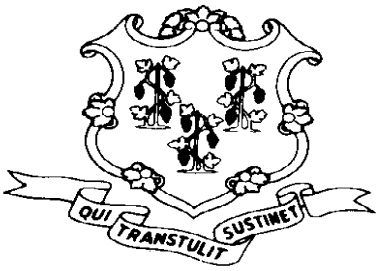
STATE OF CONNECTICUT



Preventable Hospitalizations

and

Associated Costs in Connecticut, 2007

December 2009

DEPARTMENT OF PUBLIC HEALTH
Office of Health Care Access

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Introduction

For the last decade, the Office of Health Care Access has utilized its inpatient hospital administrative discharge data and the Quality Indicators (QI) software tool developed by the Agency for Healthcare Research and Quality (AHRQ) to identify hospital admissions that evidence suggests could have been avoided, at least in part, though high quality outpatient care. These "preventable hospitalizations" are instances of inpatient hospital care for acute or chronic illnesses typically treated or managed in the outpatient setting.[1] Evidence suggests hospital admissions for chronic conditions such as asthma and diabetes and acute illnesses like urinary tract infections and perforated appendix could have been avoided at least in part with timely and effective ambulatory care.

This report utilizes a new Quality Indicators Mapping Tool (QIMT) tool recently developed by AHRQ.[2] The tool is designed to help organizations better understand geographical patterns of hospital admission rates and calculate potential cost savings from reducing admission rates through effective resource allocation. The software processes hospital discharge records and calculates prevention quality indicators (PQIs) which represent hospital admission rates for fourteen ambulatory care sensitive conditions for adults, and five area-level pediatric conditions that are considered preventable. PQIs provide a good, standardized starting point for examining the health care system outside the hospital and for assessing primary care services in the community. The main functions of the QIMT tool are to create maps and to calculate potential cost savings. Areas with the highest density of preventable hospitalizations show where interventions may have the biggest impact in reducing PQI admissions and maximizing potential cost savings.

Prevention Quality Indicators (PQIs)

AHRQ's quality indicators related to preventive care include five pediatric area level quality indicators and 14 adult prevention quality indicators. Hospitalizations for these conditions have been shown to significantly decrease with access to high quality primary care and disease management.

Pediatric Quality Indicators

Acute Conditions:

- Gastroenteritis admission rate
- Perforated appendix admission rate
- Urinary tract infection admission rate

Chronic Conditions:

- Asthma admission rate
- Diabetes, short-term complication rate

Adult Quality Indicators

Acute Conditions:

- Bacterial pneumonia
- Dehydration
- Low birth weight newborns
- Perforated appendix
- Urinary tract infection

Chronic Conditions:

- Asthma
- Angina without an in-hospital therapeutic procedure
- Congestive heart failure
- Chronic obstructive pulmonary disease
- Diabetes, long-term complications
- Diabetes, short-term complications
- Diabetes-related lower extremity amputation
- Diabetes, uncontrolled
- Hypertension

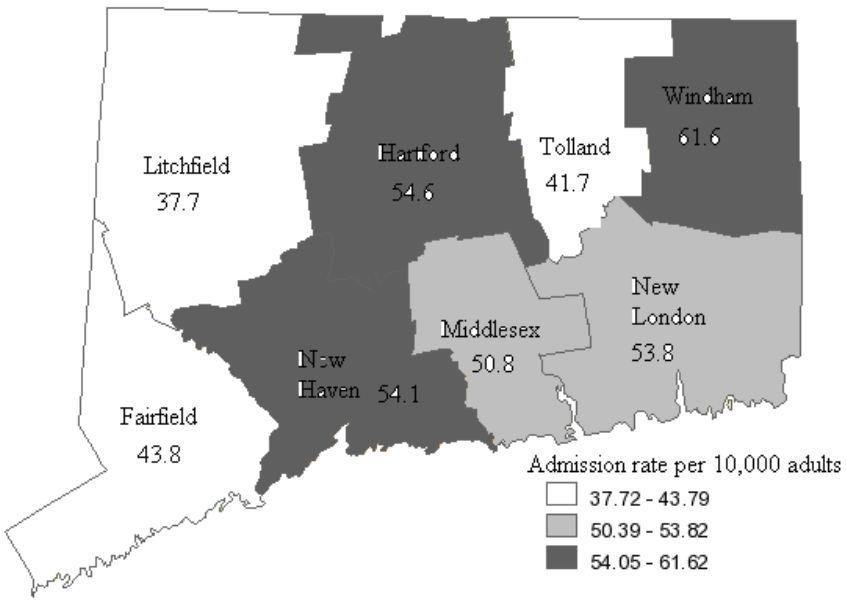
Summary of Observations

In calendar year 2007 (2007), there were 43,064 cases of preventable hospitalizations of Connecticut residents with an estimated cost of about $418 million. Sixty-one percent (or $251.3 million) of the total cost was associated with hospitalizations for adult chronic diseases, 39% (or $161.8 million) were PQI admissions for adult acute conditions, and pediatric conditions comprised the remaining 1% (or $4.7 million). From a county perspective, most of the adult PQI costs were from residents of New Haven (34%), Hartford (26%) and Fairfield (23%) counties. Three counties, Windham, New Haven, and Hartford, experienced the highest rates of adult PQI admissions per 10,000 county population, 168.7, 143.5 and 138.2, respectively. These same counties also had the highest pediatric PQI admission rates. Interventions targeted to reduce PQI cases in these three counties could have the biggest potential payoff.

A ten percent reduction in the overall occurrence of preventable hospitalization cases in the state would potentially result in a cost savings of about $42 million. This savings is equivalent to purchasing employer-sponsored insurance coverage for about 8,815 single enrollees or 3,100 family enrollees at 2008 premiums.

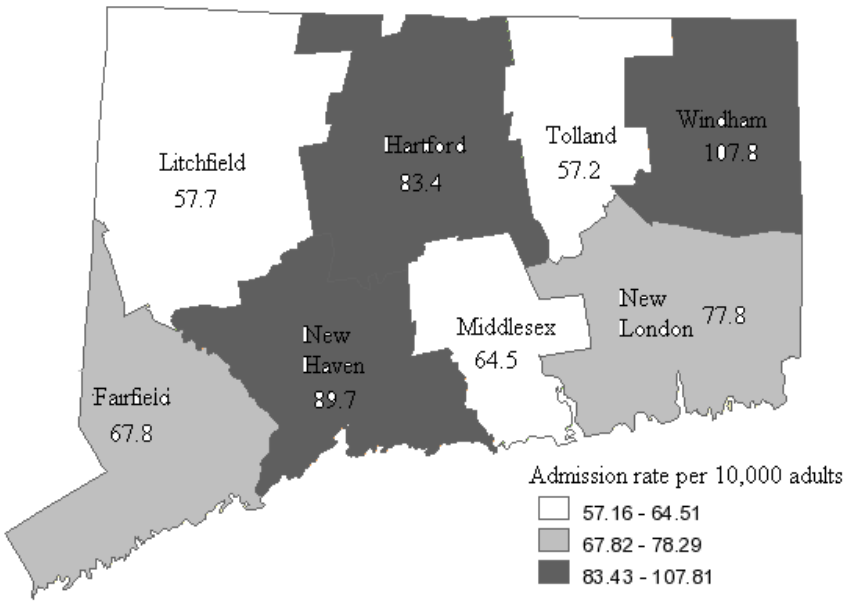
Three counties show highest density of PQI admissions for adult conditions

Figure 1: Adult acute conditions PQI rates, 2007



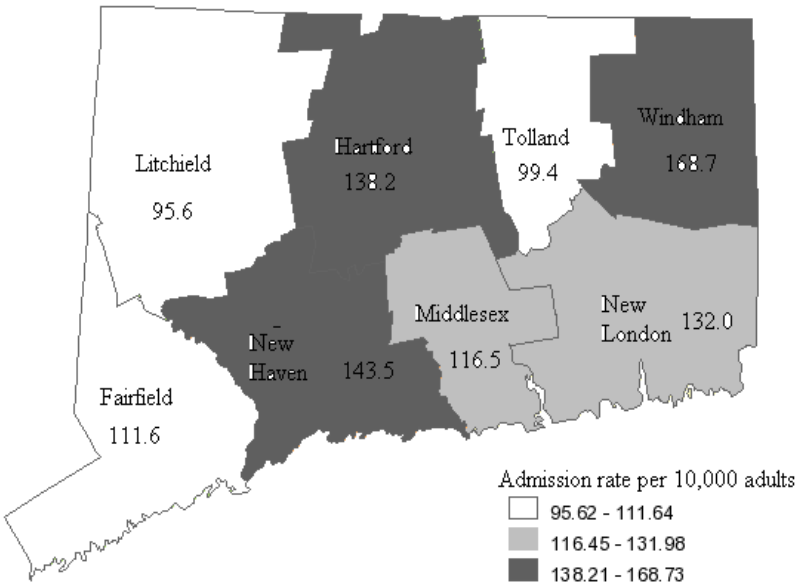
In 2007, five counties experienced PQI admission rates that exceeded the state rate of 50.4 admissions per 10,000 adults for acute conditions. They were: Windham (61.6), Hartford (54.6), New Haven (54.1), New London (53.8) and Middlesex (50.8) counties (Figure 1, see Appendix 1 for details). Hartford and New Haven counties had higher hospitalizations rates for all five acute conditions compared to the state. The cost associated with PQI admissions for acute adult conditions was $161.8 million for the state (Appendix 2). Cost related to bacterial pneumonia infections admissions were the highest. Generally, nine in ten of bacterial pneumonia infections are caused by pneumococcal pneumonia and affect mostly the elderly. It is estimated that about one-half of these infections could be prevented with vaccinations during peak seasons.[3]

Figure 2: Adult chronic conditions PQI rates, 2007



In the same year, PQI admission rates per 10,000 adults for chronic conditions for Windham (107.8), New Haven (89.7) and Hartford (83.4) counties also exceeded the rate for the state (78.3). (Figure 2, see Appendix 1 for details). These three counties had higher PQI admissions rates for at least seven of the nine chronic adult diseases when compared to the state in general. Cost associated with hospitalizations for adult chronic conditions were $251.3 million in 2007 (Appendix 2). Congestive heart failure (CHF) admissions alone accounted for nearly one-half of the expense. There were higher hospitalization rates for CHF in Windham (46.9), New Haven (42.9) and Hartford (41.0) counties compared to the state (38.6). The Institute of Medicine has identified CHF as a priority area for health improvements. [4]

Figure 3: Overall adult PQI rates, 2007

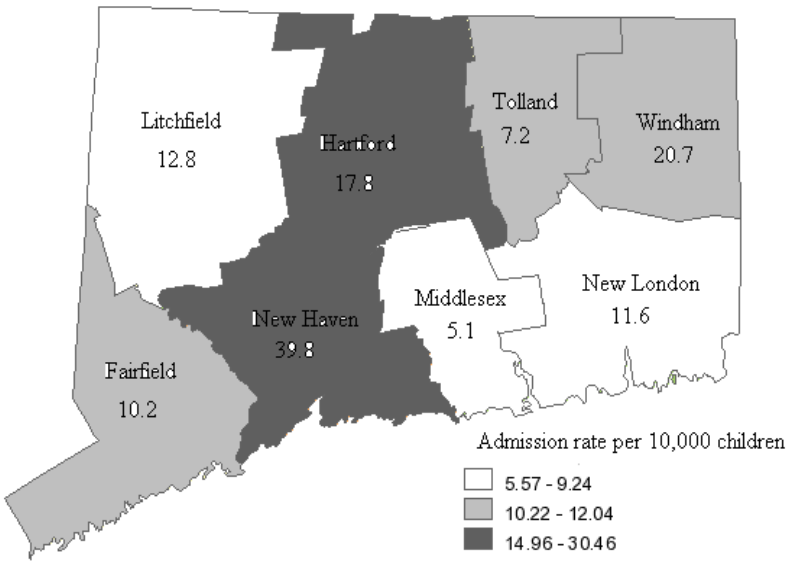


Relatively higher admissions rates for chronic and acute conditions in the state's adult population in three counties led to higher overall PQI admission rates for Windham (168.7), New Haven (143.5) and Hartford (138.2) counties compared to the state (128.8) per 10,000 adults (Figure 3, see Appendix 1 for details).

Notably, three counties, New Haven ($140 million or 34%), Hartford ($107 million or 26%) and Fairfield ($96.4 million or 23%) accounted for the majority (83%) of the $413 million in costs associated with adult PQI admissions.

Hartford and New Haven Counties have highest concentration of PQI admissions for pediatric conditions

Figure 4: Pediatric acute conditions PQI rates, 2007

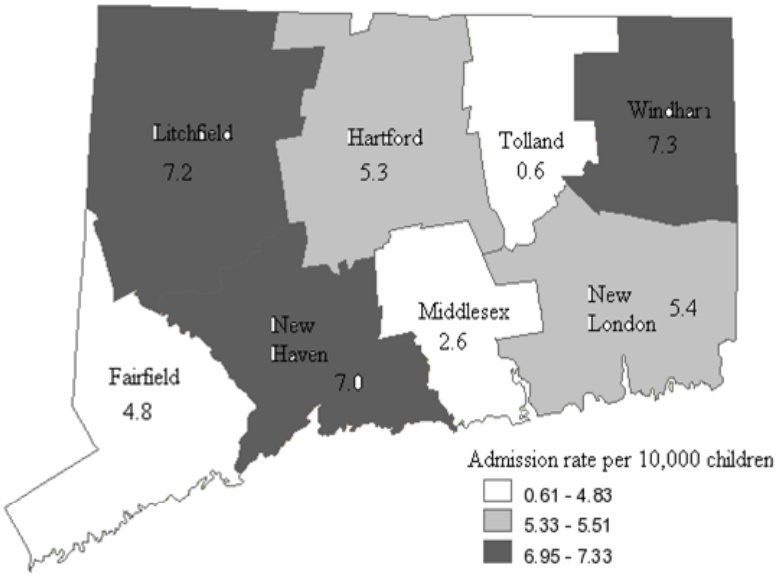


New Haven County (30.5) had the highest concentrations of PQI admissions for pediatric acute conditions with PQI rates that exceeded state rates for all three acute conditions (Figure 4, see Appendix 1 for details).

The cost associated with treating young patients admitted with a perforated appendix was $3.2 million. PQI admissions rates for that condition were higher for Windham (52.4), New Haven (32.9) and Hartford (28.9) counties than for the state (26.8). The condition occurs when treatment for acute appendicitis is delayed because of physician misdiagnosis, patient inability to interpret the symptoms or system failures such as lack of timely access to surgery due to unavailability of a surgical room.[5]

The total hospital cost for treating pediatric PQI acute conditions in 2007 was $3.7 million. (See Appendix 2 for details).

Figure 5: Pediatric chronic conditions PQI rates, 2007

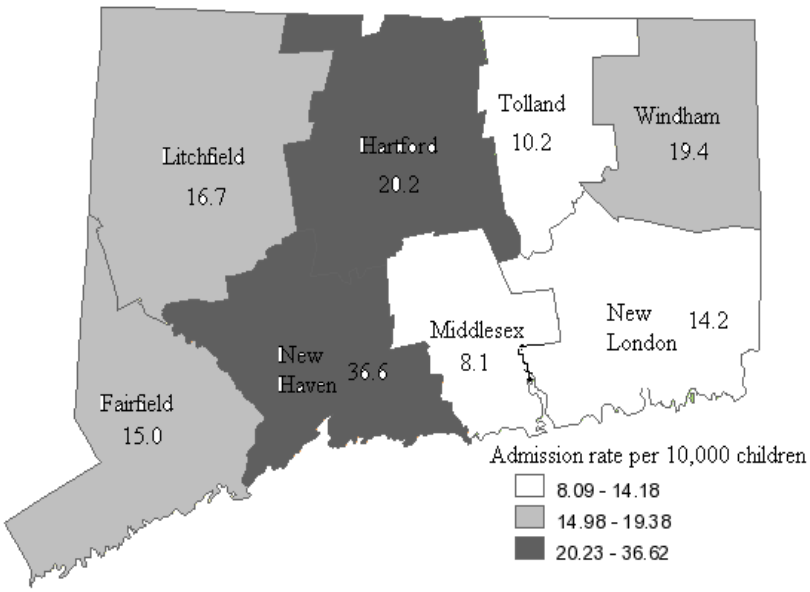


In contrast, higher PQI admissions rates for chronic conditions for children occurred in Windham (7.3), Litchfield (7.2) and New Haven (7.0) counties compared to the Connecticut rate of 5.5 per 10,000 of the child population (Figure 5, see Appendix 1 for details).

Hospital costs for PQI admissions for children with an asthma diagnosis, the most common chronic childhood disease, were $4.9 million in 2007. New Haven (39.8) and Windham (20.7) counties had the highest PQI admission rates for that condition than the state rate (20.4).

Costs associated with preventable chronic pediatric conditions admissions were $1.1 million (See Appendix 2 for details).

Figure 6: Overall pediatric PQI rates, 2007

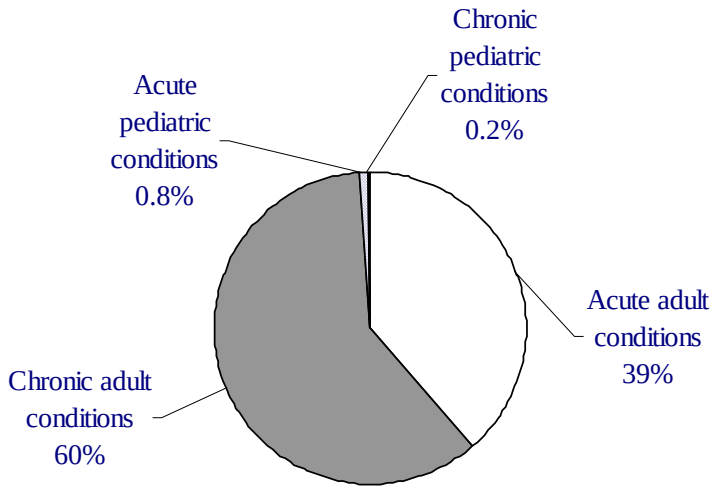


New Haven (36.6) and Hartford (20.2) counties had the highest concentration of pediatric PQI admissions per 10,000 of children overall. Only Hartford County exceeded the state rate of 21.7 per 10,000 (Figure 6, see Appendix 1 for more details).

Total hospital costs for pediatric PQI admissions in 2007 were $4.7 million and mostly associated with children living in New Haven (45%), Hartford (26%) and Fairfield (20%) counties.

PQI costs and implications of a ten percent reduction in costs

Figure 7: Distribution of PQI Costs, 2007



In 2007, all PQI admissions in the state cost approximately $418 million, largely from adult conditions. Residents of New Haven (21%), Fairfield (15%) and Hartford (16%) counties accounted for approximately three-fifths (or $252 million) of the cost associated with hospitalizations for chronic adult conditions (Figure 7).

An additional 39% (or $161.6 million) of the cost was for acute adult condition admissions, with a significant proportion from residents of New Haven (13%), Hartford (10%) and Fairfield (9%) counties.

For details of condition costs by county see Appendix 2.

Table 1: Estimates of Additional Employer-Sponsored Insurance Enrollees Based on a Ten Percent Reduction in Preventable Hospitalizations, 2007

Enrollee	Type of Employer Sponsored Insurance Coverage	2008 Average Total Insurance Premiums	Additional Enrollees based on 10% reduction in PH costs[1]
Single	Per Enrolled	$4,740	8,815
	Exclusive-provider	$4,701	8,888
	Mixed -provider	$4,726	8,841
	Any-provider	$5,114	8,170
Family	Per Enrolled	$13,436	3,110
	Exclusive-provider	$13,716	3,046
	Mixed -provider	$13,423	3,113
	Any-provider	$12,521	3,337
10% Reduction in PQI Costs = $42.0 million			

Source: *Agency for Healthcare Research and Quality, Center for Financing, Access and Cost Trends. 2008 Medical Expenditure Panel Survey-Insurance Component. CT Office of Health Care Access Acute Care Inpatient Discharge Database.*

[1]10% reduction in cost divided by average total insurance premiums

An intervention or set of interventions which successfully reduces the incidence of PQI admissions by 10% could potentially result in savings of $42 million for residents of the state.

$42 million in savings is equivalent to purchasing employer-sponsored insurance coverage for about 8,815 single enrollees or 3,110 family enrollees at average premiums of $4,740 and $13,436, respectively, at 2008 rates.

Appendix 1: PQIs rates by County, 2007 (rates per 10,000 population)

Quality Indicator	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham	CT
Pediatric Quality Indicators (Ages 0-17)									
Acute Conditions									
Gastroenteritis	**15.1**	10.8	**13.5**	4.3	**15.7**	**13.7**	7.4	**16.0**	13.4
Perforated appendix[1]	22.6	**28.9**	25.3	15.7	**32.9**	14.2	26.7	**52.4**	26.8
Urinary tract infection	**5.5**	4.9	**6.9**	2.6	**6.1**	4.5	0.9	5.1	5.2
Pediatric acute conditions	10.2	15.0	9.2	5.6	**30.5**	8.8	10.3	12.0	16.5
Chronic Conditions									
Asthma	11.2	17.8	12.8	5.1	**39.8**	11.6	7.2	**20.7**	20.4
Diabetes short-term complications	**2.7**	**2.5**	**2.2**	1.6	1.6	0.3	**3.2**	1.2	2.1
Pediatric chronic conditions	4.8	5.3	**7.2**	2.6	**7.0**	5.4	0.6	**7.3**	5.5
Overall pediatric PQI	15.0	20.2	16.7	8.1	**36.6**	14.2	10.2	19.4	21.7
Adult Quality Indicators (Ages 18+)									
Acute Conditions									
Bacterial pneumonia	28.0	**35.8**	29.8	**34.9**	**36.9**	**41.3**	29.8	**43.0**	34.2
Dehydration	**11.2**	**11.2**	7.4	7.3	**11.7**	9.1	8.2	**19.4**	10.9
Low birth weight[1]	6.6	**8.0**	**7.8**	6.4	**7.8**	6.8	6.6	**7.6**	7.4
Perforated appendix[1]	23.5	**25.8**	**25.1**	**28.7**	**26.2**	16.5	**31.3**	16.2	24.6
Urinary tract infection	16.1	**22.8**	10.4	**22.4**	**20.3**	17.8	14.1	15.0	18.8
Adult acute conditions	43.8	**54.6**	37.7	**50.8**	**54.1**	**53.8**	41.7	**61.6**	50.4
Chronic Conditions									
Asthma	10.4	**18.2**	7.5	7.7	**18.2**	14.5	8.9	**22.9**	14.7
Angina without procedure	1.8	1.7	**2.0**	1.5	**2.3**	1.4	2.0	**4.8**	2.0
Chronic obstruction pulmonary disease	11.5	15.1	14.7	**18.8**	**16.8**	**22.0**	11.7	**32.6**	15.6
Congestive heart failure	37.0	**41.0**	29.4	29.4	**42.9**	34.9	28.7	**46.9**	38.6
Diabetes- long-term complications	10.8	**14.7**	8.5	12.2	**15.9**	10.8	9.3	**13.9**	13.1
Diabetes- lower extremity amputation	2.0	**3.7**	2.1	**3.5**	**4.7**	2.8	1.7	2.9	3.2
Diabetes- short-term complications	5.5	**6.2**	4.9	4.8	**6.8**	5.8	5.0	**7.1**	6.0
Diabetes-uncontrolled	1.1	**1.3**	0.3	0.9	**1.7**	**1.4**	0.3	**1.6**	1.2
Hypertension	4.9	4.8	2.9	3.7	**7.4**	5.1	2.9	2.8	5.3
Adult chronic conditions	67.8	**83.4**	57.7	64.5	**89.7**	77.8	57.2	**107.8**	78.3
Overall adult PQI	111.6	**138.2**	95.6	116.5	**143.5**	**132.0**	99.4	**168.7**	128.8

Source: *CT Office of Health Care Access Acute Care Hospital Inpatient Discharge Database*

Rates calculated by dividing the number of PQI hospitalizations for a condition by the appropriate population and multiplying by 10,000. The exceptions were pediatric and adult perforated appendix or low birth weight newborn rates, which are per 100 appendicitis hospitalizations or births. These observed rates were then risk adjusted by age and gender. Bold numbers indicate rates above state average presented in the last column.

[1]Rates calculated based on all of births or number of patient that presented with appendicitis. These rates are per 100 births and 100 appendicitis discharges. Low birth weight newborns are grouped with the adult PQIs because, as a quality indicator, low birth rate is related to the mother's prenatal care. Due to their lower volume of hospitalizations, some caution should be taken in interpreting the rates from smaller counties. Additional caution is also necessary for low volume PQIs.

Appendix 2: PQIs Costs by County, 2007 (Cost in $ millions)

Quality Indicator	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham	CT
Pediatric Quality Indicators (Ages 0-17)									
Acute Conditions									
Gastroenteritis	0.9	0.5	0.1	0.0	0.8	0.1	0.0	0.1	**2.5**
Perforated appendix	0.9	0.7	0.1	0.0	1.1	0.1	0.2	0.1	**3.2**
Urinary tract infection	0.4	0.4	0.1	0.0	0.5	0.1	0.0	0.0	**1.4**
Pediatric acute conditions[1]	0.6	1.0	0.1	0.1	1.8	0.1	0.1	0.0	**3.7**
Chronic Conditions									
Asthma	0.7	1.1	0.1	0.1	2.7	0.1	0.1	0.1	**4.9**
Diabetes short-term complications	0.2	0.3	0.0	0.0	0.1	0.0	0.0	0.0	**0.7**
Pediatric chronic conditions[1]	0.3	0.2	0.0	0.0	0.4	0.1	0.0	0.0	**1.1**
Overall pediatric PQI[1]	**0.9**	**1.2**	**0.1**	**0.1**	**2.1**	**0.1**	**0.1**	**0.1**	**4.7**
Adult Quality Indicators (Ages 18+)									
Acute Conditions									
Bacterial pneumonia	21.0	25.4	4.4	3.7	33.2	6.4	3.2	2.3	**99.6**
Dehydration	6.3	5.8	0.9	0.7	6.8	1.0	0.6	0.8	**22.9**
Low birth weight	25.7	8.5	1.7	3.2	35.8	4.5	0.9	0.6	**80.9**
Perforated appendix	2.6	2.8	0.4	0.4	3.7	0.5	0.4	0.1	**10.9**
Urinary tract infection	8.5	11.0	1.2	2.0	13.2	1.9	0.8	0.6	**39.3**
Adult acute conditions[1]	35.8	42.3	6.5	6.5	53.2	9.3	4.6	3.7	**161.8**
Chronic Conditions									
Asthma	4.8	7.7	0.6	0.4	8.9	1.2	0.6	0.8	**25.1**
Angina without procedure	0.8	0.7	0.2	0.1	1.1	0.1	0.1	0.1	**3.2**
Chronic obstruction pulmonary disease	7.7	8.4	1.5	1.5	12.5	2.8	0.7	1.3	**36.4**
Congestive heart failure	31.1	31.2	4.1	3.4	38.2	4.8	2.3	2.4	**117.6**
Diabetes- long-term complications	9.6	10.5	1.1	1.5	15.4	1.9	0.7	0.7	**41.5**
Diabetes- lower extremity amputation	3.5	4.3	0.4	0.8	8.8	0.9	0.3	0.3	**19.2**
Diabetes- short-term complications	2.9	2.7	0.3	0.3	3.4	0.7	0.2	0.2	**10.7**
Diabetes-uncontrolled	0.3	0.4	0.0	0.0	0.5	0.1	0.0	0.0	**1.3**
Hypertension	2.0	2.0	0.2	0.2	3.8	0.4	0.1	0.1	**8.9**
Adult chronic conditions[1]	60.6	64.8	8.1	7.7	86.9	12.5	4.9	5.7	**251.3**
Overall adult PQI[1]	**96.4**	**107.0**	**14.6**	**14.2**	**140.0**	**21.8**	**9.6**	**9.4**	**413.0**

Source: *CT Office of Health Care Access Acute Care Hospital Inpatient Discharge Database*
Costs calculated by multiplying associated inpatient charges by Health Care Cost and Utilization Project (HCUP) of the U.S. Department of Health and Human Services Agency for Health Care Research and Quality (AHRQ) estimated ratio of cost to charges. In 2007, the ratio was 0.4883 for each Connecticut hospital.
[1] Costs for individual conditions do not add up to total because several patients had more than one PQI during a hospital stay. Overall PQI costs are presented without any double counting of patients.

ENDNOTES

[1] Agency for Health Care Research and Quality, *AHRQ Quality Indicators – Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions* Version 3.2, February 29, 2008.

[2] The QIMT tool is based on the March 2001 Version 3.1 of the QI tools. Since AHRQ updates the QI tools periodically, data in this publication may vary from data in prior Office of Health Care Access publications.

[3] Agency for Health Care Research and Quality, Health Care Cost & Utilization Project (HCUP), *Preventable Hospitalizations: A Window into Primary and Preventive Care, 2000.* Fact Book #5, AHRQ Publication No. 04-0056, September 2004.

[4] Ibid.

[5] Ibid.