other) in Albany, Saratoga, Columbia, Greene and Warren counties using 2014 inpatient discharge data.[8] (Exhibit 3) In lieu of information specific to utilization patterns in other care settings, a working assumption was made that a similar market share would be applied to other care delivery settings (e.g., emergency and ambulatory care).

Exhibit 3: Estimated AMCH PPS Inpatient Market Share across 5 Counties (2014)

Payer	Market Share
Medicaid	32%
Medicare	23%
Other	26%
Total	26%

Exhibit 4 summarizes information about anticipated staffing patterns and provider productivity used for modeling these impacts across DSRIP projects. AMCH 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).

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[8] AMCH PPS has attributed lives in counties other than the five used to estimate market share. IHS's assumption is that the market share represented by these five counties captures the majority of the PPS's attributed lives that do not live in the five counties as they travel there to receive care. Additionally, as market share information was not available for the outpatient setting it was assumed that the inpatient market share could act as a proxy.

Exhibit 4: 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 department 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	2,993*	3
Office-based nurse practitioner	2,548*	3
Office-based physician assistant	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 (medical assistant)	1.75 x PCP	5
Direct admin support (medical secretary/practice manager)	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 to an average panel size of 1500). [4] National health care use (visits, days) ÷ FTE providers in that setting, 2013. [5] 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 FTE physician.[9] 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.

MGMA data may overstate the number of patient encounters in the AMCH 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 ("PCMH") model the recommended panel size is 1,500-1,800. Hence, for modeling purposes we scaled the MGMA productivity numbers for primary care providers by 80% to reflect AMCH PPS's desired panel size of 1,500.

For some occupations we used national ratios to estimate staffing levels. For example, dividing total national office visits by estimates of FTE registered nurses 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.

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 AMCH 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 service area county based on projected population characteristics independent of DSRIP across all patients regardless of insurance status. These projections were then scaled to the AMCH PPS based on an estimated market share of discharges by payer, as well as the split of attributed Medicaid lives across counties (*Exhibit A-5*).

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

The growing and aging Medicare population drives much of the growth. Exhibit 5 summarizes the projected impact between 2015 and 2020 of changing demographics on physician demand by specialty.[10] The projections illustrate that across the five relevant counties (Albany, Columbia, Greene, Saratoga and Warren) total physician demand in the AMCH PPS is projected to grow by approximately 197 FTEs between 2015 and 2020 independent of the effects of DSRIP.[11] Demand for primary care physicians in the counties identified in Exhibit 5 is projected to grow by approximately 55 FTEs. The PPS's share of total physician demand growth in the five counties is projected to be approximately 98 FTEs and the PPSs demand for primary care specialties independent of DSRIP is projected to grow by approximately 22 FTEs based on current market share assumptions (*Exhibit 6*). The 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.

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[10] Inpatient market share estimate was used as proxy for outpatient market share due to lack of data.

[11] This projected growth in physician workforce demand reflects the growing and aging population and was calculated using the IHS Healthcare Demand Microsimulation Model.

Exhibit 5: Projected Impact of Changing Demographics on FTE Physician Demand, 2015 to 2020

	Specialty	Albany	Columbia	Greene	Rensselaer	Saratoga	Schenectady	Warren	Washington	Total
Primary Care	Total primary care	12.9	2	2	7.2	16	9	3.1	2.6	54.8
	Family medicine	3	0.5	0.5	1.8	4.1	2.3	0.7	0.7	13.6
	Internal medicine	8.4	2.1	1.5	4.9	10.8	5.5	2.2	2.3	37.7
	Pediatrics	1.1	-0.7	-0.1	0.3	0.6	1	0.1	-0.6	1.7
	Geriatrics	0.4	0.1	0.1	0.2	0.5	0.2	0.1	0.1	1.7
	Hospitalists (primary care trained)	1.5	0.3	0.3	0.9	2.2	1.1	0.5	0.4	7.2
Medical Specialties	Allergy and immunology	0.3	0	0	0.2	0.4	0.3	0	0	1.2
	Cardiology	3.2	0.9	0.6	1.8	4.1	1.9	1	0.8	14.3
	Critical care/pulmonology	0.9	0.3	0.2	0.5	1.3	0.6	0.3	0.2	4.3
	Dermatology	1.2	0.3	0.2	0.7	1.6	0.8	0.3	0.3	5.4
	Endocrinology	0.7	0.1	0.1	0.4	0.8	0.4	0.2	0.2	2.9
	Gastroenterology	1.1	0.2	0.2	0.7	1.5	0.8	0.2	0.3	5
	Infectious disease	0.5	0.2	0.1	0.3	0.8	0.3	0.2	0.2	2.6
	Hematology and oncology	1.1	0.3	0.2	0.6	1.4	0.7	0.3	0.3	4.9
	Nephrology	0.8	0.2	0.1	0.4	0.7	0.4	0.2	0.2	3
	Pediatric subspecialty	0.3	-0.2	0	0.1	0.2	0.4	0	-0.2	0.6
	Rheumatology	0.4	0.1	0.1	0.3	0.6	0.3	0.1	0.1	2
Surgery	General surgery	1.3	0.3	0.2	0.8	1.7	0.8	0.3	0.3	5.7
	Colorectal surgery	0	0	0	0	0.1	0	0	0	0.1
	Neurological surgery	0.3	0.1	0	0.2	0.4	0.2	0.1	0.1	1.4
	Ophthalmology	2.1	0.5	0.4	1.2	2.6	1.3	0.6	0.6	9.3
	Orthopedic surgery	1.6	0.4	0.3	1	2.1	1.1	0.4	0.4	7.3
	Otolaryngology	0.7	0.1	0.1	0.4	0.9	0.5	0.1	0.1	2.9
	Plastic surgery	0.4	0	0.1	0.3	0.6	0.3	0.1	0.1	1.9
	Thoracic surgery	0.3	0	0	0.1	0.3	0.2	0.1	0.1	1.1
	Urology	1.1	0.3	0.2	0.7	1.4	0.7	0.3	0.3	5
	Vascular surgery	0.2	0.1	0	0.1	0.3	0.1	0.1	0.1	1
	Obstetrics and gynecology	0.9	-0.3	0.1	0.6	1.5	1.2	0	-0.1	3.9

	Specialty	Albany	Columbia	Greene	Rensselaer	Saratoga	Schenectady	Warren	Washington	Total
	Anesthesiology	2.6	0.7	0.6	1.7	4.6	2.1	0.9	1	14.2
Other	Emergency medicine	0.3	-0.1	0.1	0.3	1.1	0.6	0.1	0	2.4
	Neurology	1	0.2	0.2	0.6	1.5	0.8	0.3	0.3	4.9
	Other medical specialties	1.4	0.3	0.2	0.8	2	1.1	0.4	0.3	6.5
	Pathology	0.4	0.2	0.1	0.3	0.9	0.4	0.2	0.1	2.6
	Physical med and rehab.	0.8	0.2	0.1	0.5	1.1	0.6	0.2	0.2	3.7
	Psychiatry	0.2	-0.4	0.1	0.5	1.6	1.2	-0.1	0	3.1
	Radiology	2.8	0.5	0.4	1.6	3.5	1.9	0.6	0.7	12
	Total	**43.3**	**7.8**	**7.3**	**25.8**	**59.8**	**32.1**	**11.1**	**9.9**	**197.1**

Exhibit 6: Projected Impact of Changing Demographics on Physician Demand within the Five-County Region without DSRIP, 2015 to 2020

	Specialty	FTEs
Primary Care	Total primary care	6.5
	Family medicine	1.5
	Internal medicine	4.5
	Pediatrics	0.5
	Geriatrics	-
	Hospitalists (primary care trained)	1
Medical Specialties	Allergy and immunology	0.5
	Cardiology	2
	Critical care/pulmonology	0.5
	Dermatology	0.5
	Endocrinology	0.5
	Gastroenterology	0.5
	Infectious disease	-
	Hematology and oncology	0.5
	Nephrology	0.5
	Pediatric subspecialty	-
	Rheumatology	-
Surgery	General surgery	0.5
	Colorectal surgery	-
	Neurological surgery	-
	Ophthalmology	1
	Orthopedic surgery	1
	Otolaryngology	-
	Plastic surgery	-
	Thoracic surgery	-
	Urology	0.5
	Vascular surgery	-
	Obstetrics and gynecology	1
Other	Anesthesiology	1.5
	Emergency medicine	-
	Neurology	0.5
	Other medical specialties	0.5
	Pathology	-
	Physical med and rehab.	0.5
	Psychiatry	0.5
	Radiology	1
	Total	**21.5**

Exhibit 7 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 AMCH PPS network. Similar to the approach for developing PPS-specific physician FTE demand projections, these were also scaled to the AMCH 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 433 FTEs between 2015 and 2020. Strong growth in demand is also likely among nurse aides and home health aides and various therapist and technologist titles. Applying the PPS market share to applicable settings, registered nurse demand will grow by approximately 45 FTEs. 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 slightly between 2015 and 2020 due to changing demographics. The little population growth across the PPS service area is primarily among the elderly population (who use minimal psychology services); the highest use of psychologist services is by children and younger adults—and this population is growing slowly and in some counties is actually declining. Independent of this projected change in demand, there is evidence of a current shortfall of psychologists and other behavioral health providers in the PPS service area (documented elsewhere but outside the scope of this report).

**Exhibit 7: 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]	AMCH PPS Network				
		Inpatient	Emergency	Ambulatory	Home Health	AMCH PPS Total
Registered nurse	433	30	2	7.5	5	44.5
Licensed practical nurse	141	4	0	3	1	8
Nurse aide	351	7	0	2	0.5	9.5
Home health aide	65	0	0	0	10	10
Pharmacist	27.5	0	0.5	3	0	3.5
Pharmacy technician	35	0	0.5	4	0	4.5
Pharmacy aide	4.5	0	0	0.5	0	0.5
Psychologist	-12	0	0	-4.5	0	-4.5
Chiropractor	7.5	0	0	0.5	0	0.5
Podiatrist	4.5	0	0	0.5	0	0.5
Dietitian	9	0.5	0	0.5	0	1
Optician	2.5	0	0	0	0	0
Optometrist	1.5	0	0	0	0	0
Occupational therapist	58.5	6	0	0.5	0.5	7
Occupational therapist aide	9.5	1	0	0	0	1
Occupational therapy assistant	12.5	1	0	0	0	1
Radiation therapist	2.5	0	0	0	0	0
Radiological technologist	13.5	0	0.5	1.5	0	2
Respiratory therapist	10	0.5	0	0.5	0	1
Respiratory therapy technician	1.5	0	0	0	0	0
Medical clinical technician	6.5	0	0	0.5	0	0.5
Medical clinical lab technologist	25	2	0	1	0	3
Medical sonographer	23.5	2.5	0	0.5	0	3
Nuclear medicine technologist	42.5	0.5	4	0	0	4.5

[a] Total across the following 8 counties: Albany, Columbia, Greene, Rensselaer, Saratoga, Schenectady, Warren, Washington.

It should be noted that the projected demand in healthcare workers shown in Exhibit 7 does not factor in current vacancies within the AMCH PPS. Organizations that submitted current state workforce survey's to the AMCH PPS reported a total of 1,015 full-time vacancies and 638 part-time vacancies. The greatest vacancies were reported for staff registered nurses (196), personal care aids (186) and nurse aides/assistants (121).

IV. Anticipated PPS Workforce Impacts by DSRIP Project

Based on findings from the AMCH PPS-sponsored community needs assessment ("CNA"), AMCH PPS selected five system transformation projects (Domain 2), four clinical improvement projects (Domain 3), and two population-wide prevention projects (Domain 4). AMCH PPS's projects support the goals of NYS's DSRIP program 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 emergency and acute care service delivery. There is substantial overlap among and between these eleven projects, resulting in economies of scale and more effective utilization of staff through integration.

A. Project 2.a.i: Creation of an Integrated Delivery System

In an effort to serve AMCH PPS's population through evidence-based coordinated care, AMCH PPS is implementing an Integrated Delivery System ("IDS") and transforming healthcare delivery through an organized and collaborative network of primary, behavioral, specialty, long-term and post-acute care providers as well as through social service and community-based providers.

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 thus reduce duplication of tests.[12] For purposes of projecting target workforce needs, it was assumed that better integration of the delivery system does not have an independent effect on health workforce needs (other than the addition of Health Information Technology personnel to implement network integration). However, the IDS is necessary for the PPS's other DSRIP projects to be successful in identifying and risk stratifying patients to provide interventions, and coordinate and manage care for these patients. As previously noted, project integration results in economies of scale and efficient and effective utilization of the workforce.

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[12] 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

B. Domain 4 Projects: 4.b.i - Promote tobacco cessation, especially among low SES populations and this with poor mental health & 4.b.ii – Increase access to quality chronic disease preventative care and manage in both clinical and community settings

The analysis within this report does not separately model the two population-wide prevention projects. While Project 4.b.i is not explicitly modeled, the workforce impact of other transformation projects that are modeled (e.g., project 2.d.i – Implementation of patient activation activities, project 3.a.i – Integration of primary care and behavioral health, project 3.b.i – Evidence based strategies to improve CVD, project 3.d.iii - Implementation of guidelines for asthma management) will capture most of the workforce needs of this project and incorporate features to strengthen tobacco use cessation. AMCH PPS anticipates using tobacco educators for this project; however, this will be a small piece of the care management function and is not expected to require significant increase in providers. [13]

Project 4.b.ii aims to increase access to chronic disease preventive care and management. The project has not been modeled as it is not anticipated to have a significant workforce impact outside of the workforce impact that is projected as part of the domain 2 and domain 3 projects. Including explicit workforce projections for these two domain 4 projects could result in a duplicative count.

C. Approach to Modeling DSRIP projects

Subsequent sections within Section IV of this report describe the modeling approach and assumptions used to project the workforce impacts of the AMCH PPS's remaining eight system transformation and clinical improvement projects. The Appendix also provides additional details regarding the data and assumptions leveraged to model workforce impacts. However, to inform the approach in modeling AMCH PPS's target workforce state, the following primary research questions were leveraged to guide the modeling of the projected workforce impacts for each DSRIP project:

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?

Within each section the projected workforce impacts for each DSRIP project are calculated and summarized based on the utilization of health care services by the anticipated actively

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[13] PPS communication to IHS.

engaged patients likely to be impacted by each intervention as well as the level of anticipated changes in how future care delivery will be staffed to meet patient care needs.

The results presented in this report have been calculated based upon project impact assumptions that the projects will be implemented in line with the PPS's submitted project implementation plans. As such, any necessary modifications to project implementation will likely produce results different from those shared within this report. Modifications can occur as population needs change or as DOH requirements are changed. Additionally, although literature and clinical studies were leveraged to inform DSRIP project assumptions pertaining to the projected workforce impact, it is necessary to note that the published outcomes from these studies are not entirely in line with the project requirements within the DSRIP projects that the PPS has chosen to implement. Therefore the workforce impacts described throughout this report are estimations leveraged to simulate workforce needs within AMCH PPS, and so, it is possible that the DSRIP projects may have less impact on the workforce despite the projections stated. Numerous other variables, like IT readiness, financial sustainability and DSRIP revenue become confounding, unpredictable variables that complicate the accuracy of estimated workforce need and demand.

D. Project 2.a.iii: Health Home at Risk Intervention Program

Overarching project goals of the Health Home at Risk Intervention project include proactive management of higher risk patients not currently eligible for Health Homes through access to high quality primary care and support services. The targeted population for this intervention includes patients who, based on their history of care plan adherence and/or social needs, are judged to be at-risk and could benefit from care management and care coordination services. These include, but are not limited to, patients with high risk pregnancy, hepatitis C, diabetes, cancer, behavioral health needs, cardiology and respiratory conditions.

Using the HDMM, preliminary estimates suggest that the number of actively engaged patients for this program will grow from approximately 14,250 in DY1 to 15,840 by DY4 assuming current phase-in assumptions remain unchanged (*Exhibit 8*). The following assumptions and inputs were used to model the workforce implications of this project:

- Participants in the project are at **moderate to high risk** of becoming Health Home eligible. We assume that individuals at low risk do not require the intensity of care that this project will provide.
- For the following assumptions, results from the New York Chronic Illness Demonstration project were used as inputs, in particular, for the group with a risk score of 0.3 – 0.5 (representing a moderate risk population), and the results reported from year 2 of the demonstration (as there appears to be a higher degree of uncertainty associated with the year 1 results). Results from the demonstration suggest, in comparison to non-participants, that participants experience:
    - A decline of 3.7% in inpatient days
    - A 4.2% decline in ED visits
    - A 1.8% increase in primary care visits

- The analysis uses the following inputs and assumptions about care coordinator caseloads
    - Each care coordinator will have an active case load of 100 – 200 patients at any given time[14]
    - For the analysis, IHS assumes each coordinator will spend an average of 3 hours per patient per month, so each care coordinator is responsible for 640 patients a year[15].

The distribution of staffing impacts by care settings and job titles most likely to be affected by 2020 include:

- 19 care coordinator FTEs may potentially be required to support the level of care management called for under this initiative to serve 15,840 patients
- **In outpatient/office settings:** A possible increase of 2,400 primary care visits and 1,200 specialist visits could increase demand for primary care providers by potentially 2 FTEs, direct medical support by approximately 3 FTEs, and direct admin supply by approximately 2 FTEs
- **In the ED setting**: The impact on providers in this setting is a minimal decrease in FTEs
- **In the inpatient setting:** A potential decline of 3,600 inpatient days could contribute to a potential 22 FTE decrease in RN FTEs

The analysis suggests that project 2.a.iii's greatest impact on the AMCH PPS workforce will be on the FTEs associated with care coordinators, with increases also estimated for office-based primary care and specialty care providers and direct support. Workforce FTEs in the ED and inpatient settings are anticipated to decline, with a greater impact on the inpatient setting and specifically RNs owing to this patient population achieving better control of their health. The results in the table above are reflective of AMCH PPS's assumption that a portion of the target population (engagement target) may refuse care.[16]

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[14] PPS provided ratio.

[15] AMCH PPS has indicated that the time spent with each patient ranges from 1-3 hours per month for low complexity patients (average of 2), to 3 – 5 hours per month for high complexity patients (average of 4). Assuming each coordinator spends an average of 3 hours per patient per month, and that they work 1920(48 weeks*5 days/week*8 hours/day) hours, they may see 640 patients a year.

[16] AMCH indicated that a potential 20% of those eligible for the project may refuse care, the analysis assumes that 75% of the target engagement population enrolls, to illustrate a more conservative scenario.

Exhibit 8: Home Health at Risk: Projected Impact

	2017[17]	2018	2019	2020
Projected eligible patients	14,250	15,840	15,840	15,840
Projected actively engaged (75%)	10,700	11,900	11,900	11,900
Projected DSRIP impact				
Inpatient days	-3,200	-3,600	-3,600	-3,600
Primary care visits	2,100	2,400	2,400	2,400
Emergency visits	-1,100	-1,200	-1,200	-1,200
Workforce FTE Implications				
Office/outpatient				
Primary care providers	1.5	1.5	1.5	1.5
Direct medical support	2.5	3	3	3
Direct admin support	2	2	2	2
Registered nurses	0.5	1	1	1
Emergency department				
Emergency physicians	-0.5	-0.5	-0.5	-0.5
NPs and PAs	0	0	0	-0.5
Registered nurses	-2	-2	-2	-2
Inpatient				
Hospitalists	-1.5	-2	-2	-2
Registered nurses	-19	-21.5	-21.5	-21.5
Licensed practical nurses	-1	-1	-1	-1
Nurse aides/assistants	-5	-5.5	-5.5	-5.5
Coordinators/educators				
Care coordinators	17	19	19	19

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[17] Approved Implementation Plan indicates 14,252 (approximately 14,250) will be engaged by March 2016. IHS has assumed that the full engaged population impact will be captured in the following year (2017), and the same for the target engaged numbers in 2017, 2018 and 2019.

E. Project 2.a.v: Create a Medical Village Using Existing Nursing Home Infrastructure

According to the AMCH PPS project plan, four nursing homes have expressed interest in decertifying beds, converting this excess bed capacity to alternative uses. This space will be converted to primarily urgent care centers or other health related purpose to promote better outcomes by providing same facility treatment for nursing home residents that currently require either medical transportation or are sent to the ED for conditions that could be treated in a less intensive setting.

These sites will house newly developed care navigators that will assist residents and others to make connections with community based organizations to meet patient needs. These urgent care centers or multi-specialty sites will have established relationships with PCMH Level 3 2014 primary care sites. This will facilitate more coordinated care as the urgent care sites will also utilize EHRs that meet the guidelines for PCMH Level 3 2014 as well as meaningful use. Geographically, these new medical villages will be located in underserved neighborhoods and communities, to the extent feasible, including NYS DOH Hot Spot Cancer mapping sites for colorectal cancer, colorectal cancer screenings, mammograms, female breast cancer and lung cancer.

The following inputs furnished by AMCH PPS and assumptions are used in this analysis:

- Four SNFs to participate in the program
- Assume 2 providers or extender equivalents per site for care delivery at the following productivity levels[18]
    - 2300 visits per year for NPs
    - 3200 – 3300 visits per year for MDs
- Patients will have 3 – 4 visits a year for a panel size of 500 – 700 patients per site[19]
- 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:[20]
    - 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

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[18] AMCH provided assumption.
[19] AMCH provided assumption.
[20] https://www.pcpcc.org/initiative/newyork-presbyterian-regional-health-collaborative

Using the reported outcomes from the literature in the analysis, the following table provides the projected implications, in terms of service utilization, for this DSRIP project by 2020:

- Potentially 1,830 fewer emergency visits
- Approximately 800 less hospitalizations
- A 4,550 reduction in inpatient days

Exhibit 9: Create Medical Village: Projected Impact

	2017[21]	2018	2019	2020
Engaged Medicaid patients	100	300	680	680
Health care use absent DSRIP				
Emergency visits	1,540	3,080	6,160	6,160
Hospitalizations	700	1,400	2,800	2,800
Inpatient days	3,990	7,980	15,960	15,960
Projected DSRIP impact				
Emergency visits	-460	-920	-1,830	-1,830
Hospitalizations	-200	-400	-800	-800
Inpatient days	-1,140	-2,270	-4,550	-4,550
Workforce FTE implications				
Office/Outpatient				
Primary care providers	2	4	8	8
Direct medical support	3.5	7	14	14
Direct admin support	2.5	5	10	10
Registered nurses	0.5	0.5	1.5	1.5
Emergency Department				
Emergency physicians	0	-0.5	-1	-1
NPs & PAs	0	0	0	0
Registered nurses	-0.5	-1.5	-3	-3
Inpatient				
Hospitalists	-0.5	-1	-2.5	-2.5
Registered nurses	-7	-13.5	-27	-27
Licensed practical nurses	-0.5	-1	-1.5	-1.5
Nurse aides	-1.5	-3.5	-7	-7

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[21] Approved Implementation Plan indicates 100 patients will be engaged by March 2016. IHS has assumed that the full engaged population impact of these 100 will be captured in the following year (2017), and the same for the target engaged numbers in 2017, 2018 and 2019.

For workforce impact, the analysis suggests:

- **In outpatient/office settings**: A possible increase in demand for primary care providers of potentially 8 FTEs, direct medical support of approximately 14 FTEs, and direct admin supply by approximately 10 FTEs as well as a slight increase in RN FTEs (approximately 2)
- **In the ED setting**: The impact on providers in this setting ranges from no impact to a slight decrease in FTEs
- **In the inpatient setting**: A potential decline of greater than 4,500 inpatient days could contribute to a potential decrease in 27 FTE RNs, as well as a decrease in hospitalists, LPNs and nurse aids.

AMCH anticipates that dual eligible beneficiaries may see a decrease in inpatient service utilization through the provision of non-emergent care at these locations. The analysis appears to support this, with inpatient service utilization potentially falling by more than 4,500 days by 2020. [22]

F. Project 2.b.iii: Emergency Department Care Triage for At-Risk Populations

Many patients who visit the emergency department have non-urgent conditions which could have been treated in a less expensive setting. The goals of this initiative are to:

- identify ED patients who would be better served by a primary care provider who can provide continuity of care
- divert members to appropriate alternative PCMH 2014 Level 3 outpatient care sites, health home organizations, or community based crisis stabilization services (project 3.a.ii), and also increase connections of members to primary care providers and
- educate patients on appropriate use of ED services.

The statewide target is to reduce avoidable ED use among the Medicaid population by 25% within five years. Working towards this goal, AMCH PPS's focus for project 2.b.iii includes all patients who meet the program criteria.

The target patient population modeled includes the 35% of attributed lives that use the ER at least once during the year and the 6.5% that drive over 25% of the volume. This includes patients with ambulatory sensitive chronic conditions and at-risk patients requiring more intensive ED care management services post discharge. Program components include PPS

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[22] Provided in AMCH PPS communication.

connectivity to community PCPs, especially PCMHs, but also home health home providers and other resources. Another resource to be developed concurrently with the PCMH certifications is the expansion of operating hours for primary care and open scheduling policies which will facilitate the connection of the patient from the ED to a primary care provider.

For patients without a primary care provider presenting with minor illnesses, patient navigators will assist the patient to secure an appointment with a primary care provider who has PCMH 2014 Level 3 recognition. For patients with a primary care provider, patient navigators will assist the member in receiving a timely appointment with their own provider.

For modeling, we use the following inputs and assumptions:

- Based on PPS input, we estimated a ratio of 1:132 patient navigators to patients per month[23]
- Numbers of Medicaid attributed lives that are targeted to take part in this program grows to 5,049 patients in 2020
- Average annual number of potentially avoidable ED visits per engaged beneficiary is 4 and successfully diverted ED visits is 1 (25%)[24]
- 50% of patients for whom a visit with a primary care provider is arranged will result in a primary care visit[25]
- Probability that during the ED visit patient will see an emergency physician (88.7%), a nurse practitioner (5.8%) or a physician assistant (12.3%) are based on national averages from the National Hospital Ambulatory Medical Care Survey (NHAMCS)
- Annual encounters per emergency physician (1,973) is based on MGMA medians for the Eastern Region while annual encounters per emergency nurse practitioner (2,572) and per emergency physician assistant (1,910) come from a national median estimated by MGMA

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[23] The average (between low and high FTEs) for Patient Navigators is 2.2, 0.5 and 0.5 across AMC, Saratoga and Columbia hospitals (information provided by PPS).

[24] Source: ED Care Management, CMMI Health Care Innovation Award, program update slides for Dec 2-3, 2015 CMS site visit. Notes: High utilizers of ambulatory care sensitive conditions in the NYC Health + Hospitals ED care management intervention had 3+ ED visits within 12 months. For patients with at least one ED visit during the period September 2014 to June 2015, 10% of patients had 5 or more ED visits during 10-month period studies.

[25] A synthesis of the literature reports that for nine studies with an ED-based intervention to connect patients to a primary care provider the rate of successful follow-up with a PCP ranged from 39% to 65%, with an average follow-up rate of 53% when weighted by intervention sample size. The populations participating in these interventions, however, varied greatly—e.g., patients admitted for a specific condition such as asthma, urban patients, rural patients, children, elderly, uninsured, and insured. See Table 1 in Katz et al. Comparative Effectiveness of Care Coordination Interventions in the Emergency Department: A Systematic Review. *Annals of Emergency Medicine*. Vol 60(1): July 2012, pp 12-23.

By 2020 the net projected AMCH PPS impact associated with achieving this modeled reduction in ED visits may be the following (detailed in *Exhibit 10*):

- Approximately 3,500 fewer ED visits
- An additional 1,800 primary care visits as a result of the 50% of diverted ED visits will result in a visit to a PCP

Exhibit 10: Emergency Department Triage: Projected Impact

	2017	2018	2019	2020
Engaged patients appropriately redirected to PCMH after triage	860	3,530	3,530	3,530
Projected DSRIP impact				
Avoided emergency visits	-900	-3,500	-3,500	-3,500
Primary care visits impact	400	1,800	1,800	1,800
Workforce FTE implications				
Office/Outpatient				
Primary care providers	0	1	1	1
Direct medical support	0.5	1.5	1.5	1.5
Direct admin support	0	1	1	1
Registered nurses	0	0.5	0.5	0.5
Emergency Department				
Emergency physicians	-0.5	-1.5	-1.5	-1.5
Nurse practitioners & physician assistants	0	-0.5	-0.5	-0.5
Registered nurses	-1.5	-5.5	-5.5	-5.5
Care coordinators				
Non-nurse navigators (patient navigators)	0.5	2	2	2

Examining the FTE effects by setting, changes in utilization suggest that by 2020:

- Approximately 2 patient navigator FTEs may be required for project implementation
- **In the ED setting:** The PPS network will require approximately 6 fewer emergency RN FTEs, 2 fewer ED physician FTEs, as well as slight decreases in nurse practitioners and physician assistant FTEs
- **In the office/outpatient settings:** Estimated slight increases in primary care provider FTEs, direct medical support FTEs, and FTEs in direct administrative support may be required

AMCH's experiences with the implementation of health homes has already impacted ED utilization for some high utilizers, and it is anticipated that enhanced linkages to community based care will further reduce utilization. The impact is included in the estimates in Exhibit 10, above.

G. Project 2.d.i: Implementation of Patient Activation Activities for Uninsured and Low/Non-Utilizing Medicaid Populations

This initially began with the focus of increasing patient activation activities for the population that were under-utilizing or not utilizing the health care system at all. At present, the project has evolved to focus more on increasing the ability of the target population to manage itself, and thereby increase their levels of engagement.

Increased engagement and self-management may 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 some 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.

Patient engagement will be determined by conducting assessments of their activation in care. Using Patient Activation Measurement (PAM) surveys, patients are routinely assessed to determine their level of engagement; with the goal being to increase patient self-management skills to the highest level possible. Workers who conduct these PAM assessments will either provide counseling to the patient or refer them to their PCP for this purpose. 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, as well as patients referred for self-management, counseling and education.
- **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. In addition, patients who are actively engaged as partners in their own care are less likely to utilize the EDs inappropriately.
- **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

The following inputs and assumptions were used for modeling purposes:

- Community Health Workers ("CHWs") will be used at a ratio of 1:50 – 70 patients/ week.[26] Assuming that each CHW sees an average of 60 patients per week and there are 40 hours a week, this means that each CHW sees each patient for 2.7 hours per month, for a total of 720 patients a year[27]

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

- An estimated 70% of the target population already has a primary care provider. For modeling we assume that the 70% of the target population currently with a primary care provider will experience a 1 visit/year increase in number of primary care visits, and the 30% currently without a primary care provider will experience a 2 visit/year increase in primary care visits.

Exhibit 11 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 800 fewer emergency visits
- Approximately 900 fewer inpatient days
- Approximately 29,500 additional primary care visits

The projected workforce impact includes:

- An estimated 32 additional non-RN care coordinator (CHW) FTEs
- **In office/outpatient settings**: Results suggest the following additional FTEs may be required: 13-14 primary care provider FTEs, 23 FTE direct medical supports, 16 FTE administrative support staff and 6 FTE staff RNs

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[26] AMCH PPS provided input.

[27] IHS assumption.

- **In the ED setting:** Minimal estimated change in demand
- **In the inpatient setting:** An estimated decline in demand for inpatient staff RNs of approximately 6 FTEs

Exhibit 11: Patient Activation: Projected Impact

	2017	2018	2019	2020
Number of actively engaged patients with PAM assessments	18,840	22,670	22,670	22,670
Projected DSRIP impact				
Inpatient days	-700	-900	-900	-900
ED visits	-700	-800	-800	-800
Primary care visits	24,500	29,500	29,500	29,500
Workforce FTE implications				
Office/Outpatient				
Primary care providers	11	13.5	13.5	13.5
Direct medical support	19.5	23	23	23
Direct admin support	14	16.5	16.5	16.5
Registered nurses	5.5	6.5	6.5	6.5
Emergency Department				
Emergency physicians	-0.5	-0.5	-0.5	-0.5
NPs and PAs	0	0	0	0
Registered nurses	-1	-1.5	-1.5	-1.5
Inpatient				
Hospitalists	-0.5	-0.5	-0.5	-0.5
Registered nurses	-4.5	-5.5	-5.5	-5.5
Licensed practical nurses	0	-0.5	-0.5	-0.5
Nurse aides/assistants	-1	-1.5	-1.5	-1.5
Non-RN care coordinator(CHWs)	26	31.5	31.5	31.5

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 care coordinator FTEs to meet this need.

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

To address the needs of individuals with co-morbid physical and behavioral health needs, AMCH PPS intends to better integrate behavioral and physical health outcomes by pursuing three related models of primary care and behavioral health integration:

- Model 1
  - o Co-locating behavioral health services at primary care practice sites, develop collaborative evidence-based standards of care (including medication management, care engagement), conduct preventive care screenings that will include behavioral health screenings, use EHR to track patients
- Model 2
  - o Co-locating primary care at behavioral health sites, develop collaborative evidence-based standards of care (including medication management, care engagement), conduct preventive care screenings that will include behavioral health screenings, use EHR to track patients
- Model 3
  - o Implement IMPACT model at primary care sites, develop collaborative evidence-based standards of care (including medication management, care engagement), employ a depression care manager, a psychiatrist, measure outcomes and provide "stepped care" as required by IMPACT as well as use EHR to track patients

The goal is to transform the delivery of behavioral health services by integrating primary care and behavioral health services. This initiative will include additional training and certification of participating PCPs to achieve 2014 Level 3 PCMH primary care certification, as well as hiring additional behavioral health providers to expand access to community-based care. The AMCH PPS identified that in 2012 there were over 6,700 behavioral health-related potentially preventable emergency visits within the PPS network of which approximately 22% were related to alcohol dependence, alcohol withdrawal, and cocaine dependence. It is anticipated that a reduction in preventable visits will be achieved through multiple interventions, and as described in the following section we anticipate that the Behavioral Health Community Crisis Stabilization Services (project 3.a.ii) intervention will have a much larger effect on reducing preventable emergency visits and hospitalizations than will be achieved through the three integration models analyzed in this section.

Though the project intends for all patients seeking care at the participating sites to receive preventative care behavioral health screening, the target population modeled for intervention was individuals with co-morbid behavioral health and physical health conditions residing within the AMC PPS, as these are among the highest risk group for preventable emergency department visits and avoidable hospitalizations.

The following assumptions and inputs are used in this analysis.

- We assume that approximately 15% of the Medicaid population has unmet behavioral health needs (i.e., not receiving specialty mental health services), with these unmet needs largely consist of mild-to-moderate depressive/anxiety disorders or substance abuse, and that these patients constitute the target population for care in integration models 1 and 3.[28]

- Based on AMCH PPS input, we assume that 30% of the target population for this intervention will participate in integration model 2 (with increased access to primary care services by collocating primary care providers with behavioral health clinics).

- We assume that 80% of the Medicaid population with unmet behavioral health needs visits a primary care provider during the year and these individuals will be screened and are candidates to receive behavioral health services under integration models 1 and 3.[29] Of the screened candidates with unmet behavioral health needs, we assume that 80% of will be diagnosed and referred (with undiagnosed patients reflecting patients with the least severe symptoms).

- Absent DSRIP, an estimated 25% of referred patients will complete a referral.[30] Under DSRIP the PPS estimates that the referral completion rate will increase to 80%.[31] This estimate is in line with Geisinger's reports that after integrating behavioral health across the continuum of care, 85% of patients attended their first office visit with a behavioral health specialist.[32]

- We assume that behavioral health services will be provided by a mix of behavioral health providers, including psychiatrists, psychologists, clinical social workers, licensed mental health therapists, substance abuse providers, etc. We assume that

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[28] IHS assumption: for modeling purposes, an estimate of the percentage of Medicaid population may have unmet behavioral health needs was required. Data from the literature around this metric is scarce, but indicates that 15% may be conservative, as some estimate that 60% to 70% of patients with behavioral health issues leave medical settings without receiving behavioral health treatment. http://www.commonwealthfund.org/publications/newsletters/quality-matters/2014/august-september/in-focus#/#4. The 15% assumption was chosen in order to avoid overestimating effects of the DSRIP program, but this number may underestimate unmet need. Still, when combined across the three integration models we estimate that 1 in 4 of the PPS's attributed lives will be receiving professional behavioral health services.

[29] Nationwide, 86.5% of adult and 93.5% of child Medicaid beneficiaries had contact with a health care professional in the past year. This information is used to guide IHS's assumption that 80% of the Medicaid population with unmet behavioral health needs will visit a PCP. http://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2014_SHS_Table_A-18.pdf

[30] 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/

[31] AMCH PPS BH patient referral completion target.

[32] 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

each licensed professional will manage approximately 75 active patients for approximately 6 months (or approximately 150 patients annually).[33]

- Any care coordination services required by this population are modeled under the Health Home at Risk Intervention Program.

Projected changes in utilization by 2020 as a result of program implementation include (Exhibit 12):

- The number of BH-related ED visits may decrease by about 230 visits
- BH-related inpatient days may fall by about 370 days

By 2020 the net projected PPS-wide workforce impact associated with this DSRIP initiative will likely include:

- **In the outpatient/office setting**: approximately 37 FTE increase in licensed behavioral health workers—including a mix of psychiatrists or psychiatric nurse practitioners, psychologists, clinical social workers, addiction counselors or like behavioral health providers. In addition, we calculated about 40 FTE care managers will be required, as well as 5 primary care providers and support staff.
- **In the ED setting**: Little anticipated impact on the providers in this setting.
- **In the inpatient setting**: Little anticipated impact on the providers in this setting.

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[33] Source indicates caseloads of 100 – 150 patients. IHS chose the higher caseload as the project focuses on population without serious mental health issues, and in that case, presumably, providers are able to see more patients. https://aims.uw.edu/collaborative-care/team-structure/care-manager

Exhibit 12: Integration of Behavioral Health into Primary Care: Projected Impact

	2017	2018	2019	2020
Population modeled				
Integration model 2	1,400	7,490	11,480	11,480
Integration models 1 and 3	64,600	64,600	64,600	64,600
Population with unmet BH needs	6,500	6,500	6,500	6,500
Population with unmet BH needs visiting PCP	5,200	5,200	5,200	5,200
Population screening positive for BH needs absent DSRIP	2,600	2,600	2,600	2,600
Population screening positive for BH needs with DSRIP	2,800	3,600	4,100	4,100
Screened population completing BH referral absent DSRIP	500	500	500	500
Screened population completing BH referral with DSRIP	900	2,300	3,300	3,300
Change in population receiving BH counseling	300	1,800	2,800	2,800
Health care use impact of DSRIP				
Encounters with BH provider	1,700	9,100	13,900	13,900
Primary care visits	210	1,100	1,690	1,690
BH-related ED visits	-30	-150	-230	-230
BH-related inpatient days	-40	-240	-370	-370
Workforce FTE implications				
Office setting				
Psychiatrists/psych nurse practitioners	0.5	2	3.5	3.5
Psychologists	0.5	3	5	5
Licensed clinical social worker/depression care manager	2.5	13	19.5	19.5
Addiction counselors	1	5.5	8.5	8.5
Care managers	5	26	39.5	39.5
Primary care providers	0.5	3	5	5
Direct medical support	1	5.5	9	9
Direct admin support	4	22	35	35
Registered nurses	0	0	0.5	0.5
Emergency Department				
Emergency physicians	0	0	0	0
Nurse practitioners or physician assistants	0	0	0	0
Registered nurses	0	0	-0.5	-0.5
Inpatient				
Hospitalists	0	0	0	0
Registered nurses	-0.5	-1.5	-2	-2
Licensed practical nurses	0	0	0	0
Nurse aides/assistants	0	-0.5	-0.5	-0.5

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. The projected impact across ED and inpatient settings is small due primarily to the modest increases in numbers who receive BH counseling even after full project implementation.

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

The PPS will implement an intervention program that at a minimum will integrate and develop outreach, mobile crisis teams, and community based intensive crisis services, following successful models that have been demonstrated in other areas of the state. AMCH PPS will work with health homes, PCMHs, The Capital District Psychiatric Center (CDPC) and EDs to develop a centralized triage that, when appropriate, will divert patients from the ED to less intensive settings by leveraging new and existing resources such as outreach, mobile crisis intervention and intensive crisis services, as well as written protocols to ensure that patients are treated in the most appropriate setting.

It is anticipated that anyone who is having a behavioral health crisis would be a potential client for crisis services. This project will target the behavioral health population, together with other projects (2.a.iii & 4.b.i) and will serve patients with behavioral health diagnoses who need crisis stabilization services that could be delivered in settings other than the ED or inpatient settings.

The intervention has the following goals:

1. **Supporting the development of 3-4 crisis stabilization sites throughout the AMCH PPS region**. Three sites will be established to serve adult populations, and one site each in Saratoga County, Albany County, and Columbia/Greene Counties. A fourth crisis stabilization site is envisioned to provide services to the pediatric and adolescent population. The region for this pediatric/adolescent crisis stabilization site is undetermined, and staffing for this potential site is not included in the table below.
2. **Supporting the expansion of the Mobile Crisis Services throughout the AMCH PPS region** to provide services 24 hours a day, seven days a week, 365 days a year. None of the four Mobile Crisis Services in the PPS currently provide services at this level. Services will be both face to face and telephonic.

Areas of opportunities for efficiencies in Project 3aii staffing and funding include collaborating with other organizations. AMCH PPS will look to collaborate with AHI PPS in Saratoga County, as the AHI PPS also is participating in Project 3.a.ii; will work toward partnering with Northern Rivers Family Services, who have received a capital funding award for crisis stabilization services; and funding will partially come from increased revenues related to the upcoming "carving in" of crisis intervention services into Medicaid Managed Care Plans.

The following assumptions and inputs are used in this analysis:

- Modeling inputs from a study that implemented behavioral crisis stabilization include the following:[34]
  - Study results suggest an estimated 2.5 ED visits annually per engaged patient would occur in the absence of crisis stabilization, but crisis stabilization would reduce ED use among engaged patients. This study reports that following crisis stabilization the percentage of patients with one or more ED visits declined by 13 percentage points. Discussion with the AMCH PPS implementation team suggested that due to long wait times one PPS location was likely to experiences a small drop in ED visits relative to this study (assume a 7% decline), while two other PPS sites likely would experience declines similar to published results (10-13% decline). For modeling we assume a 10% decline in behavioral health-related ED visits among patients receiving crisis stabilization services.
  - For modeling, we used study results of the proportion of patients with a mental health hospitalization pre intervention (39%) compared to hospitalization rates post intervention (14%). We assume that hospitalizations average 7.2 days (the national average length of stay for mental disorders).[35]
  - Study results are that connection to outpatient services for mental health services increased following crisis stabilization. Pre intervention 64% of patients had one or more outpatient mental health services, while post intervention this increased to 79% of patients.
- We assume the following FTE staffing at each of the four sites to implement the program:
  - 1 psychiatrist or psychiatric nurse practitioner
  - 4 licensed clinical social workers
  - 1 primary care nurse practitioner
  - 1 medical director physician (assume a primary care physician)
  - 1 paraprofessional/psychiatric technicians
  - 4 registered nurses
  - 4 direct administrative support staff
  - 2 care coordinators/navigators
  - 2 peer counselors

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[34] https://www.wilder.org/Wilder-Research/Publications/Studies/Mental%20Health%20Crisis%20Alliance/Crisis%20Stabilization%20Claims%20Analysis%20-%20Technical%20Report.pdf
[35] http://www.cdc.gov/nchs/fastats/mental-health.htm

- o 4 security guards (to provide continuous coverage)
- We assume 4 mobile crisis services teams to provide continuous coverage for the area, with each team consisting of:
    - o 1 licensed mental health provider (e.g., licensed clinical social worker)
    - o 1 non-licensed provider (e.g., psychiatric technician, paraprofessional or certified peer specialist)

Exhibit 13 projects the potential effects on service utilization and PPS workforce requirements of this DSRIP initiative intended to strengthen community crisis stabilization services and capabilities, by 2020:

- Approximately 2,300 additional behavioral health outpatient visits
- Approximately 1,900 fewer emergency visits
- Approximately 1,900 fewer hospitalizations and 13,800 fewer inpatient days

The projected workforce impact includes:

- **Intervention staff:** The additional workforce to staff the crisis stabilization centers and mobile stabilization teams are described above and summarized in Exhibit 13.
- **In the ED setting**: We project minimal impact on the providers in this setting.
- **In the inpatient setting**: Anticipated decreases in the FTEs of providers in this setting, including an estimated decrease of 83 FTE RNs, 7 fewer hospitalists, 4-5 fewer licensed practical nurses, and 21 fewer nurse aides. A portion of the reduction in hospitalists could be psychiatric hospitalists or other professionals (psychiatrists, or psychiatric nurse practitioners) who provide mental health services to patients while in the hospital.

The analysis suggests the greatest workforce implications will occur at the stabilization centers where the most care for this project will be provided and additional resources will be required, as well as hospital-based services disproportionately affecting the nurse workforce.

Exhibit 13: Crisis Stabilization Services: Projected Impact

	2017	2018	2019	2020
Projected engaged patients	3,770	7,530	7,530	7,530
Projected DSRIP impact				
BH outpatient visits	1,100	2,300	2,300	2,300
ED visits	-900	-1,900	-1,900	-1,900
Hospitalizations	-1,000	-1,900	-1,900	-1,900
Inpatient days	-6,900	-13,800	-13,800	-13,800
Workforce FTE implications				
Crisis Stabilization Center				
Licensed clinical social workers	4	12	12	12
Psychiatrists/psych nurses	1	3	3	3
Nurse practitioner (primary care)	2	6	6	6
Medical director physician (assume PCP)	1	3	3	3
Direct admin support	4	12	12	12
Registered nurses	4	12	12	12
Paraprofessionals/psychiatric technicians	1	3	3	3
Peer counselors	2	6	6	6
Security guards	4	12	12	12
Care coordinator/navigator	2	6	6	6
Mobile Crisis Teams				
Licensed clinical social workers	2	4	4	4
Non-licensed psychiatric technician/paraprofessional or certified peer specialist	2	4	4	4
Office setting				
Licensed clinical social worker	0.5	1.5	1.5	1.5
Psychiatrists/psych nurses	0	0.5	0.5	0.5
Direct admin support	0.5	1.5	1.5	1.5
Emergency Department				
Emergency physicians	-0.5	-1	-1	-1
NPs and PAs	0	0	0	0
Registered nurses	-1.5	-3	-3	-3
Inpatient/psychiatric				
Hospitalists	-3.5	-7	-7	-7
Registered nurses	-41	-82.5	-82.5	-82.5
Licensed practical nurses	-2.5	-4.5	-4.5	-4.5
Nurse aides/assistants	-10.5	-21	-21	-21

J. Project 3.b.i: Evidence-based Strategies to Improve Management of Cardiovascular Disease

AMCH PPS will pursue a multi-pronged approach to address major cardiovascular disease ("CVD") risk factors. This includes improving prescribing and adherence to aspirin prophylaxis among eligible patients, improving blood pressure control by updating and strengthening implementation of HTN guidelines, improving cholesterol control by updating current cholesterol management and treatment guidelines, and increasing tobacco cessation by enabling PCPs to distribute nicotine replacement therapy at the point-of-care.

The targeted patient population will include patients living in poverty between the ages of 19-64 in the AMCH PPS 5 county catchment area with known cardiovascular diagnoses. The target population will also include patients with elevated blood pressure readings in the past but without a hypertension diagnosis in order to develop a treatment plan for an undiagnosed condition. Guidelines provided by the Million Hearts Campaign for clinical processes and treatment will be followed.

The following assumptions and inputs are used in this analysis:

- AMCH aims to improve the rate of controlled hypertension by 30%[36]
- CHW's will be used for this project at a ratio of 1:960 patients a year[37]
- Care management is estimated to decrease CVD-related emergency visits by 20%
- Care management is estimated to decrease CVD-related inpatient hospital days by 39%
- Care management is estimated to increase visits to PCPs by 1 and cardiologists by 0.5 annually
- Any care coordination services required by this population are modeled under the Health Home at Risk Intervention Program.

Exhibit 14 summarizes modeling results and projected impacts. By 2020 the net projected annual utilization impact associated with this DSRIP clinical initiative is the following:

- Emergency visits may decline by approximately 100
- Inpatient days may potentially decrease by approximately 600
- 7,200 additional urgent (unscheduled) visits to primary care providers is estimated
- 3,600 more visits to cardiologists may occur

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[36] AMCH estimates that 40% of adults in their patient population have controlled hypertension.

[37] AMCH PPS has provided an anticipated caseload of 1:70 – 80 patients per week/year. IHS assumes 80 patient at 30 minutes per patient/week or 2 hours/per patient per month.

Exhibit 14: CVD Management: Projected Impact

	2017	2018	2019	2020
DSRIP initiative participants (with phase-in)	5,030	7,180	7,180	7,180
Projected DSRIP impact				
Emergency department visits	-100	-200	-200	-200
Inpatient days	-300	-400	-400	-400
Visits to primary care providers	5,000	7,200	7,200	7,200
Visits to cardiologists	2,500	3,600	3,600	3,600
Workforce FTE implications				
Outpatient/Office setting				
Primary care providers	2.5	3	3	3
Direct medical support	5.5	7.5	7.5	7.5
Direct admin support	4	5.5	5.5	5.5
Registered nurses	1.5	2.5	2.5	2.5
Specialists (Cardiologists)	0.5	1	1	1
Emergency Department				
Emergency physicians	0	0	0	0
Registered nurses	0	-0.5	-0.5	-0.5
Inpatient				
Hospitalists	0	0	0	0
Registered nurses	-2	-2.5	-2.5	-2.5
Nurse aides/assistants	-0.5	-0.5	-0.5	-0.5
Community Health Workers (CHW)	5	7.5	7.5	7.5

The projected workforce impact by 2020 includes:

- Approximately 8 FTE additional CHWs to provide education/ counseling services to 7,180 patients
- **In outpatient/office settings**: an increase of 3 FTE additional primary care providers and 1 FTE cardiologist supported by approximately 8 FTE direct medical support staff and 6 FTE direct administrative support staff and 3 RN FTEs
- **In the ED setting**: An nominal impact on emergency department staff
- **In inpatient settings**: a slight decrease in demand for hospital inpatient staff— including approximately 3 FTE fewer RNs

In terms of workforce implications, the analysis suggests that the greatest impact of this project on workforce will be in outpatient settings where most care management activities associated with this project will occur. The project may also have some impact on nursing staff in the inpatient setting. There is minimal workforce impact in the ED setting.

K. Project 3.d.iii: Implementation of Guidelines for Asthma Management

By engaging providers, care managers, certified asthma educators (AE-Cs), behavioral health specialists, and pharmacists to implement evidence-based medicine guidelines, the project will improve asthma quality of life indicators by assuring appropriate diagnosis, classification of severity, prescription of controller medications, medication adherence, and self-management support and trigger control interventions. The PPS and the Asthma Coalition of the Capital Region (ACCR) will be responsible for achieving project goals by training primary care providers and staff on the "Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma" developed by the National Heart, Lung and Blood Institute. Staff training through the asthma educator program to become Certified Asthma Educators will also be conducted.

The AMCH PPS will develop an asthma registry for care management support, medication adherence, health service utilization and to track project metrics across the system. The registry will also identify high-utilizers of ED and hospital services for referral for additional service interventions to decrease further use of those services.

The project will target the following groups: low income children and adults with diagnosed asthma residing in the AMCH PPS service area; low income children with asthma enrolled in schools located in the AMCH PPS service area; patients with recent asthma related visits to an emergency department/urgent care/hospitalization; high-risk asthmatics as identified and referred by their primary care/specialist provider, Managed Care Organization, Health home and/or pharmacy; patients with poor medication adherence; and patients with current tobacco exposure, primary or secondary.

The following assumptions and inputs are used in this analysis:

- Each asthma educator will see 1920 patients/year[38]
- Implementing asthma management guidelines will decrease asthma-related emergency visits by 18%.[39]
- Asthma management guidelines will decrease asthma-related hospitalizations by 34%[40]
- Asthma management guidelines will decrease urgent primary care visits (i.e., unscheduled visits to a primary care provider) by 5% (approximately 1.8 visits/year)[41]

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[38] AMCH has provided a ratio of 1:200 patients at any given time, at 1 hour per month per patient. Assuming an educator works 1920 hours a year, they see 1920 patients a year
[39] http://www.ncbi.nlm.nih.gov/pubmed/16740859
[40] http://www.nga.org/files/live/sites/NGA/files/pdf/031403DISEASEMGMT.pdf

Using SPARCS data we estimate that the average length of stay for Medicaid beneficiaries hospitalized for an asthma-related reason is 2.3 days. *Exhibit 15* 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 the following:

- A reduction of 60 emergency visits
- 40 fewer inpatient days
- 780 fewer urgent (unscheduled) primary care visits

The projected workforce impact includes:

- Approximately 2 asthma health educators to provide services to 4,310 patients
- **In office/outpatient settings**: Very minimal change, with slight decreases in FTEs associated with providers in this setting
- **In the ED setting:** No substantial changes in demand for FTEs
- **In the inpatient setting**: No substantial changes in demand for FTEs

Exhibit 15: Asthma Guidelines: Projected Impact

	2017	2018	2019	2020
Number of actively engaged patients (children with asthma)	3,450	4,310	4,310	4,310
Projected DSRIP impact				
Emergency visits	-50	-60	-60	-60
Inpatient days	-40	-40	-40	-40
Urgent office visit to primary care provider	-620	-780	-780	-780
Workforce FTE implications				
Office/Outpatient				
Primary care providers	-0.5	-0.5	-0.5	-0.5
Direct medical support	-1	-1	-1	-1
Direct admin support	-0.5	-0.5	-0.5	-0.5
Emergency Department				
Emergency physicians	0	0	0	0
Nurse practitioners & physician assistants	0	0	0	0
Registered nurses	0	0	0	0
Inpatient				
Hospitalists	0	0	0	0
Registered nurses	0	-0.5	-0.5	-0.5
Licensed practical nurses	0	0	0	0
Nurse aides/assistants	0	0	0	0
Asthma health educator	2	2	2	2

41

http://pediatrics.aappublications.org/content/117/6/2149?sso=1&sso_redirect_count=1&nfstatus=401&nftoken=00000000-0000-0000-0000-000000000000&nfstatusdescription=ERROR:+No+local+token

The results of the analysis suggest that this DSRIP initiative will have only a small effect on workforce numbers and provider mix delivering direct medical care to this asthma population.

V.   Skills and Licensure Requirement's Related to DSRIP Positions

The AMCH PPS has identified the desired skill set and licensure for the newly created job titles as a result of the implementation the DSRIP projects.

Care Coordinators

Care coordinator will coordinate the needs of assigned patients across multiple providers; develop comprehensive plans to manage care delivery across a continuum of care. Assist in utilization of resources, clinical care, and promote clear communication among care team including treating physicians by ensuring awareness regarding patient. Job responsibilities vary within different organizations. An RN license is required. A bachelor's degree is preferred with an associate's degree required. A minimum of 2 years clinical utilization management/case management experience required or a New York State licensure with a minimum 1 year direct service experience in the delivery of mental health and substance abuse treatment services required.

Asthma Educators / Health Coaches

A Community Health Worker/Certified Asthma Educator's primary responsibility is the provision of asthma coordination and counseling services. They are an expert in educating individuals with asthma and their families on the knowledge and skills necessary to minimize the impact of asthma on their quality of life. The individual must have passed the exam set by the National Asthma Educator Certification Board, Inc.

CVD Educators / Health Coaches

Health Coaches are responsible for developing, implementing and evaluating various health promotion offerings in worksite, community and provider settings contribute to the development of various community and employer group partnerships and participate in the delivery of population health management programs/initiatives, including health education programs and health screenings, within these settings to support health improvement among our members and the community. A bachelor's degree in health education, nutrition, community, public health, nursing, or related field required. A master's degree is preferred. It is preferred that the person is a Certified Health Education Specialist.

Peer Support Workers

The role includes recovery coaching, emotional support, advocacy, mentoring, outreach support, and organizing/attending alcohol-and-drug-free recreational activities. No educational requirements, but a high school diploma or GED is preferred.

VI. Summary Workforce Impact Tables

Through 2020, the demand for health workers will change within the AMCH 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 by approximately 3-6% for the population of the AMCH PPS—with the amount differing by health occupation and medical specialty, and 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, most providers in the PPS network also provide services to the Medicare and commercially insured populations.

In addition, DSRIP has the potential to increase demand for some provider types (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, 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 non-DSRIP impacts of changing demographics and expanded medical coverage under the Affordable Care Act.

A. DSRIP-Related Support Hires

To aid AMCH PPS's successful fulfillment of the DSRIP goals, AMCH PPS has set up a project management office ("PMO") to coordinate the provision of management services and provide clinical leadership.

The PMO team currently consists of 25 people (approximately 24 FTEs), of which 18 were new hires and 7 were redeployed as a result of DSRIP. The current PMO team consists of a number of different roles from CEO and Executive Director to Project Coordinators and Administrative Support Assistants.

The AMCH PPS estimates it may hire up to 15 additional employees to fill PMO roles over DSRIP Year 2 to DSRIP Year 5. The potential new hires or redeployed staff would be employed to fill a number of positions:

- Practice Administrator
- Practice Manager
- Senior Practice Coordinators
- Practice Coordinators
- DSRIP Project Coordinator
- Medical Social Worker

- Administrative Support Assistants

B. AMCH Workforce Impact Summary

Exhibit 16 summarizes the AMCH PPS's estimated health workforce impact of individual DSRIP projects across professions and settings.[42] The largest projected workforce impacts of DSRIP may likely take place among nursing staff and care managers, licensed educators, and care coordinators/navigators. By 2020, the projections from this analysis indicate that demand for registered nurses may potentially fall by approximately 142 FTEs in inpatient settings, fall by approximately 16 FTEs in emergency settings, and rise by about 25 FTEs in office/clinic settings for a potential net reduction of approximately 133 FTEs.

The analysis indicates a potential increased demand for non-RN care managers (e.g., community health workers, social workers, and LPNs) and licensed educators which reflect the important roles of these professions in a transformed healthcare environment. By 2020, the demand for primary care providers is estimated to increase by approximately 41 FTEs and decrease for hospitalists and emergency physicians by about 12 FTEs and 5 FTEs, respectively. In the behavioral health professions, demand is likely to increase by approximately 58 licensed clinical professionals (e.g., psychiatrists or psychiatric nurse practitioners, clinical social workers, addiction counselors or depression care managers, psychologists, etc.). There are significant increases in demand for care coordinator-related staff, with the majority (approximately 98 FTEs) consisting of non-RN workers such as social workers, community health workers, licensed practical nurses, etc.

The results in *Exhibit 16* are based on inputs provided by the PPS at the date of this report. As the AMCH PPS implements each project, some of the modeling inputs and assumptions may change.

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[42] It excludes the ED triage goal associated with a decline in avoidable ED visits (to avoid double counting overlapping services).

Exhibit 16: Total AMCH PPS DSRIP Workforce Impact

Occupation and Setting	2017	2018	2019	2020
Primary care providers	20	34.5	40.5	40.5
Specialist Physicians				
Emergency physicians	-2	-4	-4.5	-4.5
Hospitalists	-6	-10.5	-12	-12
Cardiologists	0.5	1	1	1
Nurse practitioners and physician assistants				
Emergency department	0	0	0	-1.0
Nursing				
Registered nurses	-68.5	-118.5	-133	-133
Hospital inpatient	-74	-127.5	-141.5	-141.5
Emergency	-6.5	-14	-16	-16
Office/clinic	12	23	24.5	24.5
Licensed practical nurses				
Hospital inpatient	-4	-7	-7.5	-7.5
Nurse aides/assistants				
Hospital inpatient	-18.5	-32.5	-36	-36
Clinical Support				
Medical Assistants	31.5	46.5	57	57
Administrative support staff	30.5	65	83	83
Behavioral health				
Psychiatrists/psychiatric nurse practitioners	1.5	5	6.5	7
Psychologists	0.5	3	5	5
Licensed clinical social workers/depression care managers	9	30.5	37	37
Addiction counselors	1	5.5	8.5	8.5
Paraprofessionals/psychiatric technicians	1	3	3	3
Non-licensed psychiatric technician/paraprofessional or certified peer specialist	2	4	4	4
Peer support	2	6	6	6
Care managers/coordinators/navigators/coaches				
Care coordinators (non-RNs, including social workers, community health workers, behavioral health, and licensed practical nurses)	50.5	84.5	98	98
Asthma educators/health coaches	2	2	2	2
CVD educators/health coaches	5	7.5	7.5	7.5
Security guards (for crisis intervention centers)	4	12	12	12

C. DSRIP Target State Workforce Staffing Impact Analysis

Exhibit 17 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 are additive to DSRIP workforce impacts.

By 2020 it's estimated that AMCH PPS may require approximately 50 additional FTE primary care providers. This includes approximately 10 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 a potential 41 additional FTEs due to the DSRIP impact on the patient population.

The DSRIP impact on demand for registered nurses is an estimated decline of approximately 133 FTEs (with most of this decline in hospital inpatient settings). Independent of DSRIP, it is estimated that AMCH PPS will need approximately 40 registered nurse FTES to serve the needs of a growing and aging population. Taken together, the microsimulation analysis suggests that approximately 94 fewer registered nurses FTEs are needed within the AMCH PPS (Exhibit 17).

There is substantial projected growth in demand for administrative and clinical support personnel to support growth in demand for primary care providers, behavioral health providers, and specialist physician offices.

Exhibit 17: Total Workforce Impact on FTE Demand (2020)

Occupation and Setting	Non-DSRIP impact on demand (FTEs)	DSRIP impact on demand (FTEs)	Total impact on demand (FTEs)
Primary care providers	9.5	40.5	50
Specialist physicians			
Emergency physicians	0	-4.5	-4.5
Hospitalists	1	-12	-11
Cardiologists	2	1	3
Endocrinologists	0.5	0	0.5
ED-based nurse practitioners and physician assistants	0	-1.0	-1.0
Nursing			
Registered nurses	39.5	-133	-93.5
Hospital inpatient	30	-141.5	-111.5
Emergency	2	-16	-14
Office/clinic	7.5	24.5	32
Licensed practical nurses	7	-7.5	-0.5
Hospital inpatient	4	-7.5	-3.5
Office/clinic	3		3
Nurse aides/assistants	9	-36	-27
Hospital inpatient	7	-36	-29
Office/clinic	2	0	2
Clinical support			
Medical assistants	17	57	74
Administrative support staff	9	83	92
Behavioral health			
Psychiatrist/psychiatric nurse practitioners	0.5	7	7.5
Psychologists	-4.5	5	0.5
Licensed clinical social workers	0	37	37
Addiction counselors	0	8.5	8.5
Paraprofessionals/psychiatric technicians	0	3	3
Non-licensed psychiatric technician/paraprofessional or certified peer specialist	0	4	4
Peer support	0	6	6
Pharmacists	3.5	0	3.5
Care managers/coordinators/navigators/coaches			
Care coordinators (non-RNs, including social workers, community health workers, and licensed practical nurses)	0	98	98
Asthma educators/health coaches	0	2	2
CVD educators/health coaches	0	7.5	7.5
Security guards (for crisis intervention centers)	0	12	12

VII.   Conclusions and Implications of Target Workforce State

Modeling the future state of the workforce following the implementation of various DSRIP projects is an immensely complex analysis involving inputs from the AMCH PPS and the published 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 AMCH PPS's patient population and assumptions that may change, and are contingent on project implementation proceeding as planned. The findings of this report must therefore be examined while taking these influencing factors into account.

A major contributor to achieving AMCH PPS's DSRIP goals will likely be the implementation of Patient Activation Activities, such as the PAM tool. 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 care coordinators for the program.

The Crisis Stabilization program is a good example of the implications of shifts in workforce demand from hospital inpatient and ED settings to primary care and community-based care. In some cases, non-DSRIP impacts will likely offset or moderate the workforce impacts of DSRIP while in other cases they may magnify DSRIP workforce impacts.

Based on the best available modeling inputs and assumptions, these results suggest that implementing DSRIP as designed will likely impact the AMCH 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 the gap analysis and transition roadmap to guide attainment of the AMCH PPS target state.

VII. Technical Appendix

Appendix I: 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.[43]

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.[44] 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.[45]

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

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

[45] 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

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 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.[46]
- **American Community Survey (ACS)**.[47] 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,

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[46] https://pad.human.cornell.edu/counties/projections.cfm
[47] https://www.census.gov/programs-surveys/acs/

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)**. [48] 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 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 by borough. 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

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

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.

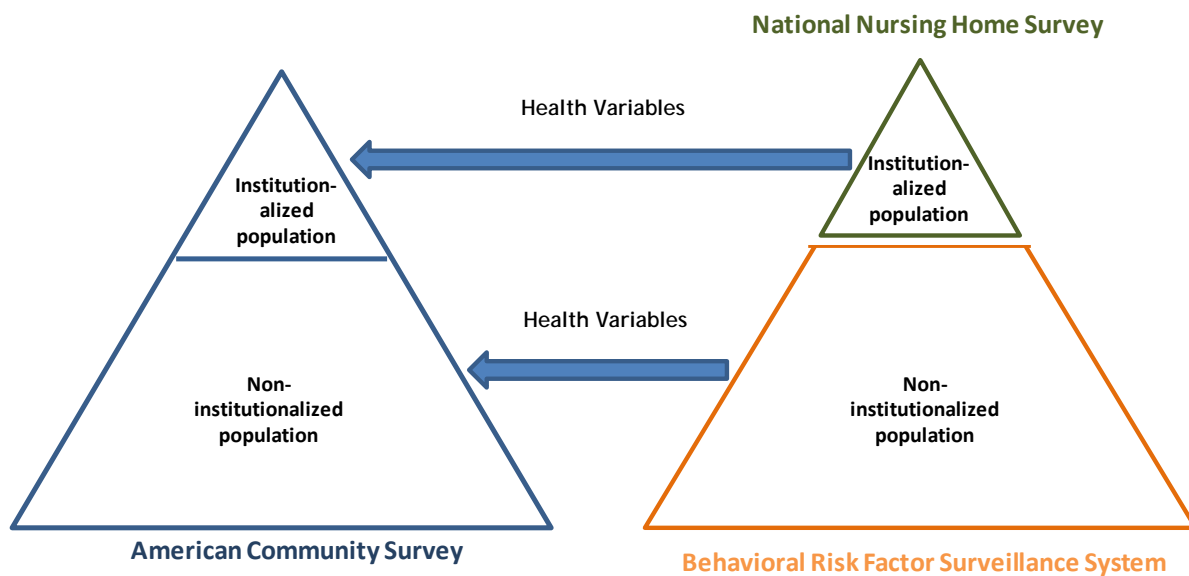### Exhibit A-1: Population Database Mapping Algorithm

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: 0-2, 3-5, 6-12, 13-17, 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

Note: Estimates for office and outpatient visits reflect rate ratios from Poisson regression. Emergency and hospitalization reflect odds ratios from logistic regression. ** indicates statistically different from 1 at the 01 level, and * indicates statistically significant at the 05 level.

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; 72-75	Obstetrics & gynecology
Ophthalmology	360-379; 8-16; 95-95.4	Ophthalmology
Diseases of the musculoskeletal	710-719; 720-724; 730-739;	Orthopedic surgery

Medical condition codes (ICD-9 CM)		Specialty/NPC Profession
system and connective tissue; injury and poisoning	805-848; 754-756; 76-84	
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
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

Note: Not all of the above categories were pertinent for modeling the impact of DSRIP on use of health care services.

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 age 75, 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 settings (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.

Model Validation

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 in 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 include 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.

Appendix II. Additional Information

The AMCH PPS provided the distribution of its attributed lives across counties (Exhibit A-5).

Exhibit A-5: Attributed Medicaid Lives by County

Member County	# of Members	% of Total attributed lives
Albany	20,992	30.1%
Saratoga	15,725	22.5%
Columbia	10,030	14.4%
Greene	6,941	9.9%
Schenectady	5,619	8.1%
Rensselaer	4,244	6.1%
Washington	1,506	2.2%
Warren	1,299	1.9%
Montgomery	972	1.4%
Fulton	774	1.1%
Ulster	540	0.8%
Dutchess	302	0.4%
Schoharie	294	0.4%
Clinton	168	0.2%
Otsego	166	0.2%
Essex	113	0.2%
Kings	102	0.1%
Herkimer	96	0.1%
Total attributed lives	**69,787**	**100%**

The AMCH PPS provided estimated inpatient market share by county (Exhibit A-6).

Exhibit A-6: Estimated Market Share by County (2014)

Payer	Albany	Saratoga	Columbia	Greene	Warren
Medicaid	46.4%	20.5%	22.8%	21.2%	7.8%
Medicare	34.5%	15.4%	19.6%	24.5%	8.1%
Other	60.4%	33 %	28 %	43 %	19 %