All-Payer Analysis of Variation in Healthcare in Maine

Conducted on behalf of
Dirigo Health Agency's Maine Quality Forum &
The Advisory Council on Health Systems Development

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Health Dialog

Acknowledgements

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I. **Executive Summary**

Documentation of significant geographic differences in healthcare utilization and spending continues to raise questions around the financing and delivery of healthcare. Like other states and the country as a whole, Maine is facing increasing challenges around the cost of healthcare. In 2007, Maine's Legislature expanded the membership of the Advisory Council for Health Systems Development and charged the Council with an annual report on the drivers of healthcare costs in Maine and to make recommendations on how to reduce these costs. As documented in Maine's 2008-2009 State Health Plan, New England's healthcare spending is higher than the national average, and Maine's per capita healthcare spending is the second highest in the nation. Working with the Dirigo Health Agency's Maine Quality Forum, Health Dialog performed an analysis of Maine's unique all-payer claims data base aimed at identifying drivers of this high cost. The following report represents this analysis. It identifies variation in healthcare spending not only to identify the drivers of cost, but also to allow for a detailed discussion of strategies to reduce variation and costs overall.

Health Dialog analyzed the claims in the all-payer database constructed by the Maine Health Data Organization and the Maine Health Information Center. The database includes commercial, Medicare and MaineCare (Medicaid) claims through 2006. Health Dialog grouped claims into Acute Inpatient, Outpatient, Emergency Room, and Other (such as long term care) types of healthcare, then looked for the main drivers of cost for inpatient and outpatient care.

Key findings from the analysis include:

- Total cost is a function of volume of services (utilization) and price per service. Of these two variables, we found utilization, or service volume, to be the more powerful determinant of cost.
- Significant variation in per-capita spending exists across Health Service Areas (HSAs) for both inpatient and outpatient care
  o A significant portion of inpatient care (>30%) is "potentially avoidable" (PA). Potentially avoidable does **_not_** mean preventable or that 30% of inpatient spending can be eliminated; rather, that through analysis and interventions, it can be reduced. See full report for further definition.
  o While some HSAs exhibit more potentially avoidable inpatient costs than others, PA admissions and costs are observed in all communities in Maine with different HSAs exhibiting high costs in different clinical areas.
  o On the outpatient side, spending is dispersed among several specific categories, with lab tests accounting for the highest percentage of all outpatient spending (6.8%), followed by advanced imaging (MR and CT) (5.1%). Over 30 additional categories account for less than 5% of total outpatient spending, with many accounting for less than 1%.
  o Outpatient spending on high cost categories (*i.e.* lab tests, advanced imaging, specialist visits) varies significantly by geography suggesting the possibility of both overuse (avoidable) and underuse.
  o While no single clinical group or type of service on both the inpatient and outpatient side drive the majority of healthcare spending, certain population cohorts do drive high percentages of the spending:
    ▪ Chronic disease patients exhibit significantly higher rates of potentially avoidable and preference-sensitive care admissions.
    ▪ Approximately 10% of the MaineCare and Commercial populations have a chronic disease, and drive approximately 30% of total spending, and 40% of inpatient spending.

- Approximately 30% of the Maine Medicare population has a chronic disease, and drives approximately 65% of total spending and 70% of inpatient spending.
  - Through reductions in potentially avoidable hospital admissions and in high variation-high cost outpatient services, this study identifies savings of over $350 million in annual health care expenditures in Maine.

The specific types of inpatient and outpatient geographic variation observed in the analysis provide a guide to begin analyzing reasons for the variation and the development of community specific strategies to address the variation. However, the analysis at the Healthcare Service Area (HSA) level does ***not*** allow for provider and/or hospital specific accountability for the variation. Additional analysis is required for that level of conclusion. This variation and the statewide high prevalence of potentially avoidable admissions indicate the presence of probable overuse in every area of the State, allowing for a discussion of state-wide and targeted community-specific strategies and interventions.

Recommendations for addressing the observed variation in cost include:

- Utilizing existing analysis to identify and develop efficiency measures (i.e. MRI utilization rates, PA admission rates)
- Subsequently, utilizing these measures in Pay-for-Performance (P4P) or other types of programs that include efficiency measures as well as quality measures
- Reporting to both the public and providers to enhance knowledge regarding the differences in types of care provided and received with the ultimate intent of changing both patient and provider behavior
- Utilizing variation analysis to enhance regulatory tools (Certificate of Need (CON) processes) whereby authorization for capacity expansion includes benchmarking and analysis of current capacity;(e.g., additional MRI capacity authorization based on benchmarks and current utilizations rates within a geographically defined area as identified in the report)
- Utilizing further variation analysis at the provider level for the development of tiered networks such that patients have incentives driving them towards high-quality and efficient providers
- Utilizing further variation analysis to identify high-performing providers, groups, and hospitals and subsequently categorizing the systems in place that lead to and allow for high performance
- Utilizing further variation analysis to support fundamental payment reform, identifying the infrastructure costs required for high-performing systems, and developing reimbursement methodologies that align incentives between desired behavior and outcomes

Many of these strategies can be pursued utilizing the existing data and analytic framework deployed with this study (i.e., including efficiency measures in P4P programs, enhancing regulatory/CON processes). Others will require additional levels and components of analysis including (but not limited to):

- Including quality measurement in subsequent analysis and developing comprehensive measurement and interventions aimed at include both cost and quality (as opposed to this study which focused only on cost)
- Refining the cost analysis to identify groups of providers and health systems responsible for patient populations (as opposed to this study which focused on geographies)

Different strategies have different adoption time-frames and different degrees of challenges associated with them. For instance, the Maine Quality Forum is already involved in public reporting and could easily develop additional reports and/or create programs for provider-level reporting. Additionally, an identified high-cost service such as advanced imaging could be regulated in a different way (i.e., allow for new purchases based on current area utilization rates and established benchmarks). By contrast, implementing the support structures and payment reform needed for high-performing health systems requires numerous steps in many different arenas (policy, payers, providers, employers, etc.). However, it is these types of changes that will address the population cohorts such as those with chronic disease that are driving healthcare spending and require the most attention in terms of quality and safety. If the vision and strategy for reform do not aspire to fundamental change in the way healthcare is delivered and paid for, trends in Maine, and the nation, will continue.

II. Introduction

As documented in Maine's 2008-2009 State Health Plan, New England's healthcare spending is higher than the national average, and Maine's per capita healthcare spending is the second highest in the nation. Like the rest of the country, Maine is grappling with issues of healthcare spending. In 2007, Maine's Legislature expanded the membership of the Advisory Council for Health Systems Development and charged the Council with an annual report on the drivers of healthcare costs in Maine and with making recommendations on how to reduce these costs. Working with the Dirigo Health Agency's Maine Quality Forum, Health Dialog identified which medical procedures, categories of cost, and/or types of populations drive healthcare spending in Maine. Once identified, we examined how the variables differed by geography and explored possible strategies and interventions to address findings.

Health Dialog's analytic framework focuses on geographic variation, utilizing the concept of "unwarranted variation". Unwarranted variation, as defined by the Dartmouth Atlas[1] is inappropriate delivery of services due to under-use, overuse and/or misuse of care and can be categorized into three domains:

- **Effective Care and Patient Safety**: Services of proven clinical effectiveness derived from randomized controlled trials, or well-constructed observational studies. These are the traditionally defined 'quality' measures

- **Supply-Sensitive Care:** Care that is strongly correlated with healthcare system resource capacity and is an indicator of the efficiency of the healthcare system (*i.e.* admissions rather than outpatient treatment for patients with chronic conditions such as diabetes or chronic obstructive pulmonary disease)
    - Recent studies have found that patients obtaining care in inefficient healthcare systems that deliver high levels of supply sensitive care have higher mortality than patients obtaining care in efficient systems (Fisher et al. 2003)

- **Preference-Sensitive Care (PSC):** Care for which the treatment options carry significant tradeoffs in terms of risks and benefits for the patient and there is limited clinical evidence favoring one option over another.

Regarding inpatient utilization and expenditures, Health Dialog examined ambulatory care sensitive conditions[2] in addition to supply sensitive conditions. In combination, we designated these inpatient costs and utilization as "potentially avoidable"

- **Potentially Avoidable (PA) Admissions** consist of 2 components:
    - **Ambulatory Care Sensitive Conditions (ACS)** – inpatient hospital admissions that could be avoided through better outpatient care
    - **Supply Sensitive Care admissions (SS)**

- Frequent examples of PA admissions include: admissions for respiratory infections, COPD, pneumonia, bronchitis, peptic ulcers, asthma and complications from diabetes.

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[1] For more than 20 years, the Dartmouth Atlas Project has documented glaring variations in how medical resources are distributed and used in the United States. The project uses Medicare data to provide comprehensive information and analysis about national, regional, and local markets, as well as individual hospitals and their affiliated physicians: http://www.dartmouthatlas.org/
[2] Ambulatory Care Sensitive Conditions are documented by the US Department of Health and Human services: http://www.ahrq.gov/data/safetynet/billappb.htm

There is considerable overlap between ACS and SS conditions. A full description is provided in the "Methods" section of the report.

- PA admissions will never be and should never be completely eliminated. Rather, the category allows for examination of patterns of care in communities (HSAs) and lends insight into the value of general and targeted strategies for cost reduction.

With this framework, Health Dialog analyzed the drivers of cost within Maine and took steps to present the output as actionable information that could inform specific strategies to reduce variation and ultimately reduce healthcare spending. The geographic variation observed in the analysis provides a guide to begin analyzing reasons for the variation and the development of community specific strategies to address the variation. However, the analysis at the Health Service Area (HSA) level does **_not_** allow for provider and/or hospital specific accountability for the variation. Additional analysis is required for that level of conclusion. The analysis does indicate the presence of probable overuse in every area of the State, allowing for a discussion of State-wide and targeted community-specific strategies and interventions.

III. Methods

Health Dialog received the following claims data from the Maine Health Data Organization (MHDO):
- Medicare Data   1/01/2003 – 12/31/2006
- MaineCare Data   1/01/2003 – 12/31/2006
- Various Commercial Payers   1/01/2003 – 12/31/2007

Health Dialog combined all claims to create an all payer database. For the purposes of this report, we focused on the 12 month period of November 1, 2005 – October 31, 2006. We used this period because it was the most recent 12 month period for which we had full claims, since both the MaineCare and Medicare data had payment lags at the end of 2006 (*i.e.* claims that were not paid as of 12/31/06 and therefore not included in the extract provided to Health Dialog).

Health Dialog attributed claims to service categories: inpatient, outpatient, emergency room, pharmacy and other (including long-term care and skilled nursing facility). For the purposes of this analysis, Health Dialog focused on traditional medical inpatient and outpatient costs. Emergency room services were excluded due to a concurrent report by the University of Southern Maine's Muskie School of Public Service. Pharmacy data was excluded because it is incomplete due to the lack of some commercial claims and Medicare Part D claims.
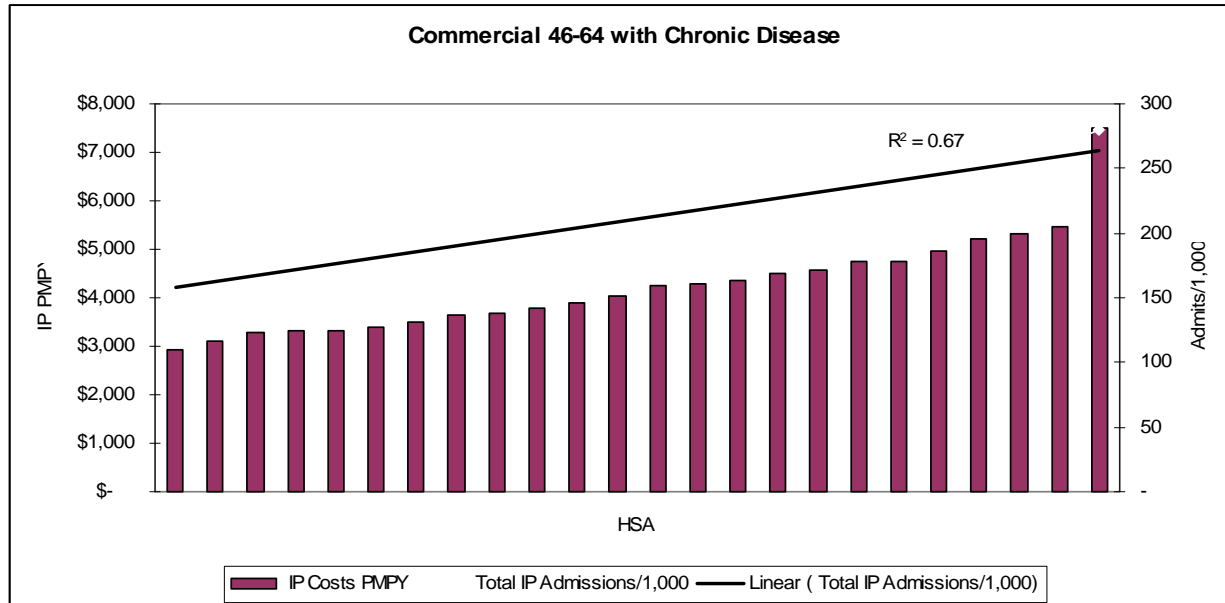
In addition, this analysis focused on those individuals who had: Commercial coverage only, Medicare coverage only, MaineCare coverage only and Medicare/MaineCare dual coverage. Other individuals with all three payers, Medicare/Commercial coverage and MaineCare/Commercial coverage were excluded from the analysis. In addition, only those members who had at least 11 months of coverage throughout the 12 month period were included in the analysis so that we could get a full picture of their health status and utilization for the period.

Analyses were based on "paid amount" in the claims database. This amount does not include any premium, deductible, co-payment or other out of pocket expenses. It represents solely what the insurer paid to the facility or physician. In addition, the paid amount for the MaineCare claims is a *paid amount based on estimates* which will eventually be reconciled.

Analyses were based on "Per Member Per Year" (PMPY) paid amounts for specific hospital stays or procedures. These paid amounts were adjusted by age, sex, and risk within payer. It was necessary to adjust each payer separately due to the fact that the MaineCare paid amounts are estimates.

Health Dialog used paid PMPY amounts for the analysis because these paid amounts are driven by utilization. Although, cost is a combination of utilization and price, utilization is the larger driver of cost (~65%) as illustrated in Methods Graph 1 shown below for the Commercial chronic population. Similar trends exist in other populations and for the other payers as well.

Methods Graph 1: Correlation between Inpatient Costs and Utilization for the Commercial 46-64 Chronic Population

Commercial 46-64 with Chronic Disease

$R^2 = 0.67$

Legend: IP Costs PMPY | Total IP Admissions/1,000 | Linear (Total IP Admissions/1,000)

X-axis: HSA
Left Y-axis: IP PMP' ($-, $1,000, $2,000, $3,000, $4,000, $5,000, $6,000, $7,000, $8,000)
Right Y-axis: Admits/1,000 (-, 50, 100, 150, 200, 250, 300)

Risk Adjustment Methodology

The Health Dialog risk score is used to risk-adjust healthcare cost estimates using the diagnosis based CMS Hierarchical Condition Categories (HCC). Risk adjustment allows comparisons between patients, or groups of patients, accounting for morbidity differences, if present. The HCC algorithm uses diagnostic categories from both outpatient and inpatient claims to calculate an overall score. The HCCs reflect the clinical relationship between specific diseases as well as expected resource use. Hierarchies are imposed so that credit is given (in terms of predicted expense) for only the most costly of clinically related conditions. For example, within the cancer hierarchy, each person is assigned only to the single highest cost category that applies. More specifically, if a patient is diagnosed with diabetes with renal manifestations as well as diabetes with acute complications, the diagnosis of diabetes with renal failure will count towards the risk score because it is higher on the diabetes cost hierarchy. Further, patients can also have more than one condition (*i.e.* cancer and diabetes). However, within each condition only one level of that condition will be counted toward the patient's risk score. The cost category that remains after this hierarchical pruning process is called an HCC. Weights are assigned to all HCCs through statistical modeling. The weights are computed from a commercial population using price insensitive cost. These weights estimate the impact on patient cost of each of the individual condition categories. Each patient's risk score, or expected relative excess cost, is the sum of the weights of the condition categories for which the patient had the corresponding diagnoses. Diagnoses associated with lab and radiology procedures are excluded to avoid using "rule-out" diagnoses, such as "rule-out pneumonia," or "rule-out fracture."

As implemented, this methodology assigns a risk score for a particular twelve-month period. Only claims incurred within that twelve-month period are used so a patient's risk score can and should vary over time.

Finally, costs were aggregated by Healthcare Service Areas (also known as Hospital Service Areas) which are defined as local healthcare markets for hospital care. An HSA is a collection of ZIP codes whose residents receive most of their hospitalizations from the hospital or hospitals in that area. For the purposes of this study, we used the HSAs as defined by the State

of Maine rather than those designated by the Dartmouth Atlas. Several Healthcare Service areas (HSAs) within the state of Maine were combined. This approach was taken because some of the HSAs have small populations; therefore, useful analyses could not be conducted on them individually. With guidance and direction utilizing local knowledge of health systems and referral patterns from the Maine Quality Forum, HSAs which were sparsely populated and geographically or administratively connected were combined for analysis.

Potentially Avoidable Methodology

For the inpatient analysis, admissions were grouped into three categories: those that were **potentially avoidable (PA)**, those that were **preference-sensitive (PSC)** and all "**other**" admissions. Methods Table 1 on the next page details PA admission types and the dollars in the database associated with those admissions. In order to create these categories, inpatient claims were compiled based on DRGs or diagnoses associated with certain conditions, as illustrated in Methods Table 1.   PA admissions fall under the category of what the Dartmouth Atlas calls supply sensitive care. Supply sensitive care relates the utilization of healthcare services to the capacity of healthcare services in a geographic area. PA admissions will never be and should never be completely eliminated. Rather, the category allows for examination of patterns of care in communities (HSAs) and lends insight into the value of general and targeted strategies for cost reduction. PSC admissions include admissions for which the treatment options carry significant tradeoffs in terms of risks and benefits for the patient and there is limited clinical evidence favoring one option over another. All admissions that do not fall in the PSC or PA categories have been deemed "other" admissions.

Methods Table 1: Potentially Avoidable Admissions by Type:

Clincial Description	Category	Paid Amount	% of Total Inaptient Dollars ($916M)
Pnemonia/Bronchitis/Resp Infections	Respiratory	$ 24,324,960	2.7%
Chest pain/collapsed/heart failure	Cardiac	$ 22,795,596	2.5%
Other Medical Digestive System Diagnoses	GI	$ 21,335,625	2.3%
Cardiac Arrhythmia	Cardiac	$ 14,583,635	1.6%
Septicemia	Other	$ 14,510,783	1.6%
Lung disease (COPD)	Respiratory	$ 11,960,258	1.3%
Disorders (excl. Malignancy) of pancreas, liver or Biliary tract	Other	$ 9,826,736	1.1%
Vascular Disease	Cardiac	$ 9,379,504	1.0%
Other Circulatory Diagnoses	Cardiac	$ 7,476,798	0.8%
Endocrine, nutritional or metabolic disorder or procedure	Other	$ 7,459,661	0.8%
GI Hemmorhage/Ulcers	GI	$ 7,454,429	0.8%
Fluid in/around lungs	Respiratory	$ 7,303,969	0.8%
Renal Failure or dialysis	Other	$ 6,684,642	0.7%
Medical Back or other Musco disorders	Musculoskeletal	$ 5,842,920	0.6%
Obesity OR procedure	Other	$ 5,756,540	0.6%
Kidney/UT neoplasm or infection	Other	$ 5,744,060	0.6%
Skin Infection (Cellulitis)	Other	$ 5,352,778	0.6%
GI Obstruction	GI	$ 4,375,968	0.5%
Fractures/sprains	Musculoskeletal	$ 4,303,505	0.5%
Nerve/Nervous System disorders	Other	$ 4,259,255	0.5%
Seizure/Headache/Dizzyness/Nose Bleed	Other	$ 4,155,228	0.5%
Poisoning or Toxic effects of drugs	Other	$ 4,128,614	0.5%
Other Medical Kidney or UT diagnoses/symptoms	Other	$ 3,564,756	0.4%
Bone Disease	Musculoskeletal	$ 3,484,078	0.4%
Diabetes	Other	$ 3,294,987	0.4%
Chemo or radiotherapy	Other	$ 3,235,527	0.4%
MS, other Degenerative Disorders	Other	$ 3,144,889	0.3%
Malignancy or infection of the female reproductive system	Other	$ 3,017,396	0.3%
Other medical Nervous system admissions	Other	$ 2,851,861	0.3%
Blood cell or coagulation disorders	Other	$ 2,818,165	0.3%
Blood clots	Cardiac	$ 2,814,244	0.3%
Other Medical Respiratory issues	Respiratory	$ 2,493,131	0.3%
Post-Op Infection	Other	$ 2,418,092	0.3%
Connective Tissue Disorders/Tendonitis	Musculoskeletal	$ 2,390,019	0.3%
Inflamatory Bowel disease	GI	$ 2,319,217	0.3%
Lymphoma or non-acute Leukemia	Other	$ 2,270,578	0.2%
Infections - nervous system	Other	$ 2,244,717	0.2%
Respiratory Neoplasm/Tumor	Respiratory	$ 2,037,961	0.2%
Reticuloenothelial and Immune disorders	Other	$ 1,945,822	0.2%
Digestive Malignancy	GI	$ 1,787,237	0.2%
Cirrhossis	Other	$ 1,772,659	0.2%
Aftercare	Other	$ 1,647,725	0.2%
Skin Ulcers/disorders	Other	$ 1,518,037	0.2%
Congenital Heart & Valve disorders	Cardiac	$ 1,496,078	0.2%
Urinary Stones	Other	$ 1,488,357	0.2%
Chest trauma/Collapsed lung	Respiratory	$ 1,453,424	0.2%
Fever or Viral Illness	Other	$ 1,449,135	0.2%
Brain Neoplasms/Tumors	Other	$ 1,352,081	0.1%
Brain Vascular Disorders	Other	$ 1,332,245	0.1%
Adrenal, Pituitary, Parathyroid, Thyroid or Thyroglossal procedures	Other	$ 1,188,159	0.1%
Malignancy of panreas or hepatobiliary system	Other	$ 1,153,639	0.1%
Malfunction of Ortho device	Musculoskeletal	$ 1,143,148	0.1%
Infection of Bone/Septic Arthritis	Musculoskeletal	$ 958,473	0.1%
Ear Ache/Sore Throat	Other	$ 936,919	0.1%
Ear/Nose/Throat trauma or malignancy	Other	$ 796,900	0.1%
Skin trauma	Other	$ 784,716	0.1%
Amputation or skin graft for endocrine disorder	Other	$ 751,146	0.1%
Malignancy or inflamation or male reproductive system	Other	$ 647,809	0.1%
Hypertension (and effects)	Cardiac	$ 618,105	0.1%
Other Infections/parasites	Other	$ 563,874	0.1%
Other Myeloproliferative disorder	Other	$ 547,901	0.1%
Injury to unspecified site	Other	$ 527,897	0.1%
Malignant/Non-malignant breast disorders	Other	$ 508,352	0.1%
Endocarditis (heart infection)	Cardiac	$ 507,716	0.1%
Allergic reactions	Other	$ 173,241	0.0%
Benign prostatic hypertrophy	Other	$ 54,545	0.0%
Urethral Stricture	Other	$ 9,104	0.0%
Total PA		$ 282,529,525	
Total IP		**$ 916,021,487**	

IV. Results

Section 1: Data Overview

Table 1 below describes the overall population in the database and the claim amounts associated with this population. It also describes in detail which populations were removed from analysis, the size of these populations and the claims dollars associated with them. In total, Health Dialog focused analyses on those 727,953 unique individuals shown in Table 1 who had continuous eligibility and Commercial only, Medicare only, MaineCare only or Medicare/MaineCare Dual coverage. These individuals accounted for approximately 67% of the total eligible members and 76% of the total claims database.

Table 1: Overall Membership and Claims Database

Maine				
Category	**Population Count**	**Percentage of Total**	**Claims ($M)[1]**	**Percentage of Total**
Total People/Individuals in HD Database with at least 1 month of eligibility in 2006	**1,094,078**	**100%**	**$ 4,944**	**100%**
People/Individuals without > 11 months of eligibility	288,569	26%	$ 626	13%
Continuously eligible People/Individuals in 2006	**805,509**	**74%**	**$ 4,318**	**87%**
Populations excluded from analysis:				
People/Individuals with Medicare and Commercial Coverage	47,238	4%	$ 352	7%
People/Individuals < 65 years of age with Medicare Coverage	17,190	2%	$ 52	1%
People/Individuals with "All" Payers	4,977	0%	$ 101	2%
Medicaid People/Individuals 65+	3,263	0%	$ 47	1%
People/Individuals with Medicaid and Commercial Coverage	4,888	0%	$ 32	1%
Total People/Individuals included in Analysis	**727,953**	**67%**	**$ 3,734**	**76%**

[1] Claim number includes IP, OP, ER, RX, SNF, LTC and "other" costs. RX, SNF, LTC and "other" were not included in further analysis

Table 2 below shows the total dollars of traditional medical costs for the analyzed populations. Traditional medical costs include inpatient, emergency room and outpatient costs. Additionally, Table 3: describes the PMPY costs associated with each of the traditional medical categories as well as an overall medical PMPY for each payer. Please note that the amounts shown in Table 3 are substantially different from commonly published PMPYs, this is because this table only includes dollars related to traditional medical expenses (IP, OP and ER); costs for other medical services such as drugs, DME, SNF and LTC are not included in this table.

Table 2: Traditional Medical Costs for the Analyzed Population

	Commercial	Medicare	Medicaid	Dual	Total
Members	380,015	102,958	191,756	53,224	727,953
IP Costs	$ 311,538,012	$ 220,591,642	$ 204,628,315	$ 179,263,517	$ 916,021,487
ER Costs	$ 56,572,629	$ 8,357,102	$ 43,808,546	$ 11,038,210	$ 119,776,487
OP Costs	$ 674,364,868	$ 173,062,927	$ 292,883,542	$ 175,865,957	$ 1,316,177,293
Traditional Medical Costs	$ 1,042,475,509	$ 402,011,671	$ 541,320,403	$ 366,167,683	$ 2,351,975,267

Table 3: Per Member per Year Costs by Payer by Service Category

	Commercial	Medicare	Medicaid	Dual
IP PMPY	$ 822	$ 2,144	$ 1,072	$ 3,356
ER PMPY	$ 149	$ 81	$ 230	$ 207
OP PMPY	$ 1,780	$ 1,682	$ 1,535	$ 3,292
Total Paid PMPY	$ 2,752	$ 3,907	$ 2,837	$ 6,855

As expected, those members with dual coverage have higher costs PMPY as compared to all other payers. Those members with straight Medicare coverage also have higher cost per member, presumably because they are an older population. Interestingly, the MaineCare and Commercial populations have similar PMPY; however, the MaineCare population shows a higher proportion of spend in the inpatient and emergency room categories, whereas the Commercial population is higher in the Outpatient categories. (Note: MaineCare costs have not yet been reconciled for this time period).

Table 4 describes the population in the database by Maine Healthcare Service Area (HSA).

Table 4: Individuals in Health Dialog database by HSA:

HSA Name	HSA Number	Individuals in Database
Portland	1	235,791
Bangor	2	98,407
Lewiston	3	100,497
Augusta	4	57,490
Waterville	5	55,685
Biddeford	6	59,385
Rockland	7	41,238
Brunswick	8	55,347
Farmington	9	26,857
Skowhegan	10	26,270
Presque Isle	11	19,415
Rumford & Bridgton	12 & 29	28,395
Sanford	14	32,103
Dover-Foxcroft & Greenville	15 & 33	18,576
Houlton	16	15,309
Caribou & Fort Kent	17 & 18	25,904
Calais & Machias	19 & 21	23,973
Blue Hill & Bar Harbor & Ellsworth	22, 30 & 31	36,212
Pittsfield	23	12,864
Lincoln & Millinocket	24 & 27	18,852
Belfast	25	15,929
Norway	26	22,422
York	28	43,941
Damariscotta & Boothbay Harbor	23 & 34	16,553

Section 2: Inpatient Costs

A. Types of Admissions

Health Dialog focused on inpatient costs because they are a large part of the traditional medical costs. Health Dialog determined which types of admissions are most common and then analyzed those admissions to estimate which admissions within these categories are "Potentially Avoidable" (PA). PA admissions fall under the category of what the Dartmouth Atlas calls supply sensitive care. Supply sensitive care relates the utilization of healthcare services to the capacity of healthcare services in a geographic area. PA admissions will never be and should never be completely eliminated. Rather, the category allows for examination of patterns of care in communities (HSAs) and lends insight into the value of general and targeted strategies for cost reduction.

Table 5 shows inpatient admissions broken down by the top 4 categories of inpatient stays. In addition, it also shows, within each category of admissions, the total dollars associated with potentially avoidable admissions. Cardiac-Circulatory is the largest category of admissions accounting for 21.1% and the largest category of PA admissions at 19.9%. Musculoskeletal is the second largest admission category at 12.5%, but the PA admissions in this category are a much smaller percentage of overall PA admissions at only 6.4%. GI (gastrointestinal) admissions accounted for 9.5% of all admissions and 13.1% of PA admissions. Finally Respiratory admissions accounted for 7.9% of all admissions, and a substantial 18.3% of PA admissions, indicating that a large percentage of Respiratory admissions are PA.

Table 5: Admissions by Type:

Type of Admission	$ Total IP	% of total IP	$ Total PA IP	% of total PA IP
Cardiac-Circulatory	$193.3M	21.1%	$56.5M	19.9%
Musculoskeletal	$114.5M	12.5%	$18.1M	6.4%
GI	$86.9M	9.5%	$37.2M	13.1%
Respiratory	$72.4M	7.9%	$52.0M	18.3%
All Other	$448.9M	49.0%	$119.8M	42.3%
Total	$916.0M	100%	$283.6M	100%

Health Dialog risk adjusted the PMPY by HSA (stratified by payer and age group) for the top three PA admission types (Cardiac-Circulatory, Respiratory and GI) and "all other" PA admissions. For the geographic variation analysis, Health Dialog focused on the older age cohorts within payers (Commercial = 45+, MaineCare = 46-64 and Medicare 65+) because these individuals account for the most PA admissions on a PMPY basis.

It is important to note that these admissions, especially when broken down into small categories are not overly common and the following graphs show substantial variation. Due to the small sample size in some of the HSAs and the limited number of admissions for these specific groups, confidence intervals are fairly large and statistically significant differences among HSAs are scarce.

Graph 1 below illustrates _total_ PA admissions PMPY by HSA for the Commercial 45+ population which ranged from $280-$500 PMPY. There were not any HSAs that were significantly higher than the mean of $389 PMPY. However, several HSAs were significantly below the mean, including Dover-Foxcroft/Greenville, Damariscotta/Boothbay Harbor, Augusta, and Rumford/Bridgton. Detail of PMPY by type of PA admission follows in graphs 2-5.

### *Graph 1: Commercial 45+ Total PA Admissions Adjusted PMPY by HSA*
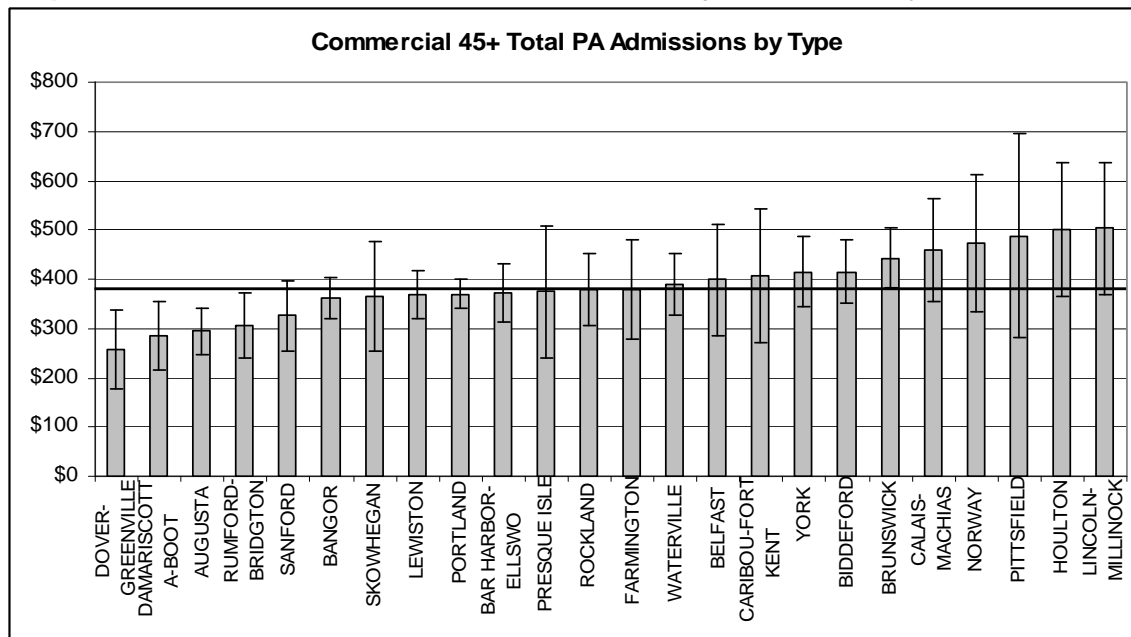
As shown in Graph 2, Cardiac-Circulatory PA admissions for Commercial 45+ members vary from approximately $45 PMPY to $140 PMPY with an overall mean of $87 PMPY. None of the high cost PMPY HSAs were significantly above the overall mean, but several HSAs including Augusta, Belfast, Bangor, and Portland were significantly below the overall mean.

Graph 2: Commercial 45+ Cardiac-Circulatory PA Admissions Adjusted PMPY by HSA
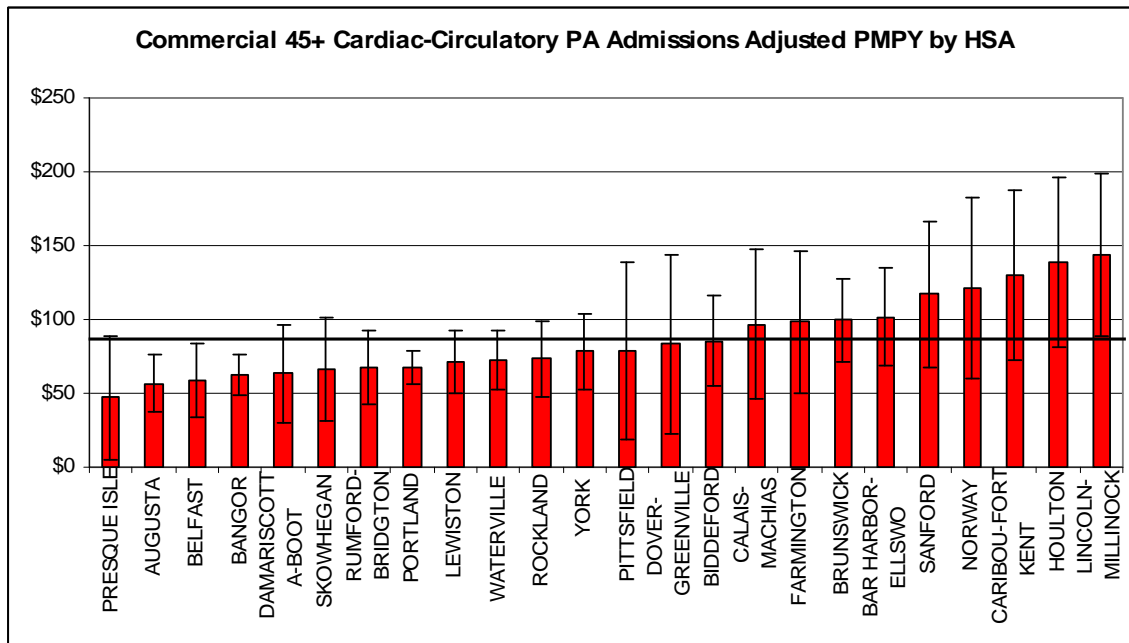
Graph 3 shows Respiratory PA Admissions by HSA for the Commercial 45+ group, which vary from $20 - $80 PMPY with an overall mean of $43 PMPY. None of the high cost HSAs were significantly higher than the overall mean, but Dover-Foxcroft/Greenville, and Rockland were significantly lower than the overall mean.

Graph 3: Commercial 45+ Respiratory PA Admissions Adjusted PMPY by HSA
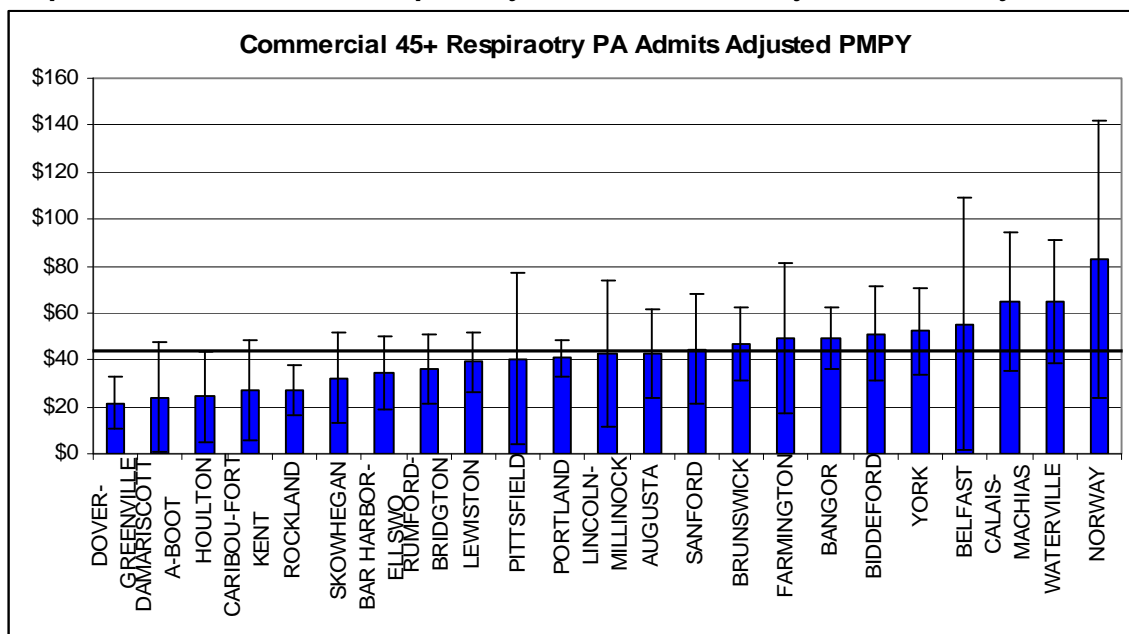
Presque Isle not included in analysis due to a lack of data points; confidence intervals were < $0

GI PA admissions ranged from $25 - $120 PMPY by HSA (Graph 4). For these inpatient admissions, none of the high cost HSAs were significantly different from the overall mean of $61 PMPY, but two HSAs were significantly below the mean: Sanford and York.

Graph 4: Commercial 45+ GI PA Admissions Adjusted PMPY by HSA
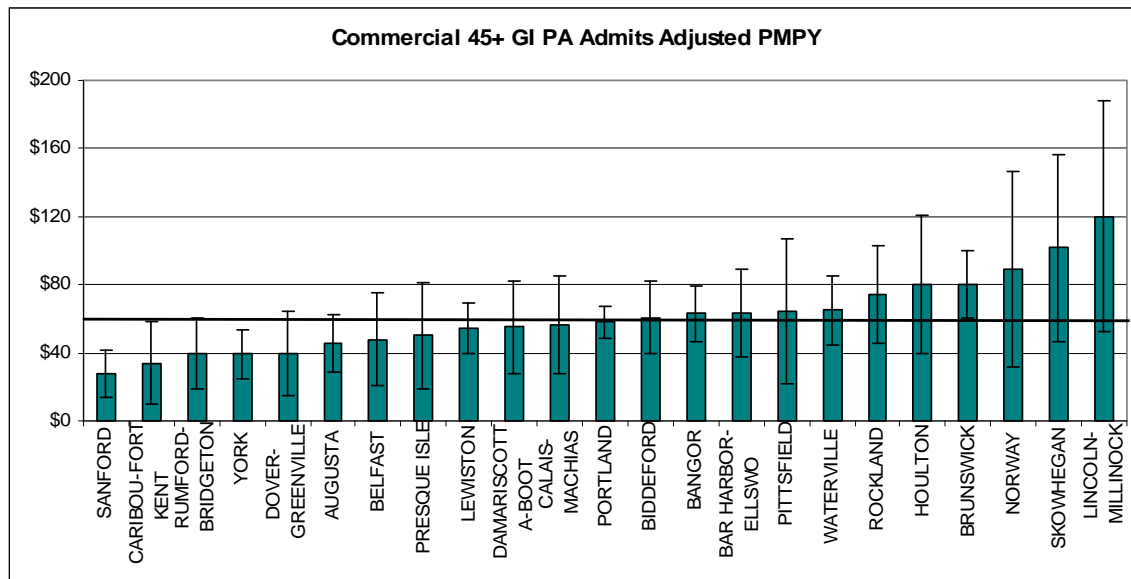
Farmington not included in analysis due to a lack of data points; confidence intervals were < $0

Finally, all other PA admissions were reviewed, with a range of $100 PMPY to almost $350PMPY (Graph 5). Once again, none of the high cost HSAs were significantly higher than the overall mean of $208 PMPY, but four HSAs were significantly lower than the overall mean including Dover Foxcroft/Greenville, Sanford, Damariscotta-Boothbay Harbor, and Augusta.

Graph 5: Commercial 45+ All Other PA Admissions Adjusted PMPY by HSA
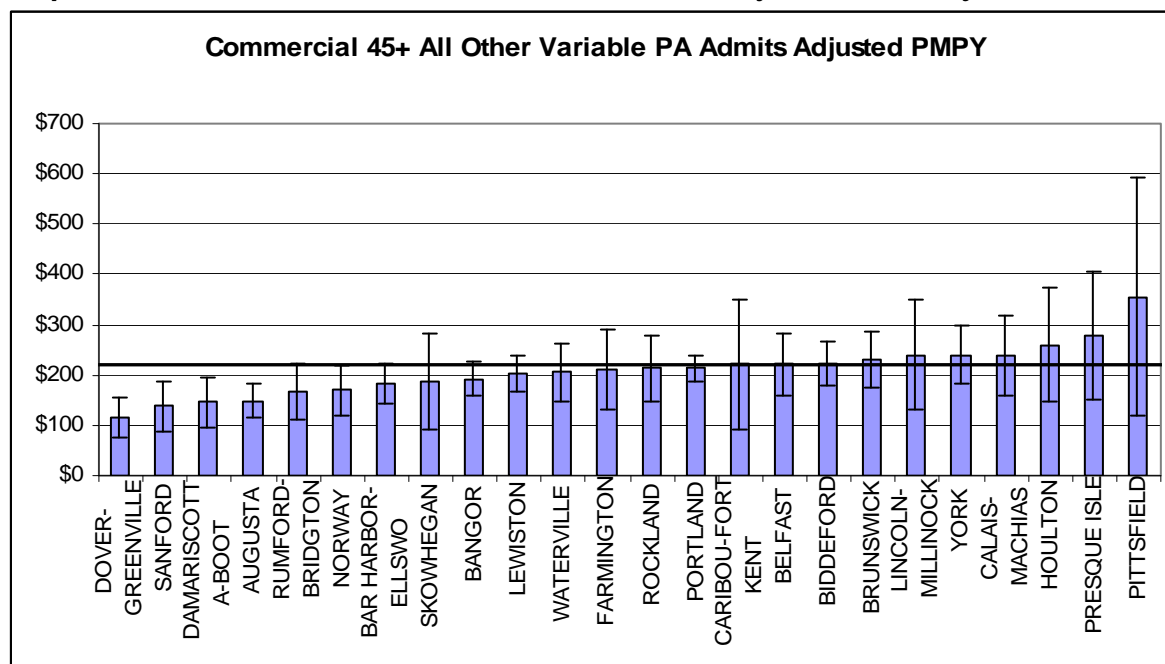
For this population, there is clear variation of PA admissions by HSA. There were two HSAs who showed up as significantly lower than the overall average consistently: Dover-Foxcroft/Greenville and Augusta.

For the MaineCare population, Health Dialog focused on the 46-64 age groups.   Graph 6 shows _total_ PA admissions PMPY by HSA which ranged from $500 - $1,500 PMPY with an overall mean of $1,033 PMPY. Only one HSA, Calais/Machias, had a cost that was significantly higher than the overall mean. Several HSAs had a PMPY cost that was significantly below the mean, including Caribou/Ft. Kent, Skowhegan, Brunswick, and Dover-Foxcroft/Greenville. Detail of PA admissions by type to follow in graphs 7-10.

Graph 6: MaineCare 46-64 Total PA Admissions Adjusted PMPY by HSA
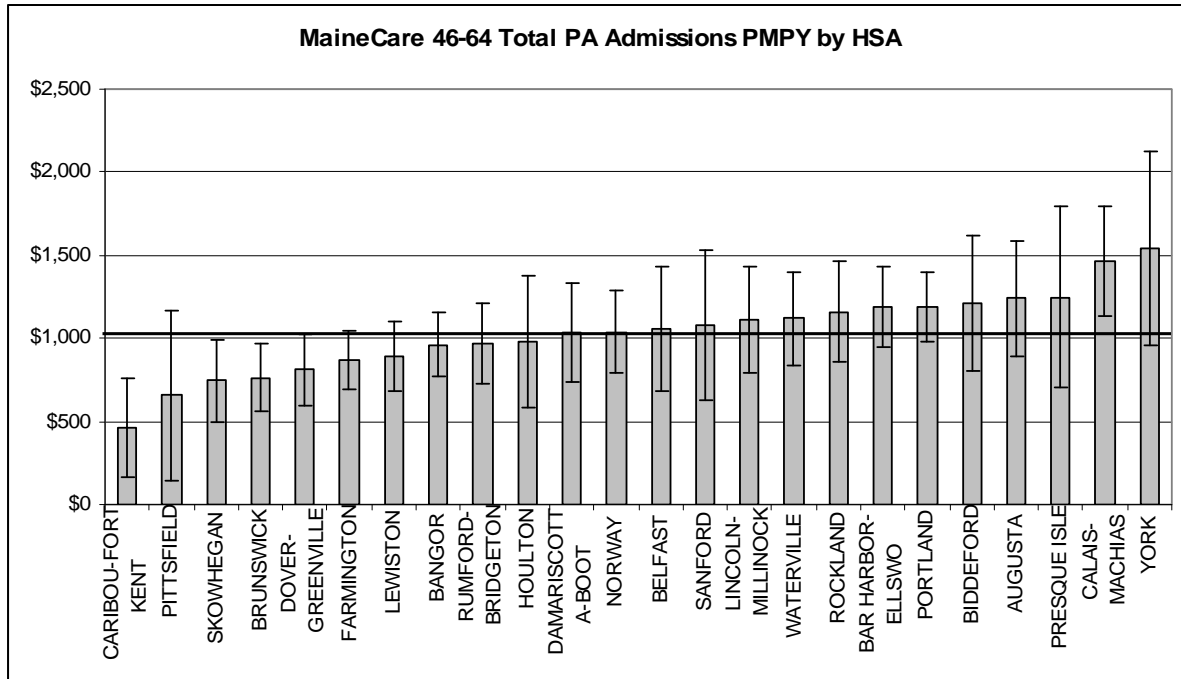
As shown in Graph 7, Cardiac-Circulatory PA admissions vary from approximately $50 - $400PMPY with a mean of $167 PMPY. Lincoln/Millinocket is the only high cost HSA that is significantly higher than the overall mean. In terms of low cost HSAs, Skowhegan, Brunswick, Lewiston, Norway, and Damariscotta/Boothbay Harbor were all significantly lower than the overall mean.
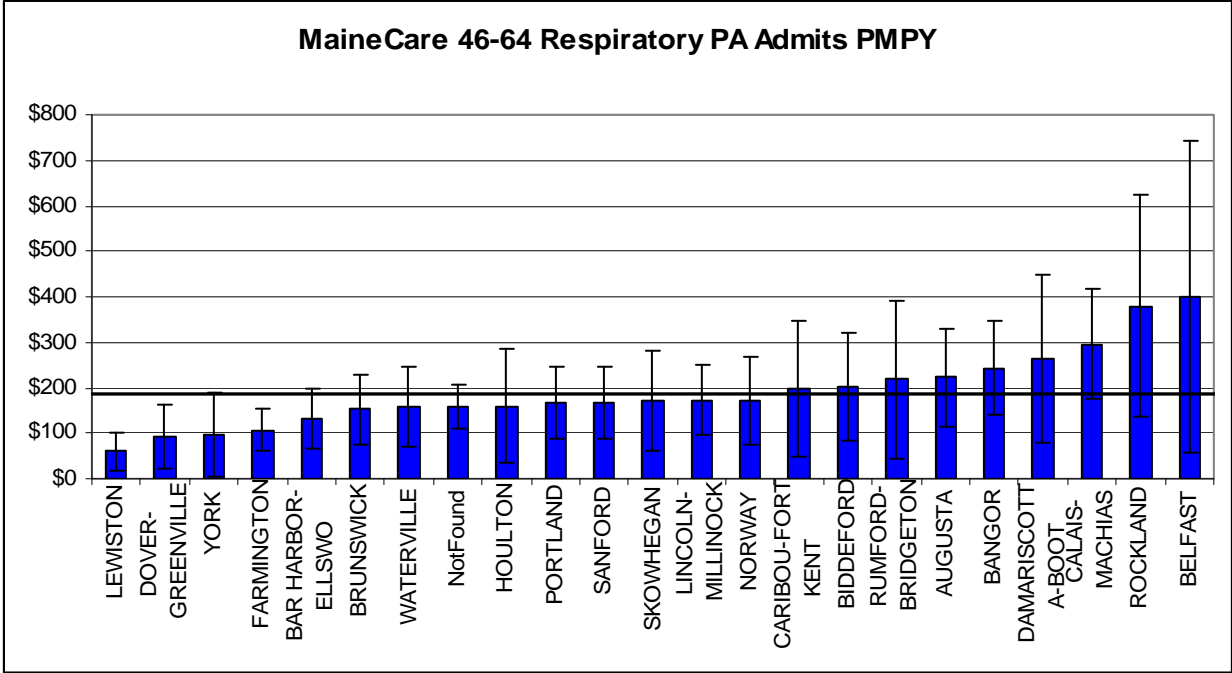
Graph 7: MaineCare 46-64 Cardiac-Circulatory PA Admissions Adjusted PMPY by HSA

MaineCare 46-64 Cardiac-Circulatory PA Admissions Adjusted PMPY by HSA
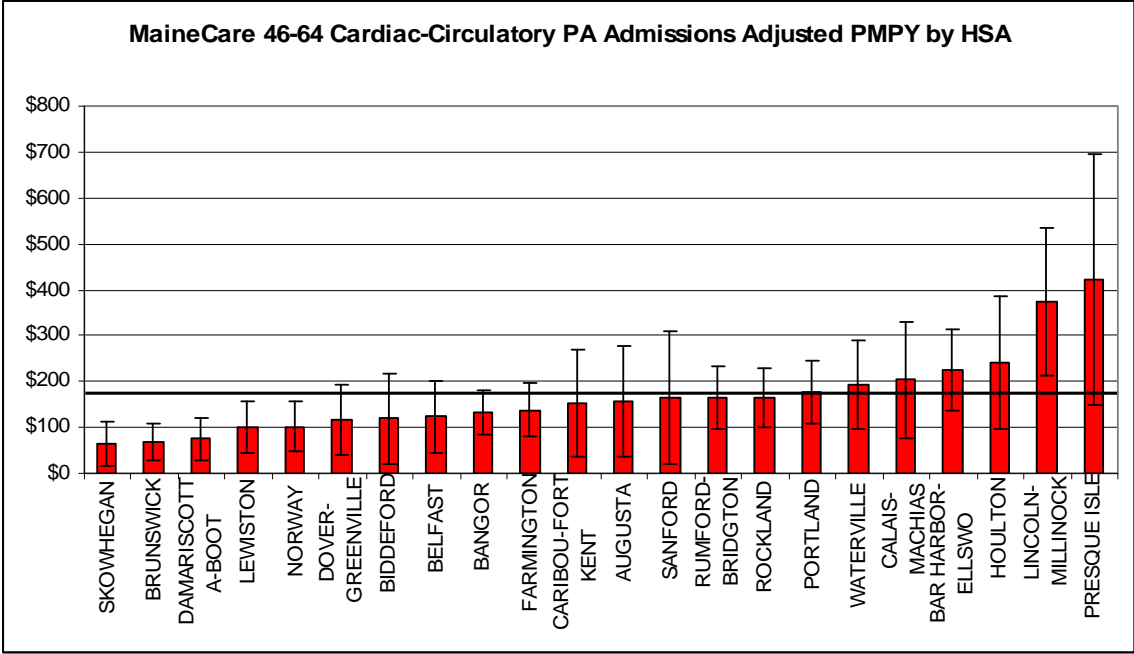
*Pittsfield and York were excluded from analysis due to a lack of data points; confidence intervals were < $0

Graph 8 shows Respiratory PA Admissions by HSA which vary from less than $50 PMPY to over $350 PMPY with an overall mean of $192 PMPY. None of the high cost HSAs were significantly higher than the overall mean, but four HSAs were significantly lower than the mean: Lewiston, Dover-Foxcroft/Greenville, York, and Farmington.

Graph 8: MaineCare 46-64 Respiratory PA Admissions Adjusted PMPY by HSA

MaineCare 46-64 Respiratory PA Admits PMPY

* Pittsfield and Presque Isle were excluded from analysis due to a lack of data points; confidence intervals were< $0

GI PA admissions were less common, with a range of $50 PMPY to about $250 PMPY by HSA with a mean of $102 PMPY (Graph 9). Bar Harbor/Ellsworth/Blue Hill was significantly higher than the overall mean; Norway, and Lincoln/Millinocket were significantly lower.

Graph 9: MaineCare 46-64 GI PA Admissions Adjusted PMPY by HSA

MaineCare 46-64 GI PA Admits Adjsuted PMPY
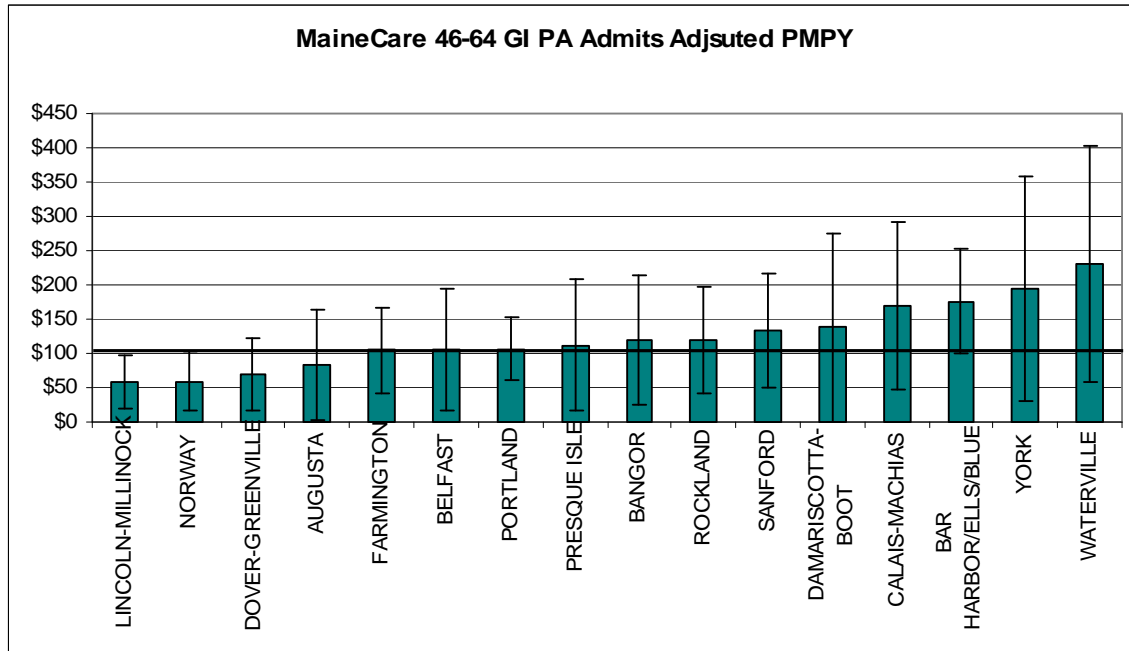
* Pittsfield, Caribou-Ft. Kent, Skowhegan, Brunswick, Lewiston, Rumford/Bridgton, Houlton and Biddeford were all excluded from analysis due to a lack of data points; confidence intervals were< $0

All other PA admissions had a range of $400 PMPY to $1,000 PMPY with an overall mean of $605 PMPY (Graph 10). None of the high cost HSAs were significantly more expensive than the overall mean, and only Bangor and Belfast were significantly lower.

Graph 10: MaineCare 46-64 All Other PA Admissions Adjusted PMPY by HSA

**Mainecare 46-64 All Other PA Admits Adjusted PMPY**
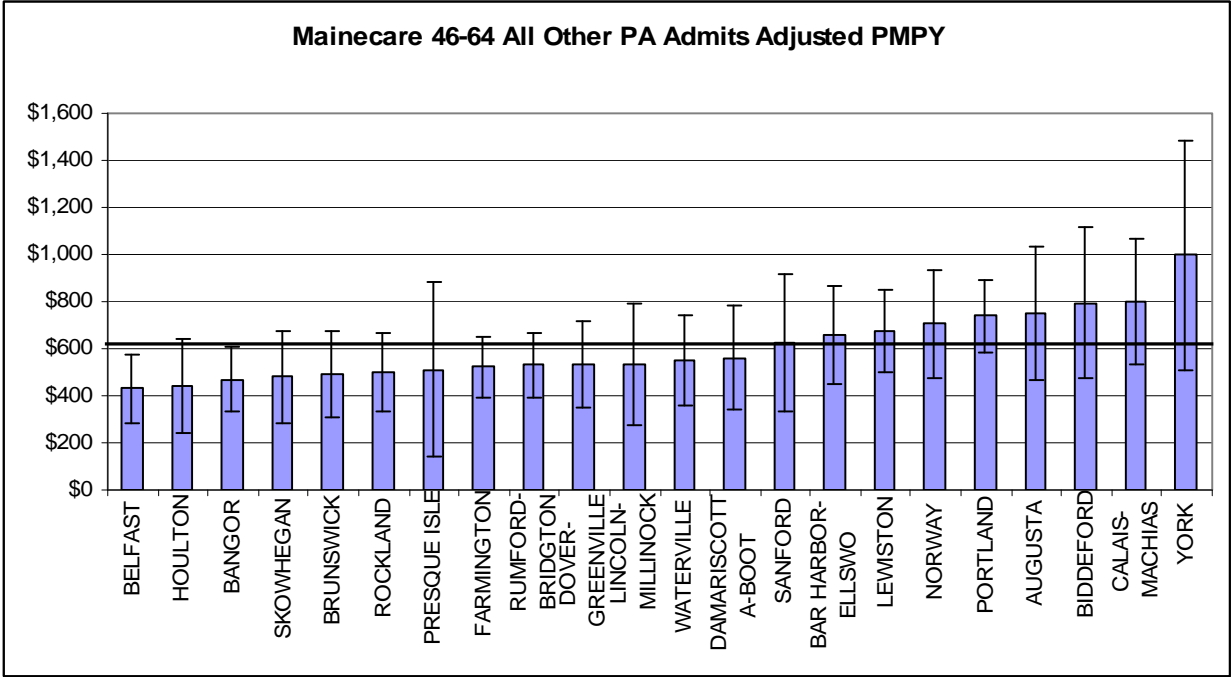
* Pittsfield and Caribou-Fort Kent were excluded from this analysis because confidence intervals were less than $0

Overall, for the MaineCare population, the only HSAs that were significantly different from the mean in more than one category were Norway and Lewiston.

Health Dialog also analyzed the PMPY cost of PA admissions by HSA for the Medicare 65+ population. Graph 11 shows the adjusted _total_ PA admissions for the Medicare population with a range of $400 - $1,150 PMPY and an overall mean of $718 PMPY. Lincoln/Millinocket, Rumford/Bridgton, and Skowhegan were all significantly higher than the overall mean. Several HSAs including Presque Isle, Farmington, Sanford, Rockland, Biddeford, Waterville, York, and Lewiston had PMPYs that were significantly below the overall mean.

Graph 11: Medicare 65+ Total PA Admissions Adjusted PMPY by HSA
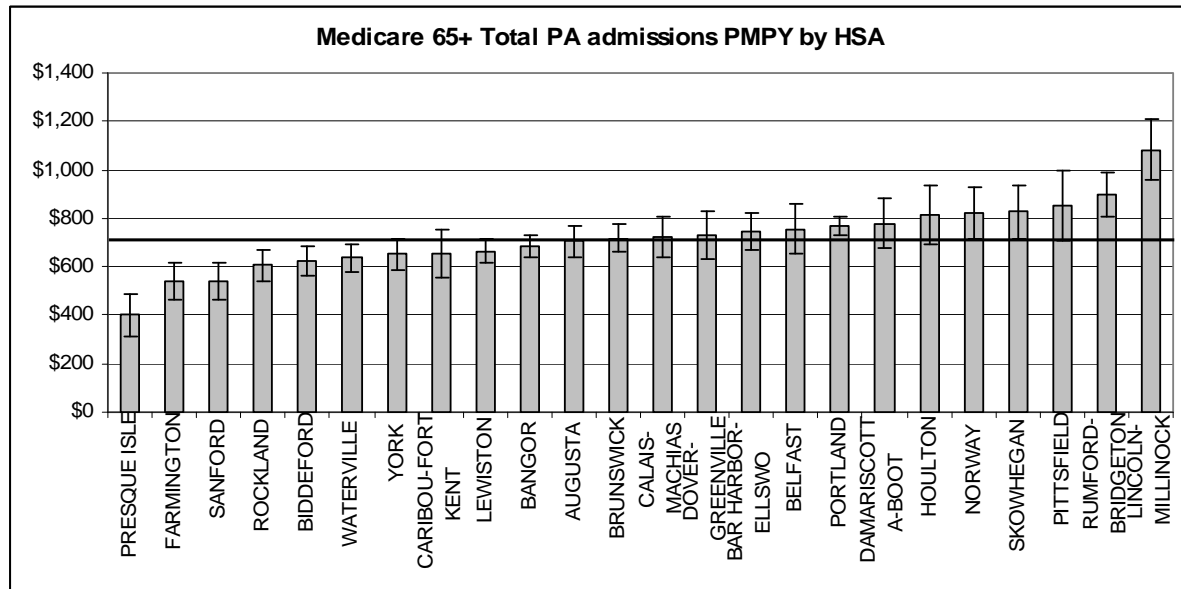
As shown in Graph 12, Cardiac-Circulatory PA admissions vary from approximately $120 to $300 PMPY with a mean of $196 PMPY. Lincoln/Millinocket and Pittsfield were the only two HSAs that were significantly higher cost than the mean. Those HSAs that were below the mean included: Sanford, Presque Isle, Farmington, Waterville, Biddeford, and Brunswick.

*Graph 12: Medicare 65+ Cardiac-Circulatory PA Admissions Adjusted PMPY by HSA*
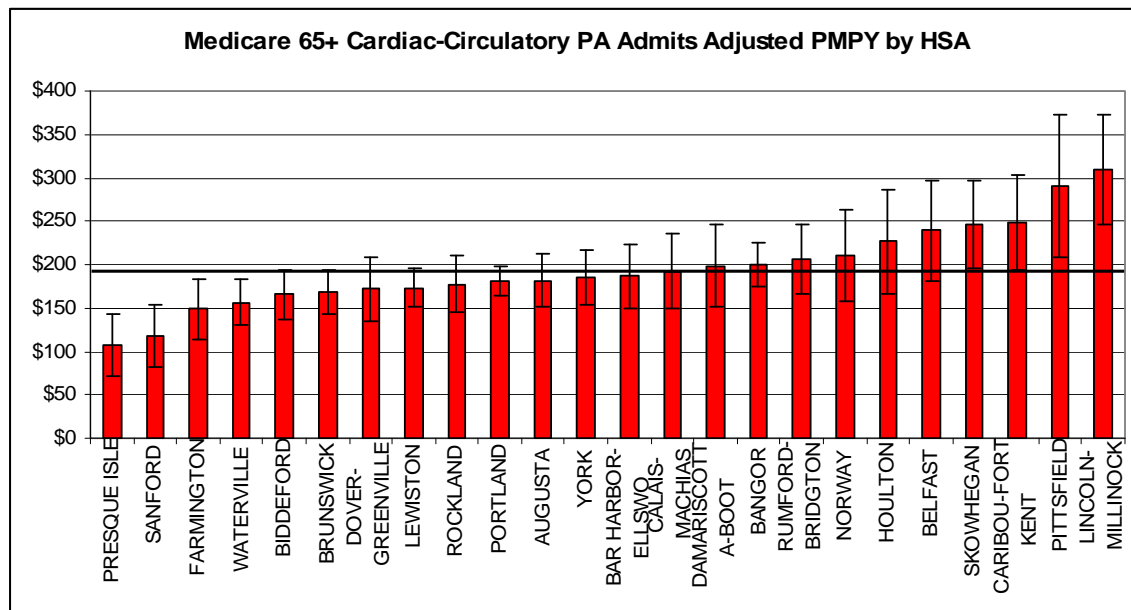
Graph 13 shows Respiratory PA Admissions by HSA which vary from less than $75 PMPY to over $200 PMPY with an overall mean of $150 PMPY. There were two HSAs that were flagged for having significantly higher costs than the overall mean including Skowhegan and Lincoln/Millinocket. HSAs that were significantly below the mean include Presque Isle, Biddeford, Sanford, York, and Portland.

**Graph 13: Medicare 65+ Respiratory PA Admissions Adjusted PMPY by HSA**
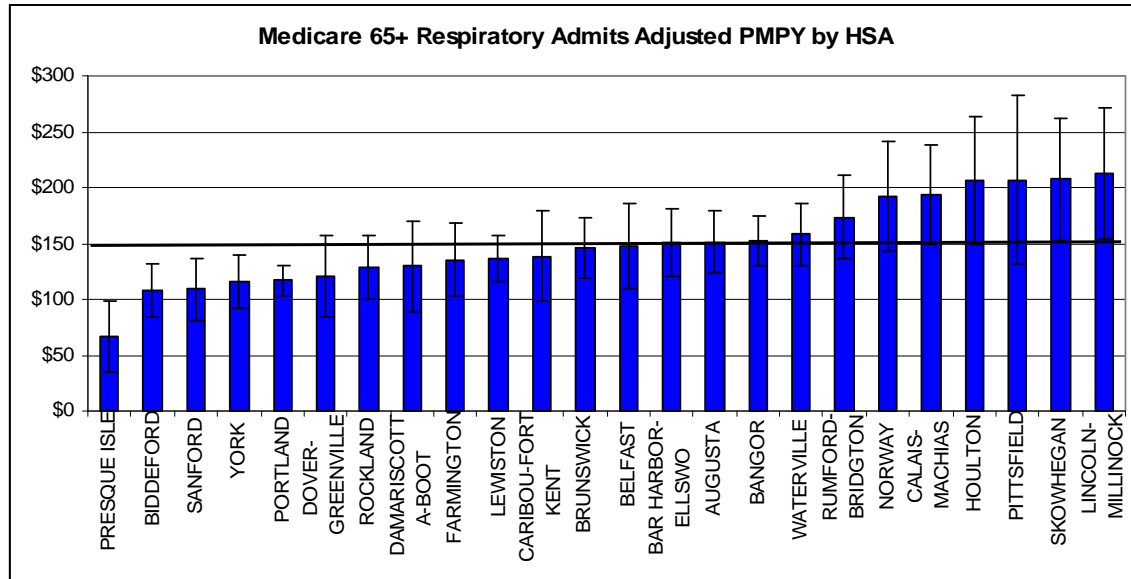
GI PA admissions were less common, with the range by HSA of $50 PMPY to about $125 PMPY with an overall mean of $84 PMPY (Graph 14). Only Lincoln/Millinocket was significantly higher than the overall mean. Those HSAs that were significantly lower than the mean included: Farmington, Pittsfield, and Waterville.

Graph 14: Medicare 65+ GI PA Admissions Adjusted PMPY by HSA
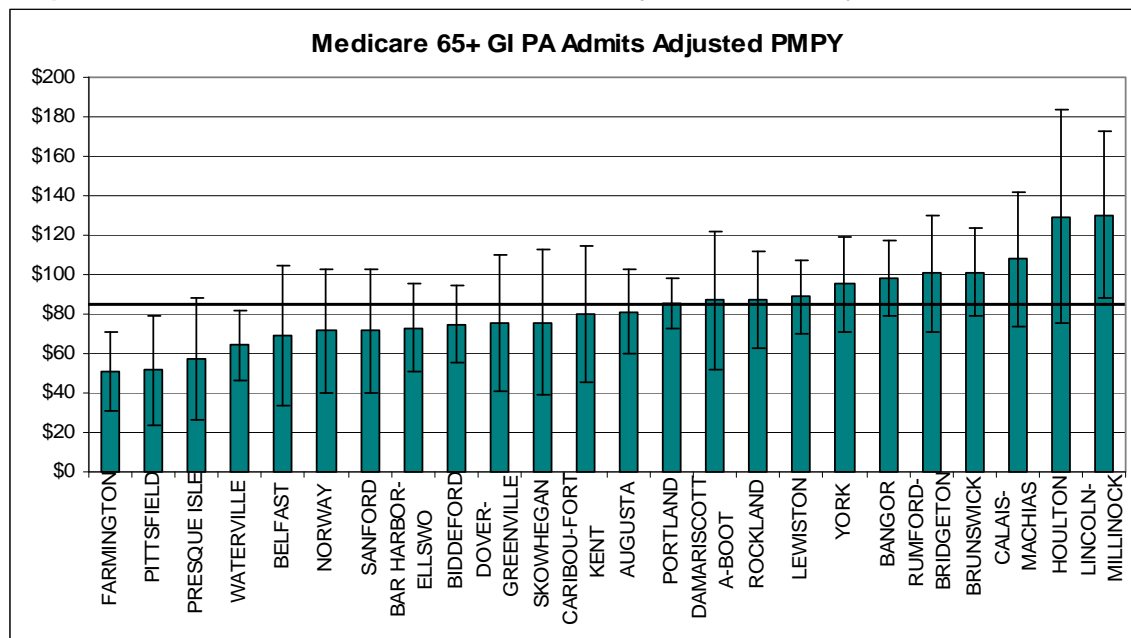
Finally, all other PA admissions were reviewed, with a range of $175 PMPY to over $400 PMPY with an overall mean of $289 PMPY (Graph #15). Bar Harbor/Ellsworth/Blue Hill, Portland, Rumford/Bridgton, and Lincoln/Millinocket were all significantly higher than the overall mean. There were several HSAs that were significantly lower than the overall mean for this category such as Presque Isle, Caribou/Fort Kent, Farmington, Rockland, and Bangor.

Graph 15: Medicare 65+ All Other PA Admissions Adjusted PMPY by HSA
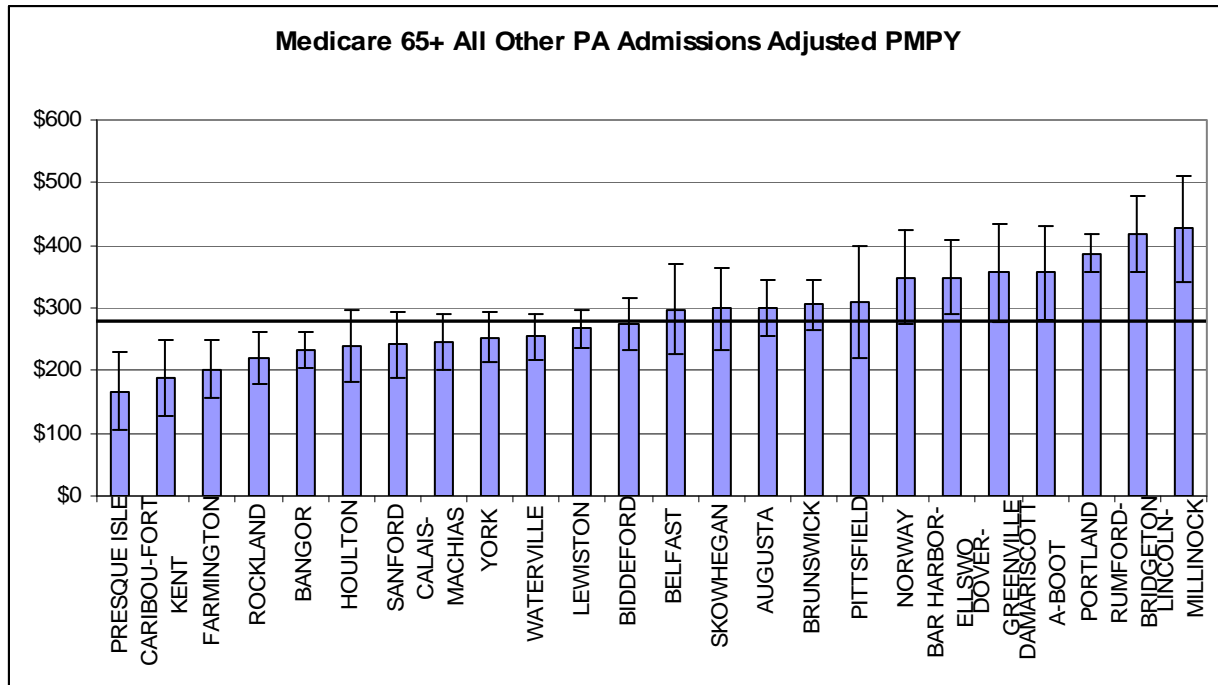
Overall, there was only one HSA, Lincoln/Millinocket that showed up as significantly higher cost in more than one of the PA categories. There were several HSAs that showed up as significantly lower than the overall mean for more than one of these categories: Presque Isle, Waterville, Farmington, Sanford, Lewiston, and Biddeford.

B. Populations with Admissions

While certain diagnoses and procedures account for high inpatient costs, it is individuals with chronic disease who drive PA admissions and account for a majority of inpatient spending. Health Dialog reviewed the utilization and costs of individuals with chronic disease. Table 6 shows a breakdown of chronic prevalence, costs and PMPY for the total vs. chronic populations and IP utilization by type for each payer.

Table 6: Chronic disease prevalence by payer: Costs, PMPY and IP Utilization

Data	COMMERCIAL			MEDICAID			MEDICARE		
	Total Pop.	Chronic Pop.	Chronic Impact	Total Pop.	Chronic Pop.	Chronic Impact	Total Pop.	Chronic Pop.	Chronic Impact
# of People	380,015	40,033	11%	191,756	22,826	12%	102,958	33,292	32%
Total Costs									
TOTAL	$ 1,042,475,509	$ 289,017,986	28%	$ 541,320,403	$ 161,834,241	30%	$ 402,011,671	$ 253,649,203	63%
IP Costs	$ 311,538,012	$ 125,434,487	40%	$ 204,628,315	$ 73,159,348	36%	$ 220,591,642	$ 159,099,399	72%
ER Costs	$ 56,572,629	$ 12,241,013	22%	$ 43,808,546	$ 11,562,013	26%	$ 8,357,102	$ 5,135,343	61%
OP Costs	$ 674,364,868	$ 151,342,485	22%	$ 292,883,542	$ 77,112,880	26%	$ 173,062,927	$ 89,414,461	52%
Per-capita Costs									
TOTAL	$ 2,752	$ 7,242	2.6	$ 2,837	$ 7,052	2.5	$ 3,907	$ 7,623	2.0
IP Costs PMPY	$ 822	$ 3,143	3.8	$ 1,072	$ 3,187	3.0	$ 2,144	$ 4,782	2.2
ER Visit Costs PMPY	$ 149	$ 307	2.1	$ 230	$ 505	2.2	$ 81	$ 154	1.9
OP Visit Costs PMPY	$ 1,780	$ 3,792	2.1	$ 1,535	$ 3,360	2.2	$ 1,682	$ 2,687	1.6
IP Utilization									
Total Admits/1,000	67	211	3.2	129	366	2.8	231	505	2.2
PA Admits/1,000	24	109	4.6	44	201	4.6	129	303	2.3
PSC Admits/1,000	6	30	4.6	4	18	4.7	35	65	1.9
"Needed" Admits/1,000	37	72	2.0	81	147	1.8	67	137	2.0

Table 6 illustrates how chronic prevalence rates are much higher in the Medicare population (32%) vs. the MaineCare (12%) and Commercial (11%) populations, mainly because a majority of chronic diseases have onsets later in life. It is important to note that although these prevalence rates do not represent a majority of the population, they do represent 28% of all claims dollars in the Commercial population, 30% of claims dollars in the MaineCare population and 63% of claims dollars in the Medicare population. Additionally, chronic disease members account for 40% of inpatient costs in the Commercial population, 36% of inpatient costs in the MaineCare population and 72% of inpatient costs in the Medicare population, indicating that chronic disease patients are drivers in inpatient costs, and therefore, PA admissions.

In the Commercial population, the overall admission rate was 67 admissions per 1,000 members, of which the majority (55%) were for "other" admissions. However, the chronic population overall admission rate was much higher at 211 admits/1,000 chronic members, and only 34% of those admissions were deemed "other" admissions. The spike in inpatient utilization for chronic patients appears to be mainly attributed to the PA admissions, where the chronic population has a rate of over 4x that of the total population (109 admits/1,000 vs. 24 admits/1,000). Additionally, preference-sensitive Condition (PSC) Admissions in the chronic population were 5x that of the total population (30 admits/1,000 vs. 6 admits/1,000).

This trend was similar in the MaineCare populations where the overall admit rate was 129 admits/1,000 members and 68% of these admissions were deemed "other" admissions. The chronic population had a higher overall admission rate of 366 admits/1,000 members and only 40% of those admissions were for "other" care. The rate of PA admissions in the overall MaineCare population was 44 admits/1,000 members, but the rate in the chronic MaineCare population was nearly 5x that at 201 admits/1,000 members. Additionally, the PSC admissions were much higher in the chronic MaineCare population at 18 admits/1,000 members vs. the total population rate of 4 admits/1,000 members.

Finally, in the Medicare population, the overall rate of admissions was 231 admits/1,000 members, and 28% of those admissions were for "other" care. In the chronic MaineCare population, the overall admission rate was 505 admits/1,000 members of which approximately 28% were also for "other" care (due to the high prevalence of chronic conditions and the age of the Medicare population, the % of other admissions is fairly similar in the total and chronic populations). The potentially avoidable admissions in the chronic population were nearly 2.5x that of the total population (303 admits/1,000 vs. 129 admits/1,000). Similarly, the PSC admissions for the chronic population were nearly 2x that of the total population (65 admits/1,000 vs. 35 admits/1,000).

Graphs 16 show the utilization of admissions of the chronic Commercial 45+ population by HSA (HSAs are blinded because these utilization numbers have not been risk adjusted). It is clear that much of the variation in admissions between HSAs is accounted for by the PA admissions for this population, and this trend is similar for Medicare and MaineCare chronic populations as well. Additionally, even the lowest utilization areas in the State have significant PA admissions that could be reduced.

Graph 16: Chronic Commercial 46-64 Admissions/1,000 Members by Admit Type and HSA
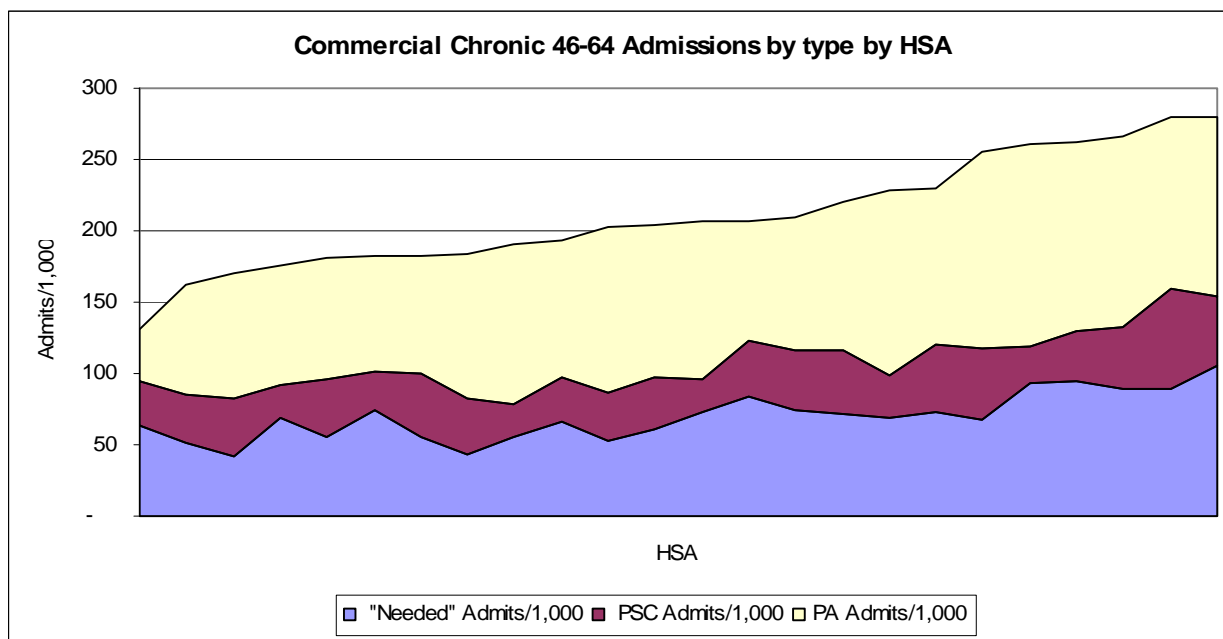
Overall, these charts indicate that at a population level, the chronic disease members are the population that are driving rates of admissions higher for all three payers, especially for PA and PSC admissions. As such, interventions at the population level should be targeted at those with chronic disease.

Table 7 below shows savings by type of admission that the State of Maine could potentially save by reducing PA admission by 25%, 50% or 75%. Additionally, Table 8 shows the potential savings by payer.

Table 7: Savings from Potentially Avoidable Admissions by Type

Type of Admission	Total PA Cost	Savings with 25% Reduction	Savings with 50% Reduction	Savings with 75% Reduction
Cardiac-Circulatory	$56.5M	$14.1M	$28.3M	$42.4M
Musculoskeletal	$18.1M	$4.5M	$9.1M	$13.5M
Respiratory	$52.0M	$13.0M	$26.0M	$39.0M
GI	$37.2M	$9.3M	$18.6M	$27.9M
Sub-Total top 4 PA Admission Types	$163.8M	$40.9M	$82.0M	$122.8M
All Other	$119.8M	$30.1M	$59.9M	$89.9M
Total	$283.6M	$71.0M	$141.8M	$212.7M

Table 8: Savings from Potentially Avoidable Admissions by Payer

Payer	Total PA PMPY	Savings with 25% Reduction	Savings with 50% Reduction	Savings with 75% Reduction
Commercial	$83.4M	$20.9M	$41.7M	$62.6M
MaineCare[1]	$51.6M	$12.9M	$25.8M	$38.7M
Medicare	$78.2M	$19.6M	$39.1M	$58.7M
Dual	$70.4M	$17.6M	$35.2M	$52.8M
Total	$283.6M	$71.0M	$141.8M	$212.7M

[1] *MaineCare $'s are based on estimated paid amount that have not yet been reconciled*

The savings of $71M, $141.8 and $212.7 are solely meant to illustrate the magnitude of the PA dollars. They are not based on any type of savings models due to particular interventions and are meant to be illustrative of possible savings.

Section 3: Outpatient Costs

Health Dialog determined that there was wide variation throughout the State of Maine for several outpatient procedures. This analysis focused on those outpatient procedures which showed high variation and are amenable to some sort of intervention (i.e., reimbursement reform, regulatory reform, etc.). Health Dialog determined that these costs were: Lab Tests, Advanced Imaging (CAT & MRI), Standard Imaging, Echography Imaging (Including Ultrasound) and Specialist visits.

Table 9 shows the total dollars by payer for each of the procedures that were determined to have high variation and be amenable to an intervention.

Table 9: Outpatient Costs - Total and high cost/high variation buckets

| Type of Service	Commercial	MaineCare[1]	Medicare	Dual	Total	% of OP cost
Total OP Costs	$674.4M	$292.8M	$173.1M	$175.9M	$1,316M	100%
Lab Tests	$58.8M	$9.6M	$13.5M	$7.7M	$89.6M	6.8%
Advanced Imaging	$45.3M	$8.4M	$8.0M	$4.9M	$66.6M	5.1%
Standard Imaging	$35.6M	$4.1M	$8.4M	$4.0M	$52.1M	4.0%
Echography	$19.5M	$6.6M	$4.3M	$2.0M	$32.4M	2.5%
Specialist Visits	$40.9M	N/A	$15.3M	$7.9M	$64.1M	4.9%
Total High Cost & High Variation	$200.1M	$28.7	$49.5M	$26.5M	$304.8M	23.3%

[1]*Specialty codes were not available for MaineCare data*

As Table 9 indicates, lab tests are the largest percentage of outpatient dollars spent that could be amenable to an intervention accounting for 6.8% of outpatient costs, likely due to the common practice of duplicative lab testing. Advanced imaging was the next largest category at 5.1%, with standard imaging not far behind at 4.0%. In total, standard imaging, advanced imaging, and ultrasound imaging account for 11.6% of outpatient costs. Specialist visits was also a large category, accounting for 4.9% of outpatient costs (and this does not include any specialist visits for MaineCare, this percentage is a known underestimate of this category). Overall, it is important to note that no one procedure accounts for a large amount of outpatient costs, the categories above have been grouped into meaningful categories, but still only account for less that ¼ of outpatient spend.

Health Dialog risk adjusted the cost PMPY for each of these procedures within each payer, and significant variation was observed. For each payer, Health Dialog analyzed the procedures referenced above Adjusted PMPY by HSA. Variation analysis again focused on the older age cohorts similarly to the inpatient analysis because these cohorts utilize the most services.

Graph 17 below shows the outpatient categories for the Commercial 45+ population by HSA in a stacked bar chart for the commercial population with a range of $700 - $1,200 PMPY. It is important to note there is not only variation between HSAs, but also in the types of services driving these variations. Confidence intervals are not included on the stacked graphs, so please refer to graphs 18-22 for significant differences between HSAs by specific type of outpatient procedure.

*Graph 17: Commercial 45+ Stacked Chart of OP PMPY by Type and HSA*
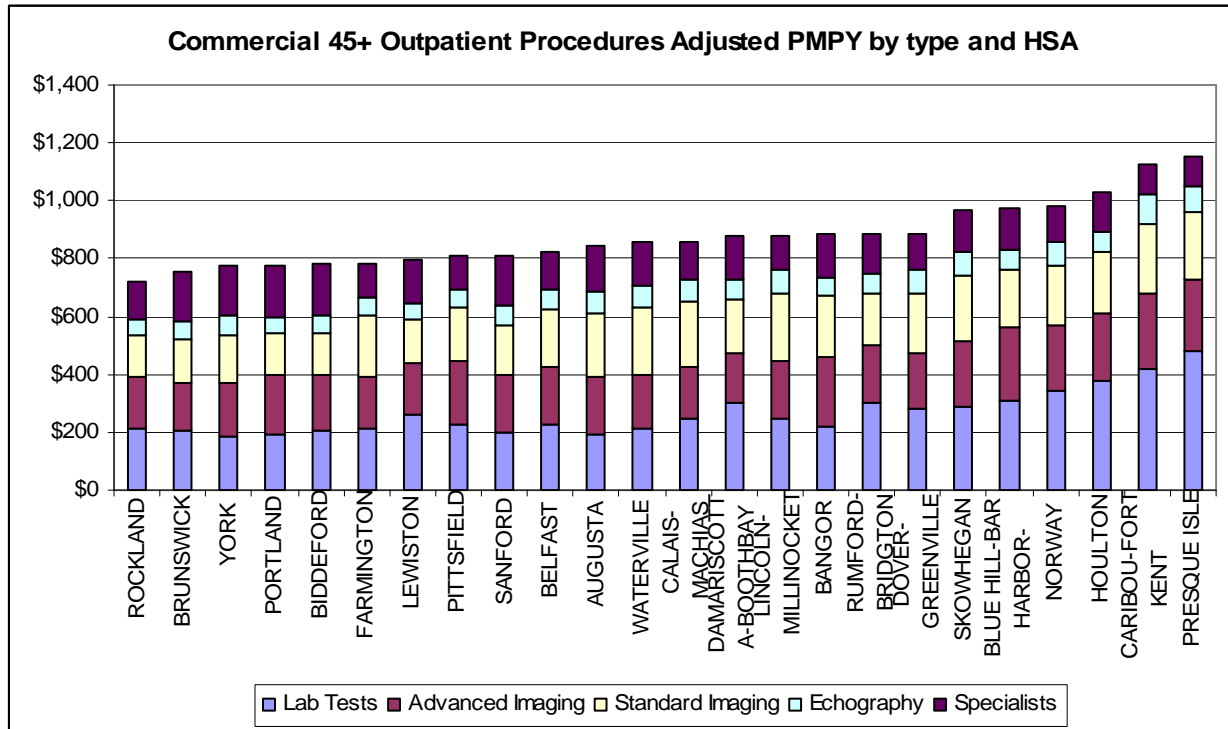
Graph 18 shows outpatient lab tests PMPY which range from about $200 to almost $500 PMPY with an overall mean of $265 PMPY. All of the HSAs were either significantly higher or lower than the overall mean. There were 15 HSAs that were lower than the mean as shown up to Lewiston. All those HSAs with costs higher than Lewiston were significantly higher than the overall mean.

Graph 18: Commercial 45+ Lab Tests Adjusted PMPY by HSA

Commercial 45+ OP Lab Tests Adjusted PMPY
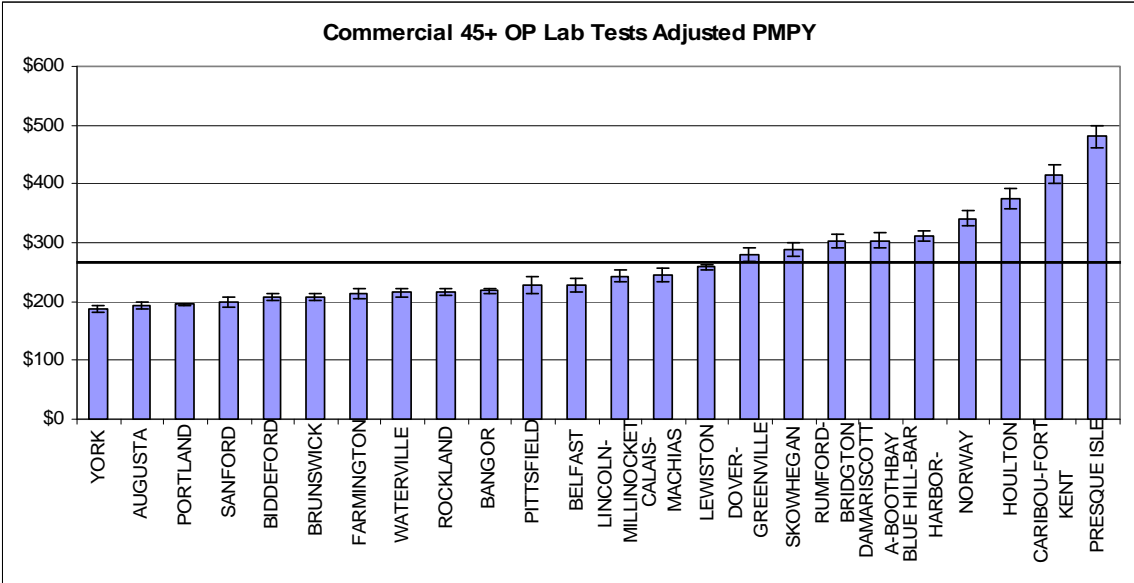
Graph 19 shows overall Advanced Imaging Adjusted PMPY which ranges from a little more than $150 PMPY to over $250 PMPY and an overall mean of $202 PMPY for the Commercial 45+ population. There were several HSAs that were significantly more expensive than the overall mean including Norway, Bangor, Presque Isle, Bar Harbor/Ellsworth/Blue Hill, and Caribou/Fort Kent. Additionally, there were nine HSAs that were significantly below the overall mean including Brunswick, Damariscotta/Boothbay Harbor, Rockland, Farmington, Calais/Machias, York, Lewiston, Waterville, and Biddeford.

Graph 19: Commercial 45+ Advanced Imaging Adjusted PMPY by HSA

Commercial 45+ OP Advanced Imaging Adjusted PMPY
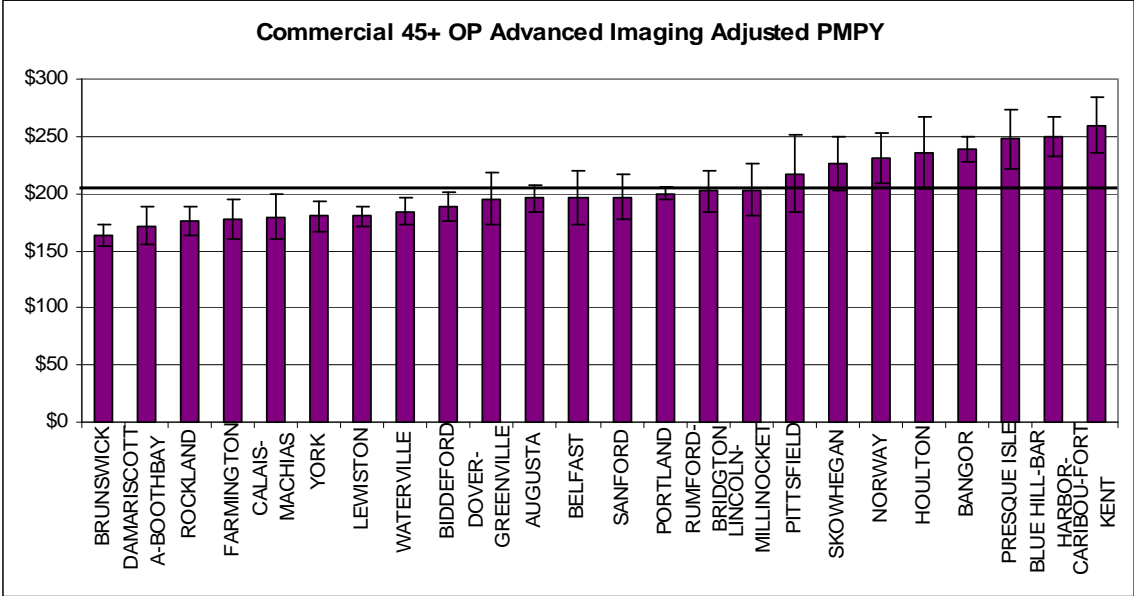
Graph 20 shows standard imaging adjusted PMPY for the commercial 45+ population which ranges from about $150- $250 PMPY with an overall mean of $196 PMPY. The following HSAs were significantly higher cost than the overall mean: Farmington, Houlton, Bangor, Augusta, Calais/Machias, Skowhegan, Waterville, Presque Isle, Lincoln/Millinocket, and Caribou/Ft. Kent. Those HSAs that were significantly lower than the mean include Rockland, Portland, Biddeford, Lewiston, Brunswick, York, Sanford, Rumford/Bridgton, and Damariscotta/Boothbay Harbor.

*Graph 20: Commercial 45+ Standard Imaging Adjusted PMPY by HSA*
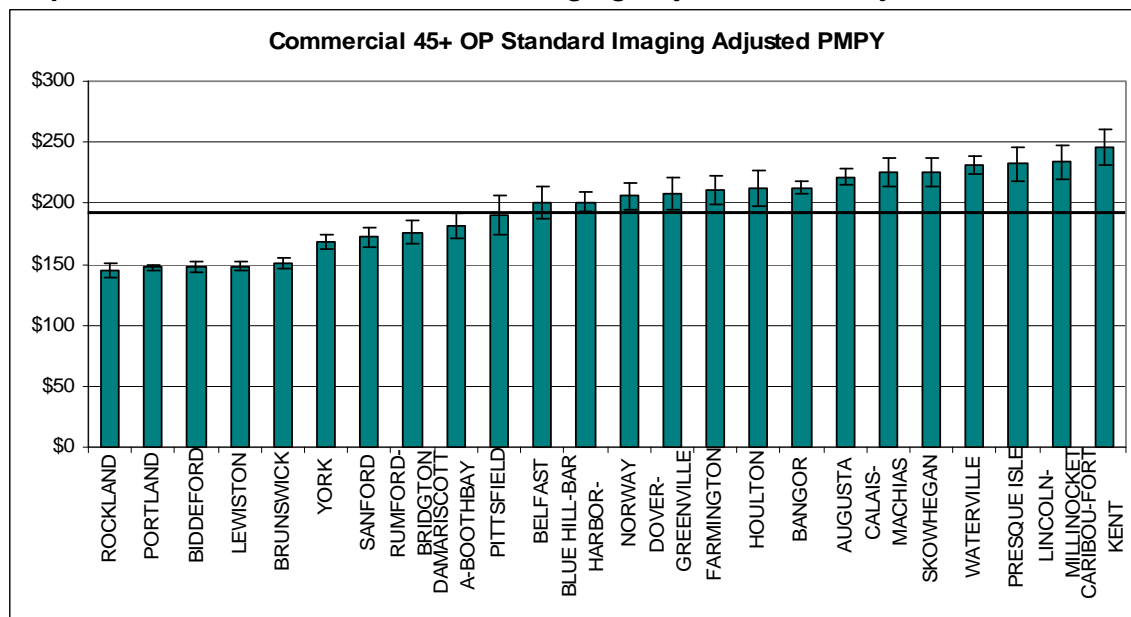
Graph 21 shows Commercial 45+ echography by HSA that range from $55 - $100 PMPY with an overall mean of $71 PMPY. The following HSAs were significantly higher than the mean: Norway, Lincoln/Millinocket, Skowhegan, Presque Isle, and Caribou/Ft. Kent. There were also several HSAs that were significantly below the overall mean including: Rockland, Portland, Biddeford, Lewiston, Brunswick, Farmington, and Bangor.

Graph 21: Commercial 45+ Echography Adjusted PMPY by HSA
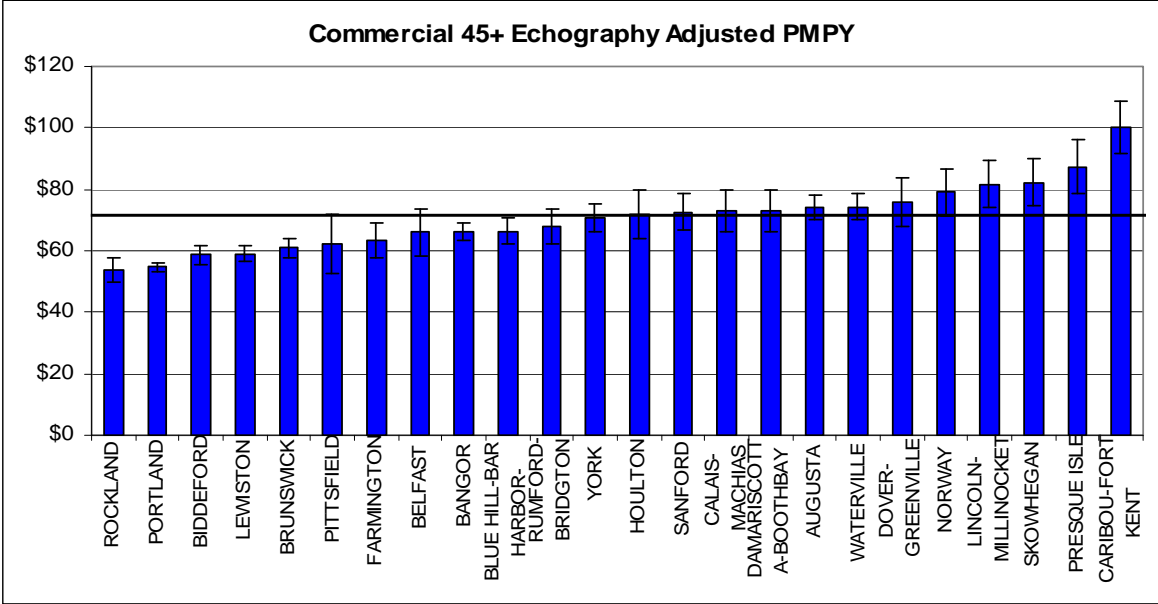
Graph 22 shows specialist visits for the Commercial population which ranged from $100 to $180 PMPY with an overall mean of $141 PMPY. Those HSAs that had significantly higher costs than the mean include: Waterville, Lewiston, Augusta, York, Sanford, Brunswick, Portland, and Biddeford. Those HSAs that are significantly lower than the mean include: Presque Isle, Caribou/Ft. Kent, Pittsfield, Lincoln/Millinocket, Farmington, Norway, Dover-Foxcroft/Greenville, and Rockland.

Graph 22: Commercial 45+ Specialist visits Adjusted PMPY by HSA
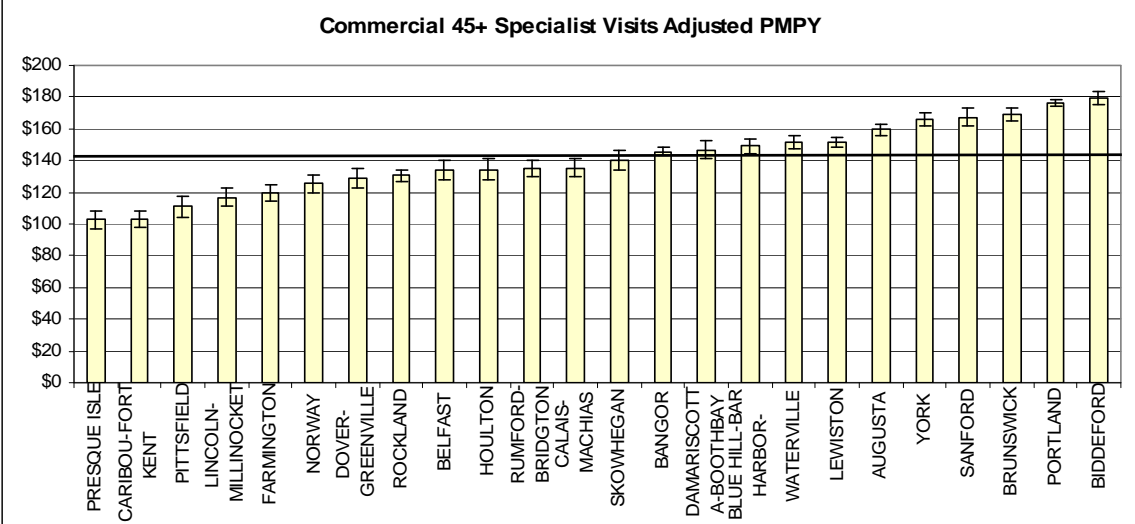
Overall, 4 HSAs were consistently higher than the mean for at least 3 of the outpatient categories: Skowhegan, Norway, Caribou/Ft. Kent, and Presque Isle. Several HSAs were consistently below the mean for at least 3 of the outpatient categories including: York, Portland, Biddeford, Brunswick, Farmington, Rockland, and Lewiston.

Graph 23 below shows the outpatient categories by HSA in a stacked bar chart for the MaineCare population. There is not only variation between HSAs, but also in the types of services driving these variations. Confidence intervals are not included on the stacked graphs, so please refer to graphs 24-27 for significant differences between HSAs by type of outpatient procedure.

*Graph 23: MaineCare 46-64 Stacked Chart of OP PMPY by Type and HSA*
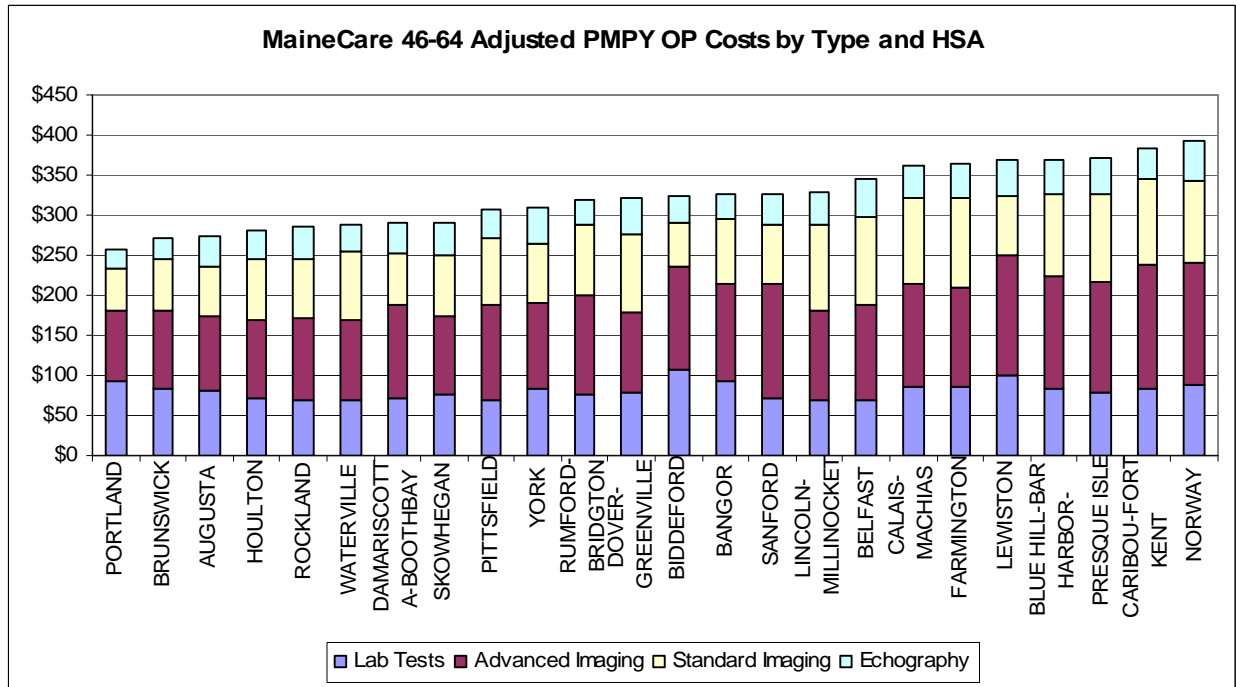
Graph 24 shows that lab tests ranged from about $70 PMPY to $110 PMPY with a mean of $81 PMPY. Those HSAs that were found to have significantly higher than the mean PMPYs were: Portland, Bangor, Lewiston, and Biddeford. There were several HSAs that exhibited significantly lower PMPYs including Rockland, Pittsfield, Belfast, Lincoln/Millinocket, Waterville, and Houlton.

Graph 24: MaineCare 46-64 Lab Tests Adjusted PMPY by HSA

MaineCare 46-64 OP Lab Tests Adjusted PMPY
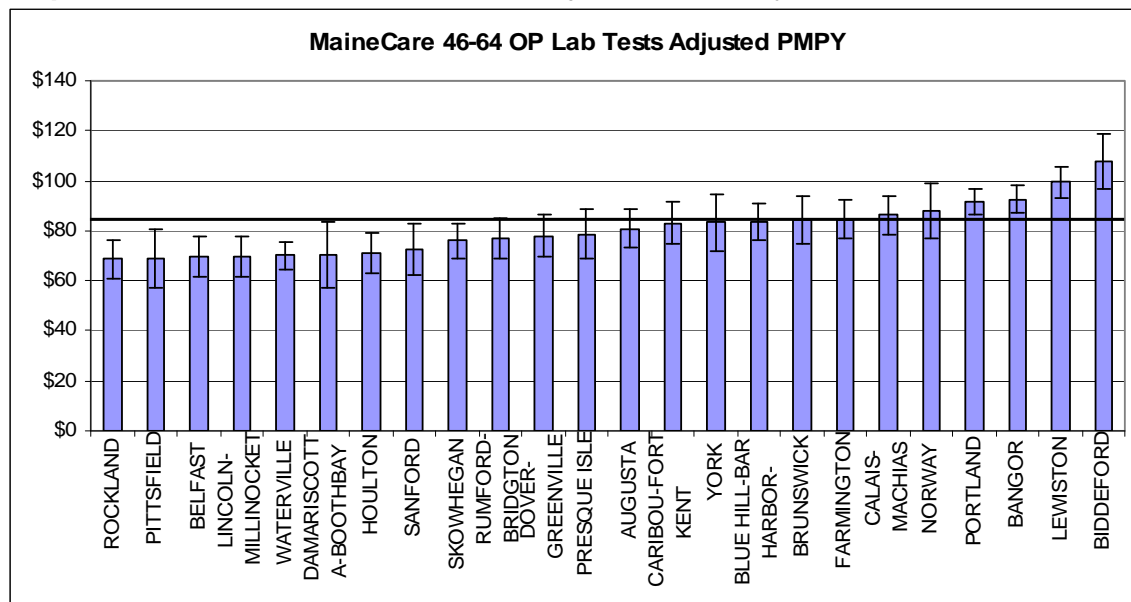
MaineCare Advanced Imaging ranged from $90 PMPY to $150 PMPY with an overall mean of $119 PMPY (Graph 25). There were four HSAs with PMPYs that were significantly higher than the overall mean: Bar Harbor/Ellsworth/Blue Hill, Lewiston, Norway, and Caribou/Ft. Kent. Those HSAs that were significantly lower than the mean included Portland, Augusta, Brunswick, Skowhegan, Houlton, and Waterville.

Graph 25: MaineCare 46-64 Advanced Imaging Adjusted PMPY by HSA

MaineCare 46-64 OP Advanced Imaging Adjusted PMPY
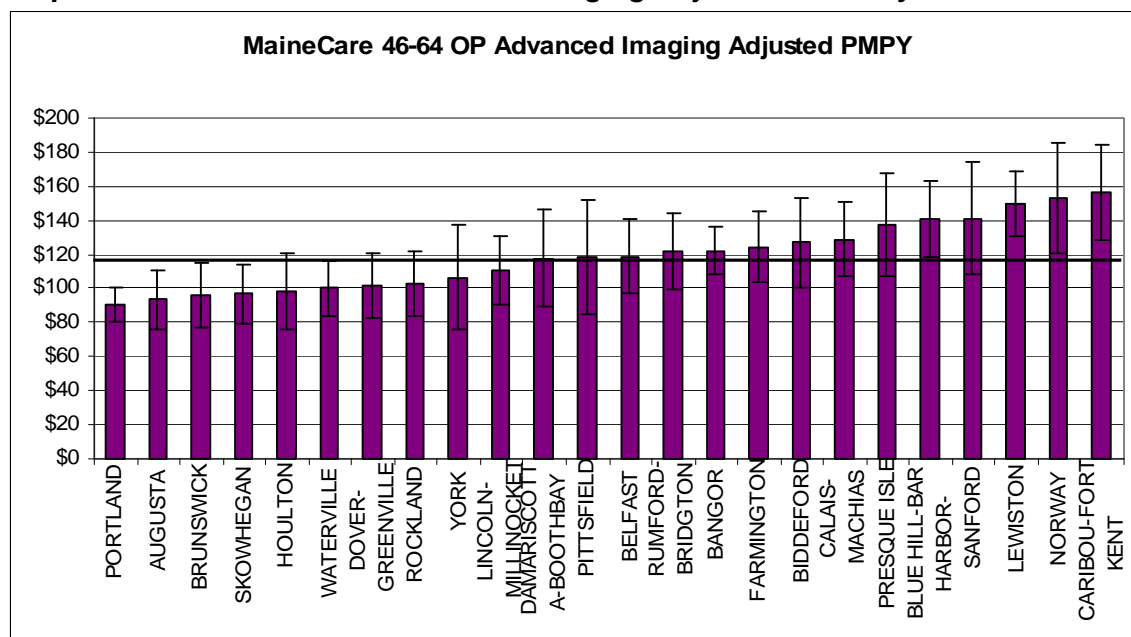
Graph 26 shows MaineCare Standard Imaging which ranges from about $50 PMPY to over $100 PMPY with a mean of $85 PMPY. Several HSAs were significantly more expensive than the overall mean including Bar Harbor/Ellsworth/Blue Hill, Norway, Calais/Machias, Caribou/Fort Kent, Lincoln/Millinocket, Belfast, Presque Isle, and Farmington. Those HSAs that were significantly lower in cost include Portland, Biddeford, Augusta, Brunswick, Damariscotta/Boothbay, Lewiston, and Rockland.

Graph 26: MaineCare 46-64 Standard Imaging Adjusted PMPY by HSA
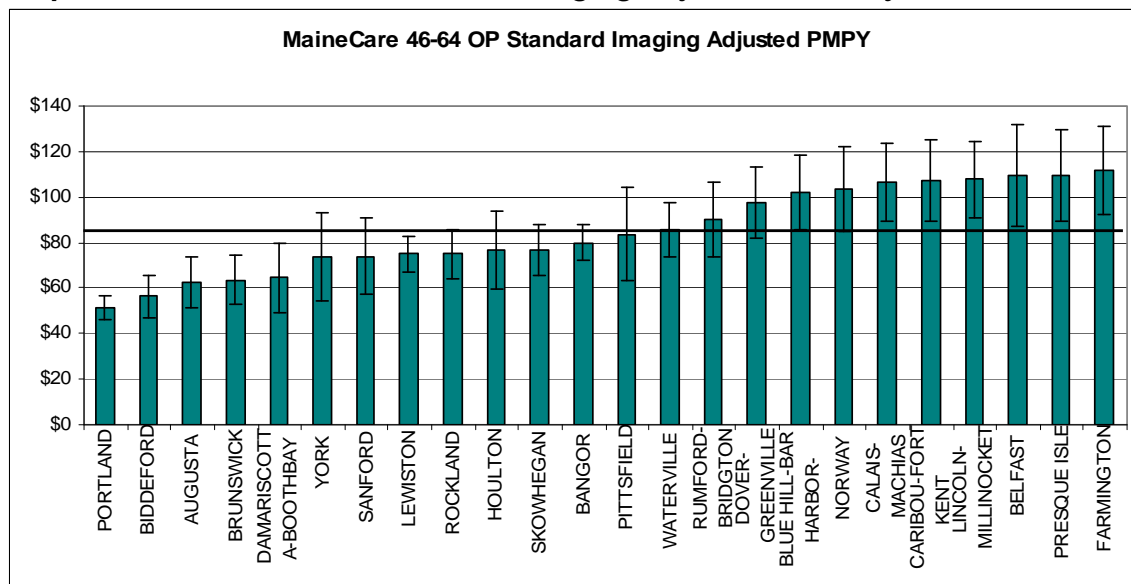
Graph 27 shows Echography for the MaineCare population aged 46-64 which ranged from $25 - $48 PMPY with an overall mean of $38 PMPY. There were only 2 HSAs that were significantly higher cost than the overall mean: Norway and Lewiston. Those HSAs that were significantly lower than the mean included Portland, Brunswick, Rumford-Bridgton, Bangor, and Waterville.

Graph 27: MaineCare 46-64 Echography Adjusted PMPY by HSA
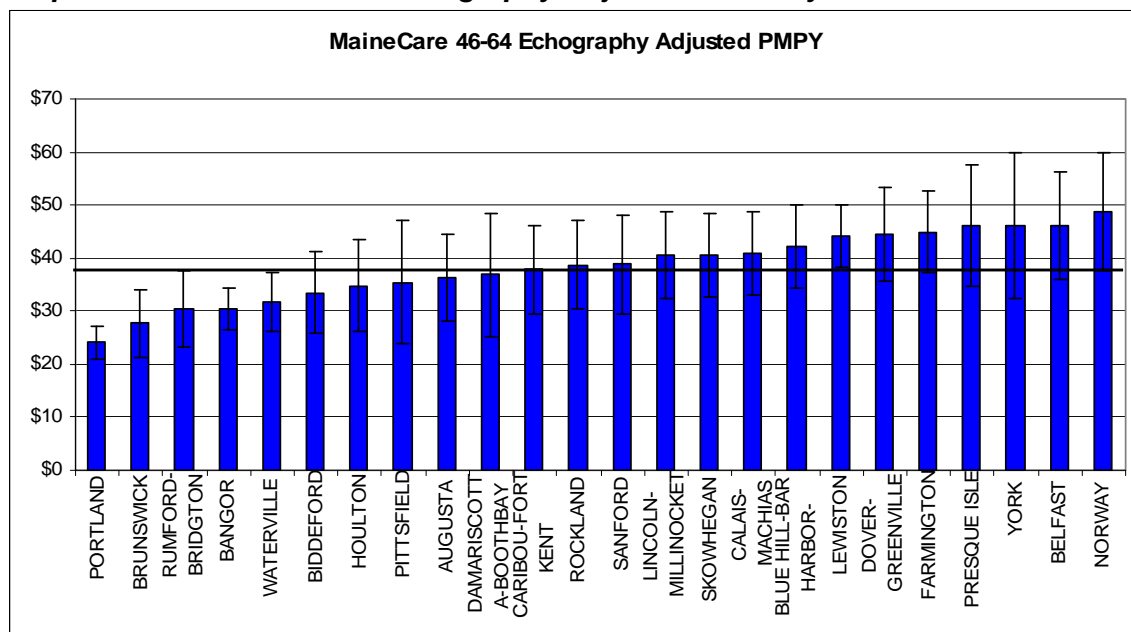
Overall for the MaineCare population, only two HSAs consistently (3/4 of procedures) showed up as higher than the overall mean: Norway and Lewiston. The HSAs that showed up consistently as lower than the mean were Waterville and Portland.

Graph 28 below shows the outpatient categories by HSA in a stacked bar chart for the Medicare population with a range of $400 - $550 PMPY. There is not only variation between HSAs, but also in the types of services driving these variations. Confidence intervals are not included on the stacked graphs, so please refer to graphs 29-33 for significant differences between HSAs by type of outpatient procedure.

Graph 28: Medicare 65+ Stacked Chart of OP PMPY by Type and HSA
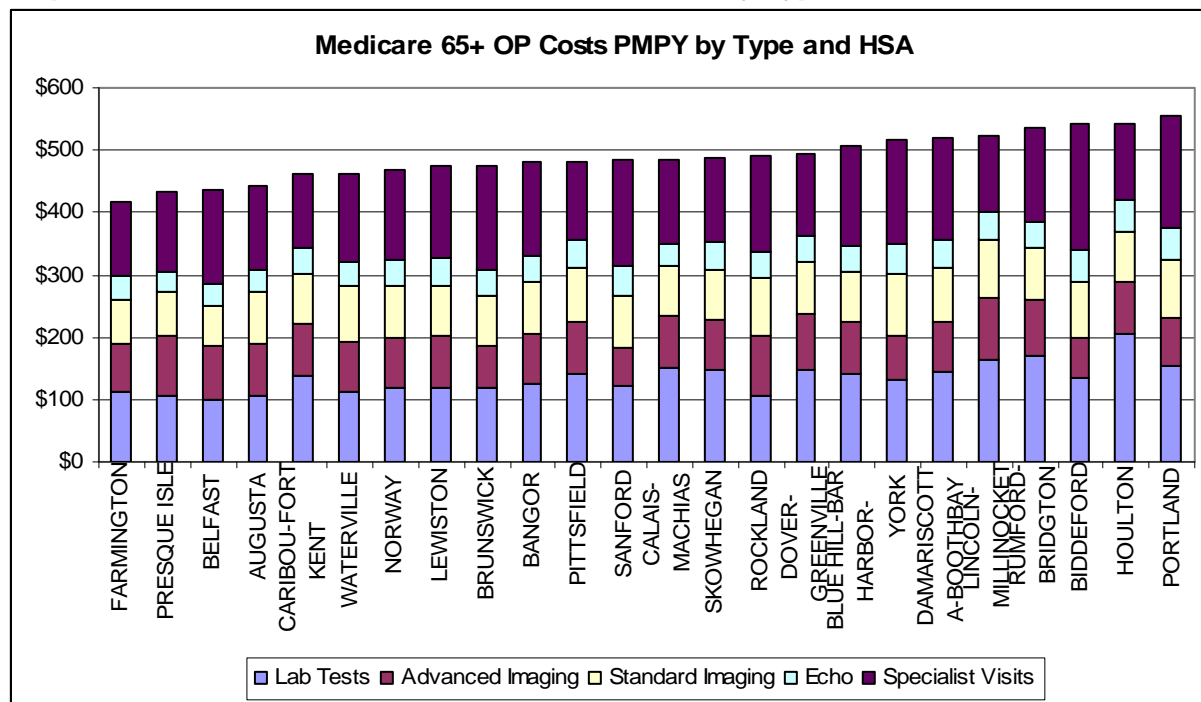
Graph 29 shows the Medicare population's variation in lab costs which ranged from about $100 - $200 PMPY with an overall mean of $134 PMPY. There were several HSAs that were significantly higher than the mean: Bar Harbor/Ellsworth/Blue Hill, Damariscotta/Boothbay, Skowhegan, Dover-Foxcroft/Greenville, Calais/Machias, Portland, Lincoln/Millinocket, Rumford/Bridgton, and Houlton. Those HSAs that were significantly lower than the overall mean include Belfast, Rockland, Augusta, Presque Isle, Farmington, Waterville, Norway, Lewiston, Brunswick, Sanford, and Bangor.

Graph 29: Medicare 65+ Lab Tests Adjusted PMPY by HSA
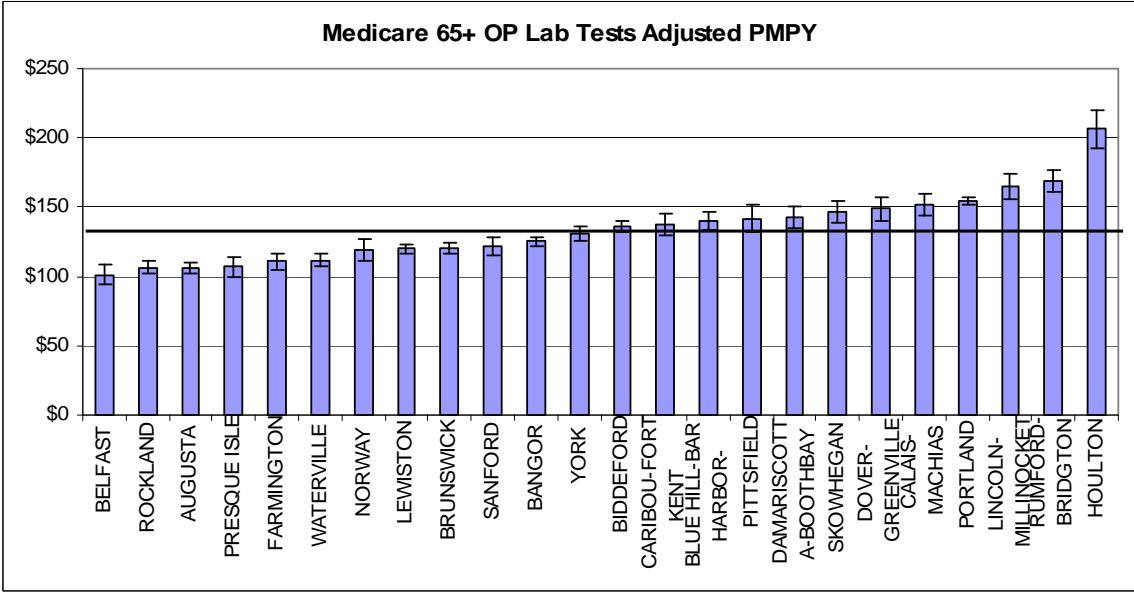
Graph 30 shows the Medicare Advanced imaging which ranges from about $60 - $100 PMPY with an overall mean of $82 PMPY. Those HSAs that are significantly higher cost than the overall mean were Lincoln/Millinocket, Rockland, Presque Isle, and Rumford/Bridgton. Those HSAs that were significantly lower than the overall mean include Sanford, Biddeford, Brunswick, York, and Portland.

Graph 30: Medicare 65+ Advance Imaging Adjusted PMPY by HSA
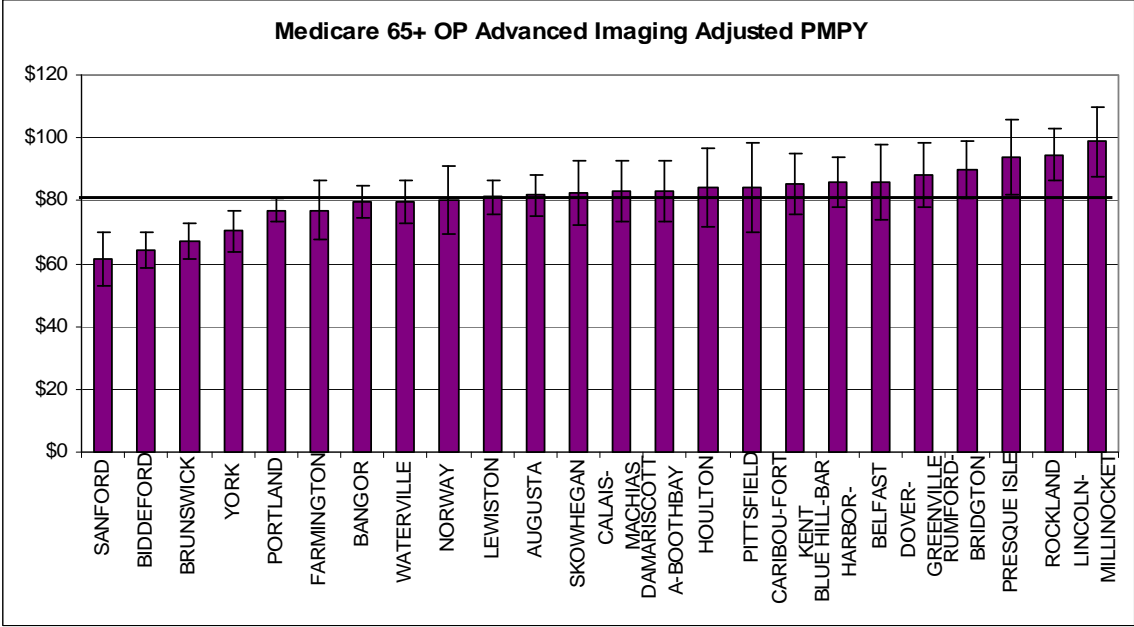
Graph 31 illustrates the Medicare Standard imaging Adjusted PMPY by HSA which ranges from about $60 PMPY to $100 PMPY with a mean of $83 PMPY. Those HSAs that are significantly higher than the mean include Waterville, Biddeford, Portland, Lincoln/Millinocket, Rockland, and York. Those that are significantly lower than the mean include Belfast, Farmington, Presque Isle, and Bar Harbor/Ellsworth/Blue Hill.

Graph 31: Medicare 65+ Standard Imaging Adjusted PMPY by HSA

Medicare 65+ OP Standard Imaging Adjusted PMPY
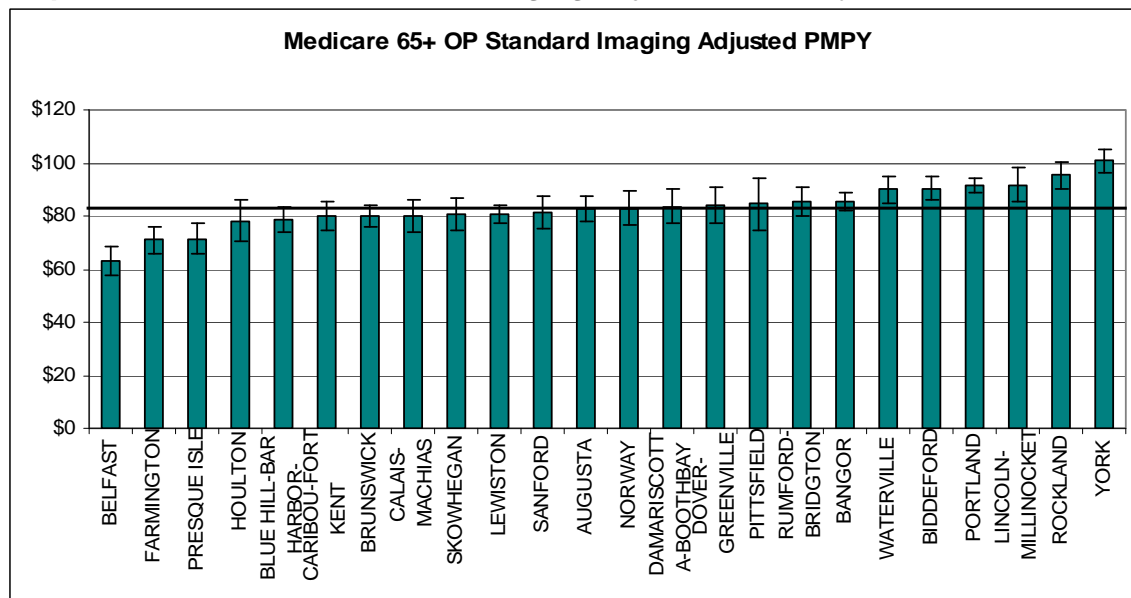
Graph 32 shows the Medicare adjusted PMPY for Echography which ranges from $30 to $50 PMPY with a mean of $43 PMPY. HSAs that are significantly high in cost are Lewiston, York, Biddeford, Sanford, Portland, and Houlton. Those that are significantly low in cost included: Presque Isle, Belfast, Calais/Machias, Augusta, Farmington, Rockland, and Bangor.

Graph 32: Medicare 65+ Echography Adjusted PMPY by HSA

Medicare 65+ OP Echography Adjusted PMPY
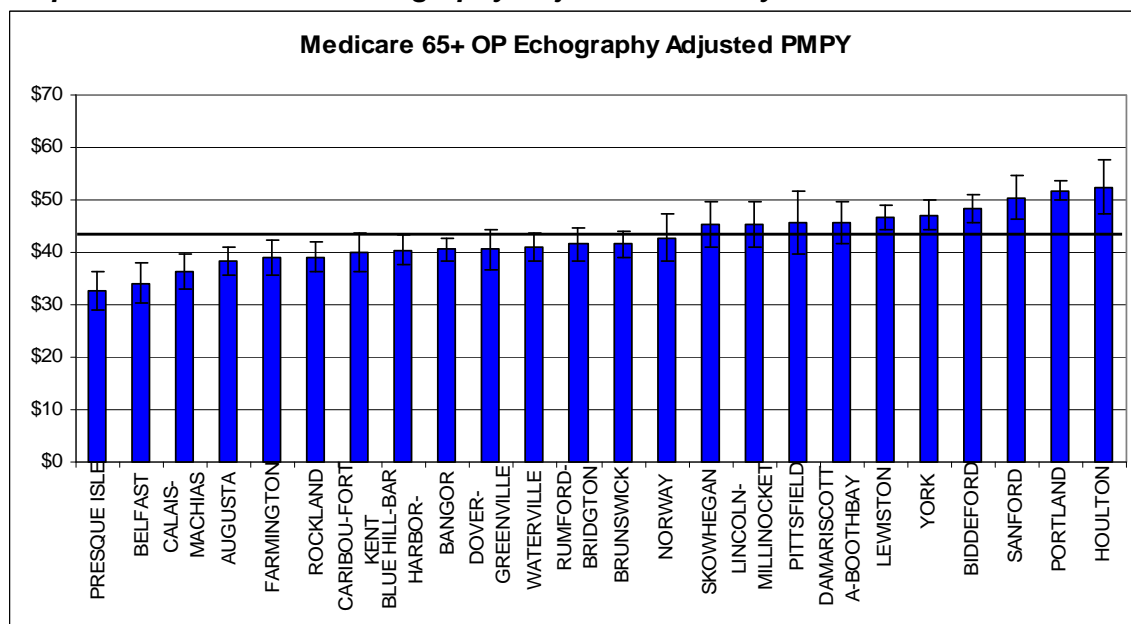
Graph 33 shows specialist visits for the Medicare population which ranged from $110 to $200 PMPY with a mean of $147 PMPY. Those HSAs that were significantly higher than the mean included: Belfast, Rockland, Bar Harbor/Ellsworth/Blue Hill, Damariscotta/Boothbay Harbor, Brunswick, York, Sanford, Portland, and Biddeford. Those HSAs that were significantly lower than the mean included: Caribou/Ft. Kent, Farmington, Houlton, Lincoln/Millinocket, Pittsfield, and Presque Isle.

Graph 33: Medicare 65+ Specialist Visits Adjusted PMPY by HSA
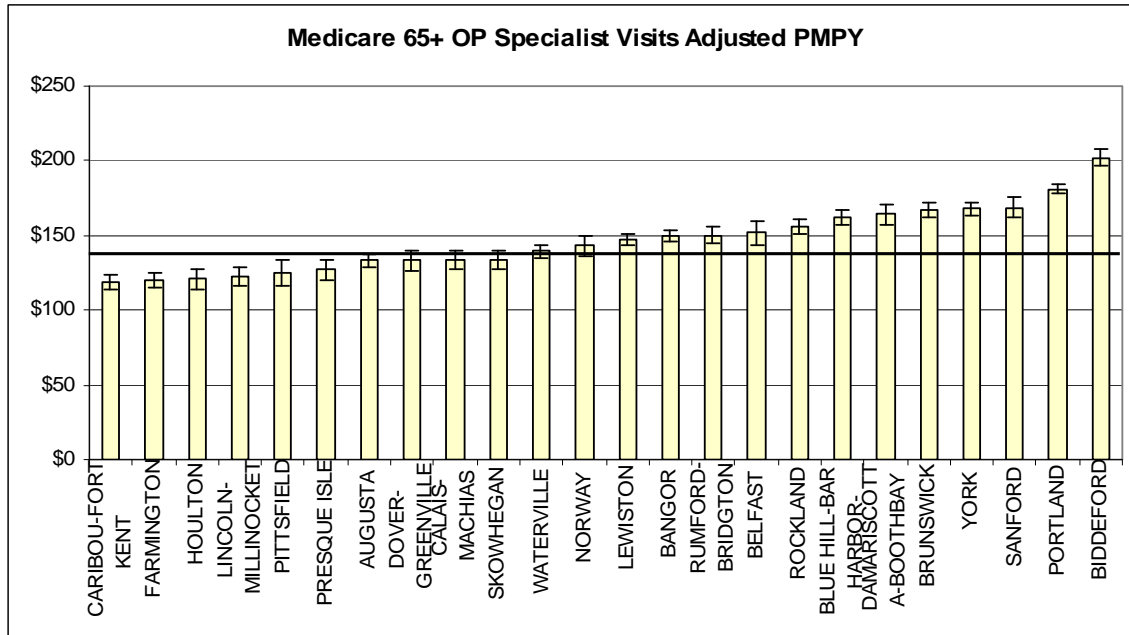
Overall, 2 HSAs were consistently higher than the mean in the Medicare populations were: Portland and Lincoln/Millinocket. Those HSAs that were consistently lower than the mean included: Belfast, Presque Isle and Farmington.

Since there is variation by HSA even after risk adjustment, this is a clear indication that these services are being overly utilized in some areas. Cost savings for the State of Maine if these high variation procedures were reduced are shown in Table 10. Estimated savings by payer are shown in Table 11.

Table 10: Estimated Cost savings from 10%, 25% and 50% reduction in OP cost categories by type

Type of Service	OP Costs	Savings with 10% Reduction	Savings with 25% Reduction	Savings with 50% Reduction
Lab Tests	$89.6M	$9.0M	$22.4M	$44.8M
Advanced Imaging	$66.6M	$6.7M	$16.7M	$33.3M
Standard Imaging	$52.1M	$5.2M	$13.0M	$26.0M
Echography	$32.4M	$3.2M	$8.1M	$16.2M
Specialist Visits	$64.1M	$6.4M	$16.0M	$32.1M
Total	$304.8M	$30.5M	$76.2M	$152.4

Table 11: Estimated Cost savings from 10%, 25% and 50% reduction in OP cost buckets by payer

Type of Service	OP Costs	Savings with 10% Reduction	Savings with 25% Reduction	Savings with 50% Reduction
Commercial	$200.1M	$20.0M	$50.0M	$100.1M
MaineCare	$28.7M	$2.9M	$7.2M	$14.3M
Medicare	$49.5M	$5.0M	$12.4M	$24.8M
Dual	$26.5M	$2.6M	$6.6M	$13.2M
Total	$304.8M	$30.5M	$76.2M	$152.4

Once again, the savings of $30.5M, $76.2M and $152.4M are solely meant to illustrate the magnitude of the dollars that the State of Maine could potentially save by reduction in high variation procedures. These calculations are not based on any type of savings models due to particular interventions and are meant to be illustrative of possible savings only.

Overall, there is much variation in terms of which HSAs are outliers for specific procedures, which is indicative of a "local signature" as well as the supply-sensitive nature of this variation. While clear variation exists in many areas, the solution or interventions to reduce avoidable costs are not the same in all areas.

V. Conclusions

Documentation of significant geographic differences in healthcare utilization and spending continues to raise questions around the financing and delivery of healthcare. Like other states and the country as a whole, Maine is facing increasing challenges around the cost of healthcare. This report identifies variation in healthcare spending not only to identify the drivers of cost, but also to allow for a detailed discussion of strategies to reduce variation and costs overall.

Key findings from the analysis include:

- Total cost is a function of volume of services (utilization) and price per service. Of these two variables, we found utilization, or service volume, to be the more powerful determinant of cost.
- Significant variation in per-capita spending exists across Health Service Areas (HSAs) for both inpatient and outpatient care
  - A significant portion of inpatient care (>30%) is "potentially avoidable" (PA). Potentially avoidable does **_not_** mean preventable or that 30% of inpatient spending can be eliminated; rather, that through analysis and interventions, it can be reduced. See full report for further definition.
  - While some HSAs exhibit more potentially avoidable inpatient costs than others, PA admissions and costs are observed in all communities in Maine with different HSAs exhibiting high costs in different clinical areas.
  - On the outpatient side, spending is dispersed among several specific categories, with lab tests accounting for the highest percentage of all outpatient spending (6.8%), followed by advanced imaging (MR and CT) (5.1%). Over 30 additional categories account for less than 5% of total outpatient spending, with many accounting for less than 1%.
  - Outpatient spending on high cost categories (lab tests, advanced imaging, specialist visits) varies significantly by geography suggesting the possibility of both overuse (avoidable) and underuse.
  - While no single clinical group or type of service on both the inpatient and outpatient side drive the majority of healthcare spending, certain population cohorts do drive high percentages of the spending:
    - Chronic disease patients exhibit significantly higher rates of potentially avoidable and preference-sensitive care admissions.
    - Approximately 10% of the MaineCare and Commercial populations have a chronic disease, and drive approximately 30% of total spending, and 40% of inpatient spending.
    - Approximately 30% of the Maine Medicare population has a chronic disease, and drives approximately 65% of total spending and 70% of inpatient spending.
  - Through reductions in potentially avoidable hospital admissions and in high variation-high cost outpatient services, this study identifies savings of over $350 million in annual healthcare expenditures in Maine.

The geographic variation observed in the analysis provides a guide to begin analyzing reasons for the variation and the development of community specific strategies to address the variation. However, the analysis at the Healthcare Service Area (HSA) level does **_not_** allow for provider and/or hospital specific accountability for the variation. Additional analysis is required for that level of conclusion. The analysis does indicate the presence of probable overuse in every area

of the State, allowing for a discussion of State-wide and targeted community-specific strategies and interventions.

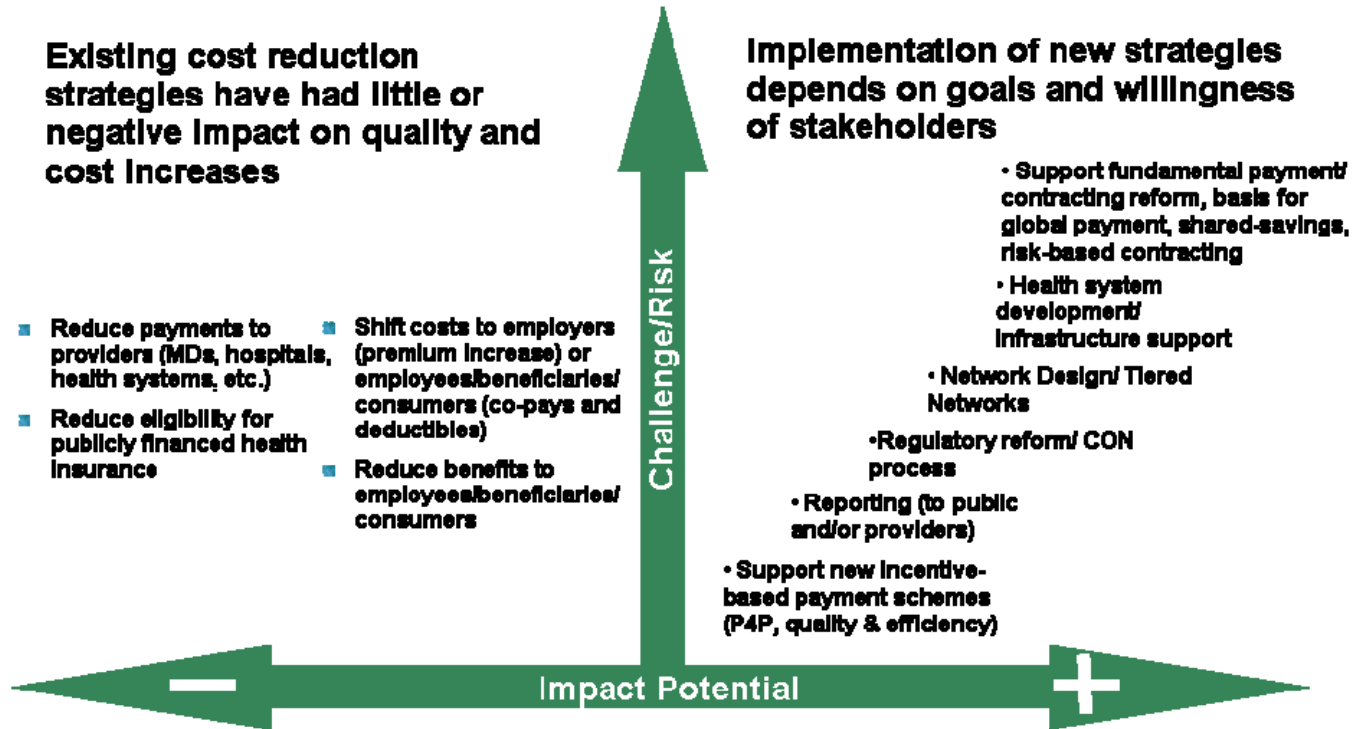Recommendations for addressing the observed variation in cost include:

- Utilizing existing analysis to identify and develop efficiency measures (i.e. MRI utilization rates, PA admission rates)
- Subsequently, utilizing these measures in Pay-for-Performance (P4P) or other types of programs that include efficiency measures as well as quality measures
- Reporting to both the public and providers to enhance knowledge regarding the differences in types of care provided and received with the ultimate intent of changing both patient and provider behavior
- Utilizing variation analysis to enhance regulatory tools (Certificate of Need (CON) processes) whereby authorization for capacity expansion includes benchmarking and analysis of current capacity;(e.g., additional MRI capacity authorization based on benchmarks and current utilizations rates within a geographically defined area as identified in the report)
- Utilizing further variation analysis at the provider level for the development of tiered networks such that patients have incentives driving them towards high-quality and efficient providers
- Utilizing further variation analysis to identify high-performing providers, groups, and hospitals and subsequently categorizing the systems in place that lead to and allow for high performance
- Utilizing further variation analysis to support fundamental payment reform, identifying the infrastructure costs required for high-performing systems, and developing reimbursement methodologies that align incentives between desired behavior and outcomes

Many of these strategies can be pursued utilizing the existing data and analytic framework deployed with this study (i.e., including efficiency measures in P4P programs, enhancing regulatory/CON processes). Others will require additional levels and components of analysis including (but not limited to):

- Including quality measurement in subsequent analysis and developing comprehensive measurement and interventions aimed at include both cost and quality (as opposed to this study which focused only on cost)
- Refining the cost analysis to identify groups of providers and health systems responsible for patient populations (as opposed to this study which focused on geographies)

Different strategies have different adoption time-frames and different degrees of challenges associated with them. The graphic below depicts a framework for discussing both long-standing existing cost-containment strategies as well as relatively new strategies.

Interventions/Strategies

Existing cost reduction strategies have had little or negative Impact on quality and cost Increases

Implementation of new strategies depends on goals and willingness of stakeholders

- Support fundamental payment/ contracting reform, basis for global payment, shared-savings, risk-based contracting
- Health system development/ Infrastructure support
- Network Design/ Tiered Networks
- Regulatory reform/ CON process
- Reporting (to public and/or providers)
- Support new Incentive-based payment schemes (P4P, quality & efficiency)

- Reduce payments to providers (MDs, hospitals, health systems, etc.)
- Reduce eligibility for publicly financed health Insurance

- Shift costs to employers (premium Increase) or employees/beneficiaries/ consumers (co-pays and deductibles)
- Reduce benefits to employees/beneficiaries/ consumers

Challenge/Risk

Impact Potential — +

On the negative side of impact potential, while long-standing strategies such as payment reductions and cost-sharing continue to be discussed and implemented, the US continues to spend significantly more on a per-capita basis with no discernible increase in quality compared to many other countries.[3]   On the positive side, examples exist which could be expanded, and new strategies could be implemented as well. Regarding existing strategies, the Maine Quality Forum is already involved in public reporting and could easily develop additional reports focused on efficiency and/or create programs for provider reporting. Additionally, an identified high-cost service such as advanced imaging could be regulated in a different way through the State CON process (i.e., allow for new purchases based on current area utilization rates and established benchmarks). In contrast, implementing the support structures and substantive payment reform needed for high-performing health systems requires numerous steps in many different arenas (policy, payers, providers, employers, etc.). However, it is these types of changes that will address the population cohorts such as those with chronic disease that are driving healthcare spending and require the most attention in terms of quality and safety. If the vision and strategy for reform do not aspire to fundamental change in the way healthcare is delivered and paid for, trends in Maine, and the nation, will continue.

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[3] The Commonwealth Fund Commission on a High Performance Health System, *Why Not the Best?* Results from a National Scorecard on U.S. Health System Performance, The Commonwealth Fund, September 2006