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ALTERNATIVE APPROACHES TO MEASURING PHYSICIAN RESOURCE USE

Appendices

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Appendices

APPENDIX 1
LIST OF MEDICAL AND SURGICAL MS-DRGs FOR SELECTED CONDITIONS

APPENDIX 1: LIST OF MEDICAL AND SURGICAL MS DRGs FOR SELECTED CONDTIONS

I. ACUTE MYOCARDIAL INFARCTION

TABLE 1 A.: MS DRGS FOR MEDICAL AMI *

MS DRG	MDC	TYPE	MS DRG TITLE
280	05	MED	Acute myocardial infarction, discharged alive w MCC
281	05	MED	Acute myocardial infarction, discharged alive w CC
282	05	MED	Acute myocardial infarction, discharged alive w/o CC/MCC

** To be included only if there is an accompanying ICD-9 code for AMI*

TABLE 1 B.: MS DRGS FOR AMI WITH PERCUTANEOUS TRANSLUMINAL CORONARY ANGIOPLASTY (PTCA)*

MS DRG	MDC	TYPE	MS DRG TITLE
246	05	SURG	Perc cardiovasc proc w drug-eluting stent w MCC or 4+ vessels/stents
247	05	SURG	Perc cardiovasc proc w drug-eluting stent w/o MCC
248	05	SURG	Perc cardiovasc proc w non-drug-eluting stent w MCC or 4+ ves/stents
249	05	SURG	Perc cardiovasc proc w non-drug-eluting stent w/o MCC

** To be included only if there is an accompanying ICD-9 code for AMI*

TABLE 1 C.: MS DRGS FOR AMI WITH CORONARY ARTERY BYPASS GRAFT (PTCA)*

MS DRG	MDC	TYPE	MS DRG TITLE
231	05	SURG	Coronary bypass w PTCA w MCC
232	05	SURG	Coronary bypass w PTCA w/o MCC
233	05	SURG	Coronary bypass w cardiac cath w MCC
234	05	SURG	Coronary bypass w cardiac cath w/o MCC

** To be included only if there is an accompanying ICD-9 code for AMI*

II CONGESTIVE HEART FAILURE (CHF)

TABLE 2: MS DRGS FOR CHF*

MS DRG	MDC	TYPE	MS DRG TITLE
291	05	MED	Heart failure & shock w MCC
292	05	MED	Heart failure & shock w CC
293	05	MED	Heart failure & shock w/o CC/MCC

** To be included only if there is an accompanying ICD-9 code for CHF*

III. CHRONIC OBSTRUCTIVE PULMONARY DISEASE

TABLE 3: MS DRGS FOR COPD IP ADMISSIONS*

MS DRG	MDC	TYPE	MS DRG TITLE
190	04	MED	Chronic obstructive pulmonary disease w MCC
191	04	MED	Chronic obstructive pulmonary disease w CC
192	04	MED	Chronic obstructive pulmonary disease w/o CC/MCC

IV. PNEUMONIA

TABLE 4: MS DRGS FOR PNEUMONIA IP ADMISSIONS*

MS DRG	MDC	TYPE	MS DRG TITLE
177	04	MED	Respiratory infections & inflammations w MCC
178	04	MED	Respiratory infections & inflammations w CC
179	04	MED	Respiratory infections & inflammations w/o CC/MCC
193	04	MED	Simple pneumonia & pleurisy w MCC
194	04	MED	Simple pneumonia & pleurisy w CC
195	04	MED	Simple pneumonia & pleurisy w/o CC/MCC

** To be included only if there is an accompanying ICD-9 code for Pneumonia*

V. BRONCHITIS

TABLE 5: MS DRGS FOR BRONCHITIS IP ADMISSIONS*

MS DRG	MDC	TYPE	MS DRG TITLE
202	04	MED	Bronchitis & asthma w CC/MCC
203	04	MED	Bronchitis & asthma w/o CC/MCC

** To be included only if there is an accompanying ICD-9 code for Bronchitis*

VI. STROKE

TABLE 6 A: MS DRGS FOR ACUTE ISCHEMIC STROKE

MS DRG	MDC	TYPE	MS DRG TITLE
061	01	MED	Acute ischemic stroke w use of thrombolytic agent w MCC
062	01	MED	Acute ischemic stroke w use of thrombolytic agent w CC
063	01	MED	Acute ischemic stroke w use of thrombolytic agent w/o CC/MCC

TABLE 6 B: MS DRGS FOR STROKE WITH CEREBRAL INFARCTION

MS DRG	MDC	TYPE	MS DRG TITLE
064	01	MED	Intracranial hemorrhage or cerebral infarction w MCC
065	01	MED	Intracranial hemorrhage or cerebral infarction w CC
066	01	MED	Intracranial hemorrhage or cerebral infarction w/o CC/MCC

VII. HIP FRACTURE

TABLE 7: MS DRGS HIP FRACTURE*

MS DRG	MDC	TYPE	MS DRG TITLE
535	08	MED	Fractures of hip & pelvis w MCC
536	08	MED	Fractures of hip & pelvis w/o MCC

** To be included only if there is an accompanying ICD-9 code for hip fracture*

VIII. HIP REPLACEMENT

TABLE 8: MS DRGS FOR HIP REPLACEMENT*

MS DRG	MDC	TYPE	MS DRG TITLE
469	08	SURG	Major joint replacement or reattachment of lower extremity w MCC
470	08	SURG	Major joint replacement or reattachment of lower extremity w/o MCC

** To be included only if there is an accompanying ICD-9 code for hip replacement*

IX. KNEE REPLACEMENT

TABLE 9: MS DRGS FOR KNEE REPLACEMENT *

MS DRG	MDC	TYPE	MS DRG TITLE
469	08	SURG	Major joint replacement or reattachment of lower extremity w MCC
470	08	SURG	Major joint replacement or reattachment of lower extremity w/o MCC

** To be included only if there is an accompanying ICD-9 code for knee replacement*

X. CHOLECYSTECTOMY

TABLE 10 A: MS DRGS FOR LAPAROSCOPIC CHOLECYSTECTOMY (CDE)

MS DRG	MDC	TYPE	MS DRG TITLE
417	07	SURG	Laparoscopic cholecystectomy w/o c.d.e. w MCC
418	07	SURG	Laparoscopic cholecystectomy w/o c.d.e. w CC
419	07	SURG	Laparoscopic cholecystectomy w/o c.d.e. w/o CC/MCC

TABLE 10 B: MS DRGS FOR NON-LAPAROSCOPIC CHOLECYSTECTOMY (CDE)

MS DRG	MDC	TYPE	MS DRG TITLE
411	07	SURG	Cholecystectomy w c.d.e. w MCC
412	07	SURG	Cholecystectomy w c.d.e. w CC
413	07	SURG	Cholecystectomy w c.d.e. w/o CC/MCC
414	07	SURG	Cholecystectomy except by laparoscope w/o c.d.e. w MCC
415	07	SURG	Cholecystectomy except by laparoscope w/o c.d.e. w CC
416	07	SURG	Cholecystectomy except by laparoscope w/o c.d.e. w/o CC/MCC

XI. BACK PAIN

TABLE 11 A: MS DRGS FOR MEDICAL BACK PAIN IP ADMISSIONS**

MS DRG	MDC	TYPE	MS DRG TITLE
551	08	MED	Medical back problems w MCC
552	08	MED	Medical back problems w/o MCC

** *To be included only if there is an accompanying ICD-9 code for back pain, excluding cases with ICD-9 code for scoliosis*

TABLE 11 B: MS DRGS FOR BACK PAIN WITH SPINAL FUSION**

MS DRG	MDC	TYPE	MS DRG TITLE
459	08	SURG	Spinal fusion except cervical w MCC
460	08	SURG	Spinal fusion except cervical w/o MCC

** *To be included only if there is an accompanying ICD-9 code for back pain, excluding cases with ICD-9 code for scoliosis*

TABLE 11 C: MS DRGS FOR BACK PAIN WITH OTHER BACK PROCEDURES**

MS DRG	MDC	TYPE	MS DRG TITLE
490	08	SURG	Back & neck proc exc spinal fusion w CC/MCC or disc device/neurostim
491	08	SURG	Back & neck proc exc spinal fusion w/o CC/MCC

** *To be included only if there is an accompanying ICD-9 code for back pain, excluding cases with ICD-9 code for scoliosis*

APPENDIX 2
MATCH RATES AMONG DIFFERENT PHYSICIANS LISTED ON CLAIMS ASSOCIATED WITH INDEX HOSPITALIZATION

Table 1: ATTENDING AND OPERATING PHYSICIAN MATCHING FOR MEDICAL MS-DRGs AND PERCENT OF PART B PAYMENT FOR INITIAL HOSPITALIZATION BILLED TO ATTENDING PHYSICIAN

Dx/Tx	MS-DRG	Description	TYPE	Percent Match OP and AT Phys (Part A)	Percent Index Part B Payment Billed to Part A at PHYS	Percent Match AT Phys (Part A) and Top Part B billing phys
AMI	280	AMI w MCC	MED	80%	22%	42%
AMI	281	AMI w CC	MED	85%	29%	47%
AMI	282	AMI w/o MCC/CC	MED	83%	27%	51%
CHF	291	Heart failure & shock w MCC	MED	83%	27%	38%
CHF	292	Heart failure & shock w CC	MED	88%	31%	41%
CHF	293	Heart failure & shock w/o CC/MCC	MED	92%	34%	46%
COPD	190	COPD w MCC	MED	62%	29%	46%
COPD	191	COPD w CC	MED	62%	35%	48%
COPD	192	COPD w/o MCC/CC	MED	57%	37%	52%

TABLE 2: PART A ATTENDING, PART A OPERATING, AND PART B PRIMARY OPERATING PHYSICIAN MATCHING FOR SURGICAL MS-DRGS

Dx/Tx	MS-DRG	Description	Type	Column A percent Match OP and AT Phys (Part A)	Column B percent Match OP Part A and Primary OP Part B Phys	Column C percent Match AT Part A and Pri OP Part B Phys
AMI with CABG	231,	CABG+PTCA w MCC	SURG	83%	33%	50%
AMI	232	CABG+PTCA w/o MCC	SURG	67%	33%	4%
AMI	233	CABG+CATH w MCC	SURG	72%	56%	39%
AMI	234	CABG+CATH w/o MCC	SURG	73%	57%	38%
AMI	246	PTCA (DES) w MCC	SURG	79%	55%	36%
AMI	247	PTCA (DES) w/o MCC	SURG	86%	58%	48%
AMI	248	PTCA (BMS) w MCC	SURG	77%	59%	39%
AMI	249	PTCA (BMS) w/o MCC	SURG	84%	68%	54%
TOTAL HIP	462	Total Hip Repl. Multiple Joint w/o MCC	SURG	100%	67%	67%
TOTAL HIP	469	Total Hip Repl w MCC	SURG	99%	66%	64%
TOTAL HIP	470	Total Hip Repl w/o MCC	SURG	99%	72%	72%
HIP FRAC.	535	Fractures of hip & pelvis w MCC	SURG	69%	10%	13%
HIP FRAC.	536	Fractures of hip & pelvis w/o MCC	SURG	71%	7%	11%
CHOLE.	411	Cholecystectomy w c.d.e. w MCC	SURG	100%	60%	60%
CHOLE.	412	Cholecystectomy w c.d.e. w CC	SURG	78%	29%	14%

Dx/Tx	MS-DRG	Description	Type	Column A percent Match OP and AT Phys (Part A)	Column B percent Match OP Part A and Primary OP Part B Phys	Column C percent Match AT Part A and Pri OP Part B Phys
CHOLE.	413	Cholecystectomy w c.d.e. w/o CC/MCC	SURG	100%	83%	83%
CHOLE.	414	Cholecystectomy except by laparoscope w/o c.d.e. w MCC	SURG	81%	45%	27%
CHOLE.	415	Cholecystectomy except by laparoscope w/o c.d.e. w CC	SURG	85%	47%	38%
CHOLE.	416	Cholecystectomy except by laparoscope w/o c.d.e. w/o CC/MCC	SURG	94%	62%	59%
CHOLE.	417	Laparoscopic cholecystectomy w/o c.d.e. w MCC	SURG	74%	43%	24%
CHOLE.	418	Laparoscopic cholecystectomy w/o c.d.e. w CC	SURG	79%	51%	36%
CHOLE.	419	Laparoscopic cholecystectomy w/o c.d.e. w/o CC/MCC	SURG	87%	68%	56%

TABLE 3: MATCH RATE BETWEEN PART A AND PART B OPERATING NPIS AND TINS FOR SURGICAL MS-DRGS

Dx/Tx	MS-DRG	Type	*COL A* % Match between Part A OP and Part B OP NPIs	*COL B* % Match between Part A OP and Part B OP TINs
AMI+ PTCA	246, 247	SURG	57%	78%
AMI+ CABG	233, 234	SURG	56%	75%
TOTAL HIP REPL.	469, 470	SURG	69%	85%
TOTAL KNEE REPL.	469, 470	SURG	74%	90%
HIP FRAC.	535, 536	SURG	8%	22%

TABLE 4 (A) : NATURE OF PART A ATTENDING TINS ACROSS STATES FOR AMI MS-DRGS AFTER MOVING FROM NPIS TO TINS

AMI	CA	FL	KS	LA	MN	NJ	VA	VT	WA	Total
# of AMI INDEX ADMISSIONS	23,087	25,988	4,632	6,345	5,176	14,738	1,187	9,236	5,843	96,232
# of PART A ATTENDING TINs	4,424	3,887	435	778	324	2,774	126	887	538	14,173
AVG. ADMISSIONS PER TIN	5	7	11	8	16	5	9	10	11	7
MEDIAN ADMISSIONS PER TIN	2	2	2	2	2	2	2	2	2	2
Actual TINs	88%	92%	98%	94%	98%	87%	98%	96%	97%	93%
NPIs	11%	6%	1%	5%	1%	12%	1%	3%	2%	7%
UPINs	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%

TABLE 4 (B) : NATURE OF PART A ATTENDING TINS FOR COPD MS-DRGS ACROSS STATES AFTER MOVING FROM NPIS TO TINS

COPD	CA	FL	KS	LA	MN	NJ	VA	VT	WA	Total
# of COPD INDEX ADMISSIONS	19,131	23,502	4,072	6,630	3,433	12,188	760	9,270	4,336	83,322
# of PART A ATTENDING TINs	4,422	3,609	470	940	261	2,710	111	871	546	13,940
AVG. ADMISSIONS PER TIN	4	7	9	7	13	4	7	11	8	6
MEDIAN ADMISSIONS PER TIN	2	2	3	3	2	2	2	2	2	2
Actual TINs	72%	83%	96%	86%	88%	69%	94%	84%	81%	82%
NPIs	27%	16%	3%	14%	11%	30%	6%	16%	19%	18%
UPINs	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%

APPENDIX 3
SUMMARY OF MS-DRG EPISODES FROM MULTISTATE DATA

TABLE 1: SUMMARY OF AMI MS-DRG EPISODES FROM MULTISTATE DATA

AMI	CA	FL	KS	LA	MN	NJ	VA	VT	WA	Total
# of AMI INDEX ADMISSIONS	23,087	25,988	4,632	6,345	5,176	14,738	1,187	9,236	5,843	96,232
STD AVG 30-DAY COST*	$9,227	$9,094	$8,329	$7,504	$7,635	$8,908	$7,697	$8,391	$7,713	$8,277
VAR AVG STD 30-DAY COST	11%	10%	1%	-9%	-8%	8%	-7%	1%	-7%	0%
UNSTD AVG 30-DAY COST*	$8,214	$7,393	$6,376	$5,588	$6,317	$8,439	$6,266	$6,528	$6,513	$6,848
VAR AVG UNSTD 30-DAY COST	20%	8%	-7%	-18%	-8%	23%	-9%	-5%	-5%	0%
STD AVG 60-DAY COST*	$12,531	$12,813	$11,367	$10,783	$10,232	$12,876	$10,682	$11,511	$10,350	$11,461
VAR AVG STD 60-DAY COST*	9%	12%	-1%	-6%	-11%	12%	-7%	0%	-10%	0%
UNSTD AVG 60-DAY COST*	$11,011	$10,122	$8,472	$7,853	$8,247	$11,753	$8,552	$8,764	$8,585	$9,262
VAR AVG UNSTD 60-DAY COST*	19%	9%	-9%	-15%	-11%	27%	-8%	-5%	-7%	0%

*Costs are not risk adjusted for beneficiary level covariates

TABLE 2: SUMMARY OF COPD MS-DRG EPISODES FROM MULTISTATE DATA

COPD	CA	FL	KS	LA	MN	NJ	VA	VT	WA	Total
# of COPD INDEX ADMISSIONS	19,131	23,502	4,072	6,630	3,433	12,188	760	9,270	4,336	83,322
STD AVG 30-DAY COST*	$6,730	$6,525	$5,633	$5,958	$5,376	$7,054	$6,330	$5,260	$5,472	$6,038
VAR AVG STD 30-DAY COST	11%	8%	-7%	-1%	-11%	17%	5%	-13%	-9%	0%
UNSTD AVG 30-DAY COST*	$6,284	$5,418	$4,484	$4,493	$4,337	$6,668	$5,199	$4,007	$4,618	$5,056
VAR AVG UNSTD 30-DAY COST	24%	7%	-11%	-11%	-14%	32%	3%	-21%	-9%	0%
STD AVG 60-DAY COST*	$9,992	$9,687	$8,015	$9,343	$7,743	$10,462	$8,656	$7,673	$7,971	$8,838
VAR AVG STD 60-DAY COST*	13%	10%	-9%	6%	-12%	18%	-2%	-13%	-10%	0%
UNSTD AVG 60-DAY COST*	$9,472	$8,100	$6,502	$7,119	$6,458	$9,871	$7,304	$5,972	$6,911	$7,523
VAR AVG UNSTD 60-DAY COST*	26%	8%	-14%	-5%	-14%	31%	-3%	-21%	-8%	0%

*Costs are not risk adjusted for beneficiary level covariates

APPENDIX 4
TIN CHARACTERISTICS AND COVARIATES

TABLE 1: TIN CHARACTERISTICS ASSOCIATED WITH LOW EPISODE VOLUME, LOW EPISODE PROPORTION AND LOW FULL TIME EPISODES FOR AMI

Condition	MS-DRG	TIN Characteristics Associated with Low Episode Volume **Pr(** n_j =1**)=1**	TIN Characteristics Associated with Low Episode Proportion **Pr((** $\sum_{i=1}^{n_j} p_{ij} / n_j$) ≤ 0.10**)=1**	TIN Characteristics Associated with Low FTEs **Pr(** ($\sum_{i=1}^{n_j} p_{ij}$)≤ 1**) =1**
Medical AMI (# of TINs: 15,732***)***	280, 281, 282	**% TINs: 31%** Single Specialty TINs TINs w Low # of NPIs, and Ortho; TINs w/o Cardiology , Internal Med, Critical Med, Med. Spec. & Radiology	**% TINs: 26%** Single Specialty TINs; Non-Rural TINs; TINs w Radiology, Anesth., Surgery, Ortho. & Surgical Spec.	**% TINs: 65%** Single Specialty TINs; Non-Rural TINs; TINs w Radiology, Anesth. & Surgery; TIN's w/o Cardiology, Internal Med. & Med. Spec.
CABG w or w/o PTCA (# of TINs: 4,763***)***	231, 232, 233, 234	**% TINs: 46%** Single Specialty TINs; Rural TINs; TINs w Low # of NPIs, Med. Spec. and Ortho; TINs w/o Cardiac. Surgery, Surgical Spec., Cardiology, Internal Med, Critical Med, Radiology & Anesth.	**% TINs: 64%** Single Specialty TINs; TINs w Radiology, Surgery,& Other Med.; TINs w/o Cardiac Surgery, Surgical Spec., Cardiology, Internal Med & Anesth.	**% TINs: 89%** Single Specialty TINs; TINs w Radiology; TINs w/o Cardiac Surgery, Surgical Spec., Cardiology & Anesth.
PTCA (# of TINs: 7,991***)***	246, 247, 248, 249	**%TINs: 45%** Single Specialty TINs; Rural TINs; TINs w Low # of NPIs, Surgery, Surgical Spec., Anesth. & Ortho; TINs w/o Cardiology , Internal Med, Critical Med., Radiology and Cardiac Surgery	**%TINs: 44%** Single Specialty TINs; TINs w Radiology, Surgery, & Anesth.; TINs w/o Cardiology, Internal Med & Critical Med.	**%TINs: 82%** Single Specialty TINs; TINs w Radiology, Surgery & Anesth.; TINs w/o Cardiology & Critical Med.

TABLE 2: RISK ADJUSTED 30 AND 60 DAY EPISODE COSTS, NUMBER, PROPORTION AND FULL TIME EPISODES FOR POOLED AMI

Condition	# of Episodes	# of TINs	TIN's Risk Adjusted 30-day Episode Cost: Mean (Std)	TIN's Risk Adjusted 60-day Episode Cost: Mean (Std)	# of episodes attributed to TINs (n_j) *MEDIAN*	# of episodes attributed to TINs (n_j) *MIN*	# of episodes attributed to TINs (n_j) *MAX*	Avg. proportion of Episode Attributed to TINs $(\sum_{i=1}^{n_j} p_{ij} / n_j)$ Mean (Std)	# of Full Time Episodes Attributed to TINs $(\sum_{i=1}^{n_j} p_{ij})$ Mean (Std)
Pooled AMI	50,432	17,538	114 (2,764)	155 (3,613)	3	1	525	0.22 (0.18)	2.88 (10.63)

TABLE 3: TIN CHARACTERISTICS ASSOCIATED WITH LOW EPISODE VOLUME, LOW EPISODE PROPORTION AND LOW FULL TIME EPISODES FOR POOLED AMI

Condition	TIN Characteristics Associated with Low Episode Volume **Pr(** n_j =1**)=1**	TIN Characteristics Associated with Low Episode Proportion **Pr((** $\sum_{i=1}^{n_j} p_{ij} / n_j$) ≤ 0.10**)=1**	TIN Characteristics Associated with Low FTEs **Pr(** ($\sum_{i=1}^{n_j} p_{ij}$)≤ 1**) =1**
Pooled AMI (# of TINs: 17,538***)***	**% TINs: 28%** Single Specialty TINs; TINs w Low # of NPIs, Surgical Spec., Other Surg. and Ortho; TINs w/o Cardiology , Internal Med, Critical Med, Med. Spec., Cardiac Surg. & Radiology	**% TINs: 24%** Single Specialty TINs; Non-Rural TINs; TINs w Radiology, Anesth. , Ortho, & Surgery; TIN's w/o Cardiology, Internal Med. & Critical Med, Cardiac Surg. & Medical Spec.	**% TINs: 58%** Non-Rural TINs; TINs w Radiology, Anesth. & Surgery; TIN's w/o Cardiology, Internal Med. & Other Medical.

APPENDIX 5
HOSPITAL LEVEL QUALITY MEASURES AND RESULTS FROM MS-DRG TEP WEIGHTING EXERCISE

Table 5.1 (a): Hospital Compare Process Measure Set for AMI

Acronym	Measure (Total Measures =7)
AMI 1	Patients Given Aspirin at Arrival
AMI 2	Patients Given Aspirin at Discharge
AMI 3	Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction (LVSD)
AMI 4	Patients Given Smoking Cessation Advice/Counseling
AMI 5	Patients Given Beta Blocker at Discharge
AMI 7	Patients Given Fibrinolytic Medication Within 30 Minutes Of Arrival
AMI 8	Patients Given PCI Within 90 Minutes Of Arrival

Table 5.1 (b): Hospital Compare Process Measure Set for CHF

Acronym	Measure (Total Measures =4)
HF 1	Patients Given Discharge Instructions
HF 2	Patients Given An Evaluation of Left Ventricular Systolic (LVS) Function
HF 3	Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction (LVSD)
HF 4	Patients Given Smoking Cessation Advice/Counseling

Table 5.1 (c): Hospital Compare Process Measure Set for Pneumonia

Acronym	Measure (Total Measures =7)
PN 1	Patients Given Oxygenation Assessment
PN 2	Patients Assessed and Given Pneumococcal Vaccination
PN 3	Patients Whose Initial Emergency Room Blood Culture Was Performed Prior to the Administration of the First Hospital Dose of Antibiotics
PN 4	Patients Given Smoking Cessation Advice/Counseling
PN 5	Patients Given Initial Antibiotic(s) within 6 Hours After Arrival
PN 6	Patients Given the Most Appropriate Initial Antibiotic(s)
PN 7	Pneumonia Patients Assessed and Given Influenza Vaccination

Table 5.1 (d): Hospital Compare Process Measure Set for Surgical Care Improvement Project

Acronym	Measure (Total Measures: 7)
SCIP 1	Surgery Patients Who Received Preventative Antibiotic(s) One Hour Before Incision
SCIP 2	Percent of Surgery Patients who Received the Appropriate Preventative Antibiotic(s) for Their Surgery
SCIP 3	Surgery Patients Whose Preventative Antibiotic(s) are Stopped Within 24 hours After Surgery
SCIP 4	Cardiac Surgery Patients With Controlled 6 A.M. Postoperative Blood Glucose
SCIP 6	Surgery Patients with Appropriate Hair Removal
SCIP VTE1	Surgery Patients Whose Doctors Ordered Treatments to Prevent Blood Clots (Venous Thromboembolism) For Certain Types of Surgeries
SCIP VTE2	Surgery Patients Who Received Treatment To Prevent Blood Clots Within 24 Hours Before or After Selected Surgeries

Table 5.2: List of AHRQ Patient Safety Indicators

Acronym	Measure (Total Measures: 15)
PSI 2	Death in low mortality DRGs
PSI 3	Pressure ulcer
PSI 4	Death among surgical inpatients
PSI 5	Foreign body left during procedure
PSI 6	Iatrogenic pneumothorax
PSI 7	CV Catheter related blood infections
PSI 8	Postoperative hip fracture
PSI 9	Postoperative hemorrhage
PSI 10	Postoperative physiologic or metabolic derangement
PSI 11	Postoperative respiratory failure
PSI 12	Postoperative pulmonary embolism or deep vein thrombosis
PSI 13	Postoperative sepsis
PSI 14	Postoperative wound dehiscence
PSI 15	Accidental puncture or laceration
PSI 16	Transfusion reaction

Table 5.3(a): RESULTS FROM MS-DRG TEP WEIGHTING EXERCISE – OVERALL CONSTRUCT

Overall Construct	Average Usefulness	Std Dev
1. ED Visits	26.67	24.43
2. Avoidable ED Visits	53.33	31.41
3. All cause Readmissions	30.83	35.56
4. Potentially preventable Hospital Readmissions	62.33	41.02
5.All cause case-mix adjusted mortality	32.50	40.22
6. Medicare Hospital Compare Measures	41.67	33.12
7. AHRQ PSIs	50.00	36.33

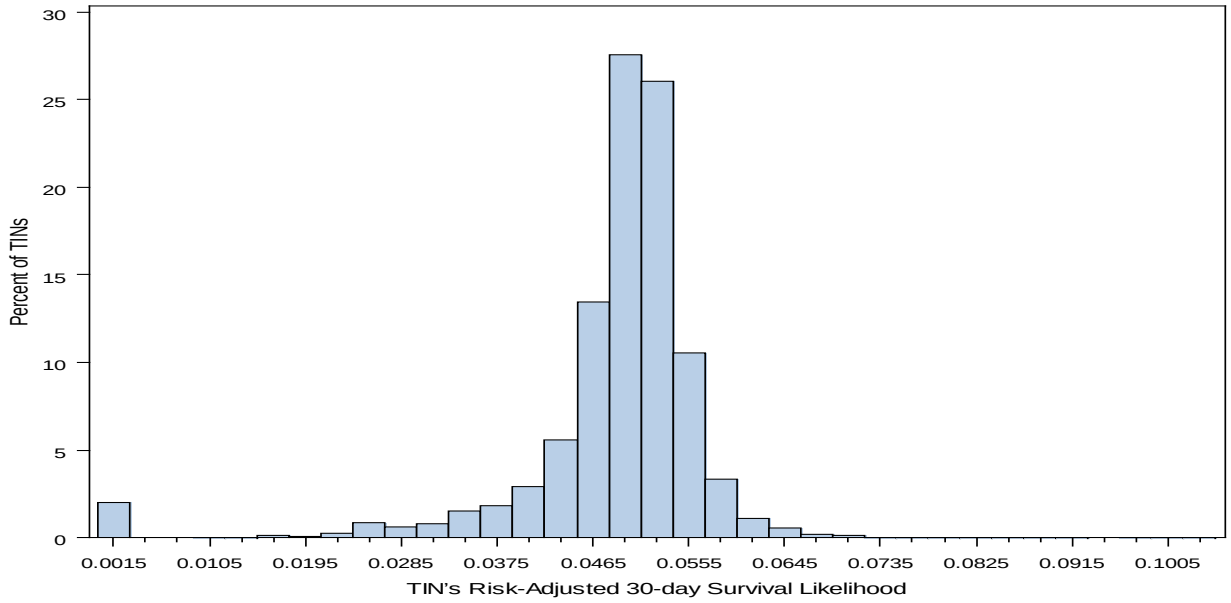
Table 5.3(b): RESULTS FROM MS-DRG TEP WEIGHTING EXERCISE – AHRQ PSIs

AHRQ PSIs	Average Usefulness	Std Dev
1.Death in low mortality DRGs	43.17	44.12
2. Pressure ulcer	63.17	37.04
3.Death among surgical inpatients	60.67	39.61
4.Foreign body left during procedure	80.00	36.33
5.Iatrogenic pneumothorax	80.00	22.80
6.CV Catheter related blood infections	83.17	23.24
7. Postoperative hip fracture	55.00	43.82
8.Postoperative hemorrhage	66.67	33.86
9. Postoperative physiologic or metabolic derangement	47.50	43.24
10.Postoperative respiratory failure	68.17	31.69
11.Postoperative pulmonary embolism or deep vein thrombosis	73.33	28.23
12.Postoperative sepsis	74.83	35.50
13.Postoperative wound dehiscence	66.67	36.56
14.Accidental puncture or laceration	79.17	35.84
15.Transfusion reaction	66.50	35.97

APPENDIX 6
EPISODE LEVEL QUALITY MEASURES

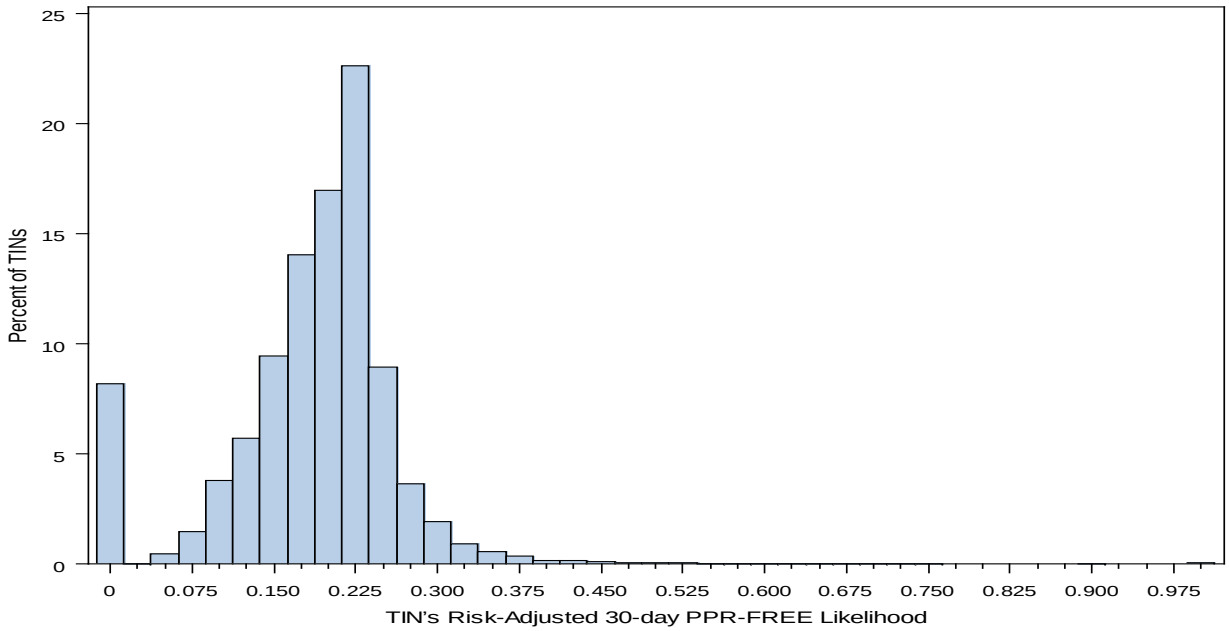
The following chart is a bar graph, showing the distribution of TINs' risk adjusted 30-day survival likelihood for COPD TINs.

FIGURE 6.1 (a): DISTRIBUTION OF TINs' RISK ADJUSTED 30-DAY SURVIVAL LIKELIHOOD FOR COPD TINs



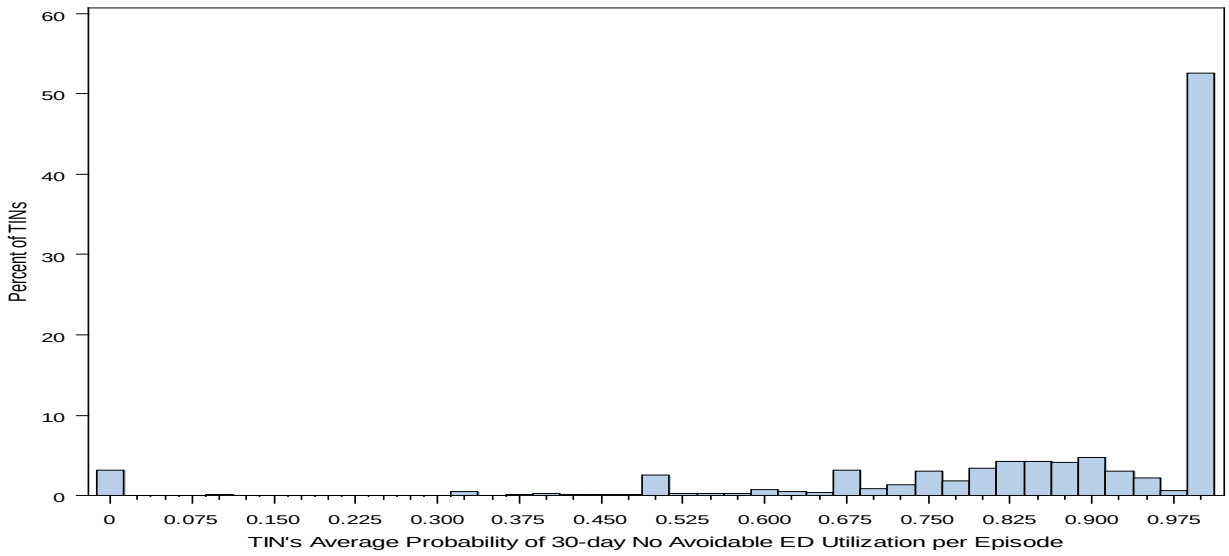
The following chart is a bar graph, showing the distribution of TINs' 30-day potentially preventable rehospitalization free likelihood for COPD TINs.

FIGURE 6.1 (b): DISTRIBUTION OF TINs' RISK ADJUSTED 30-DAY POTENTIALLY PREVENTABLE REHOSPITALIZATION FREE LIKELIHOOD FOR COPD TINs



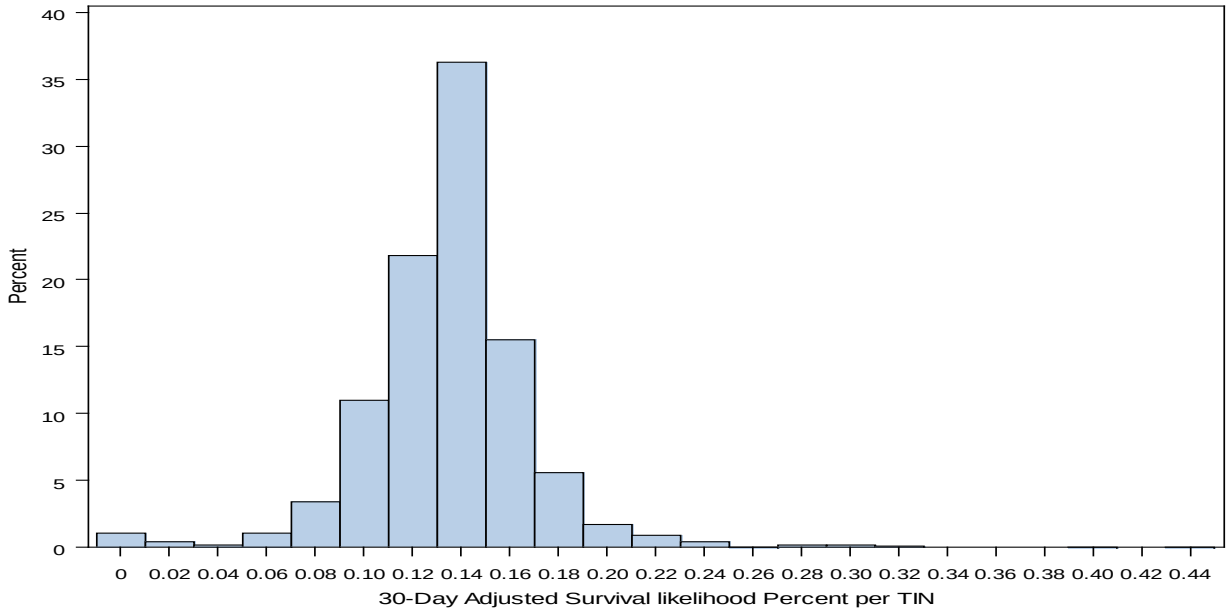
The following chart is a bar graph, showing the distribution of TINs' average probability of no avoidable ED utilization per 30-day COPD episode for COPD TINs.

Figure 6.1 (c): DISTRIBUTION OF TINs' AVERAGE PROBABILITY OF NO AVOIDABLE ED UTILIZATION PER 30-DAY COPD EPISODE FOR COPD TINs

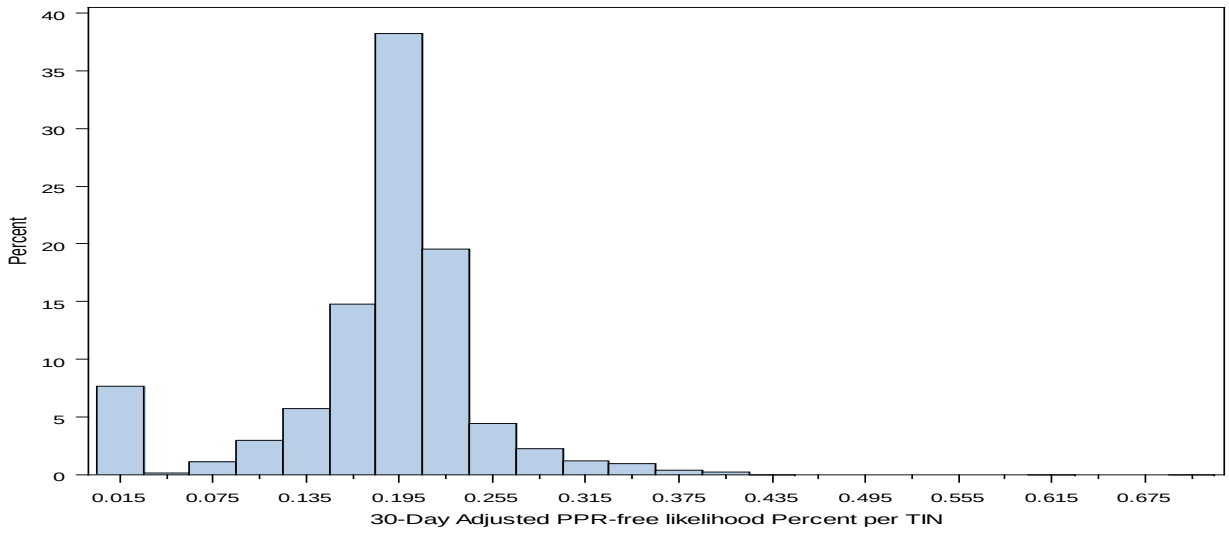


The following chart is a bar graph, showing the distribution of TINs' risk adjusted 30-day survival likelihood for Pneumonia TINs.

FIGURE 6.2 (a): DISTRIBUTION OF TINs' RISK ADJUSTED 30-DAY SURVIVAL LIKELIHOOD FOR PNEUMONIA TINs

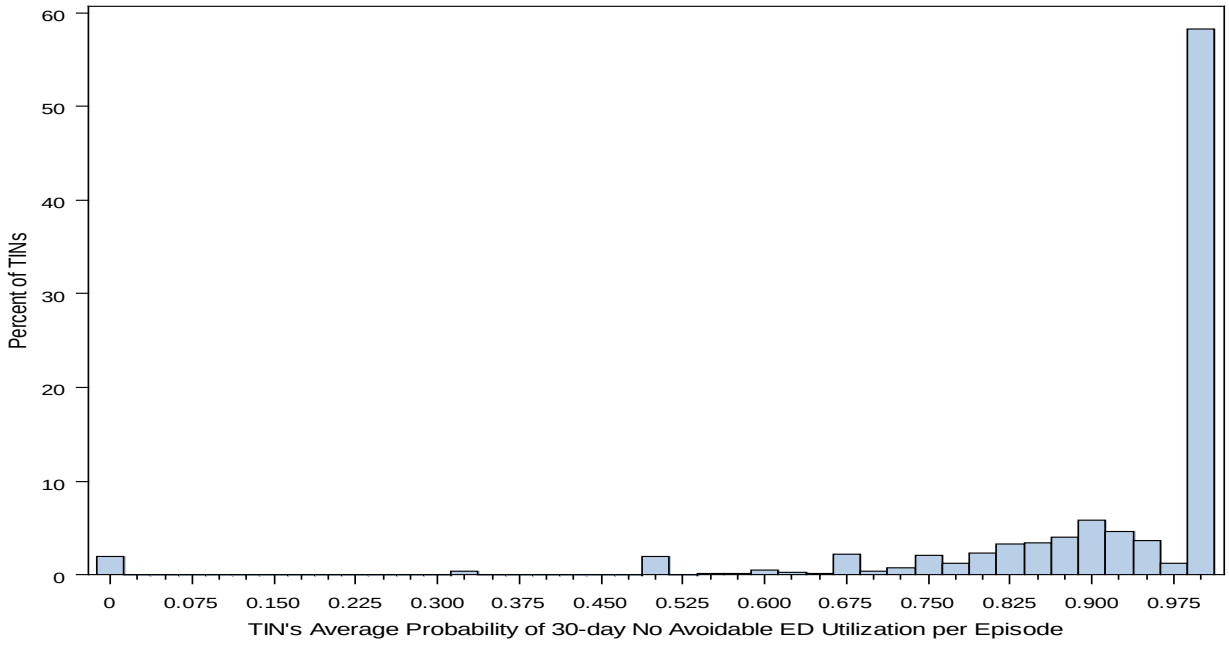


The following chart is a bar graph, showing the distribution of TINs' risk adjusted 30-day potentially preventable rehospitalization free likelihood for Pneumonia TINs. **FIGURE 6.2 (b): DISTRIBUTION OF TINs' RISK ADJUSTED 30-DAY POTENTIALLY PREVENTABLE REHOSPITALIZATION FREE LIKELIHOOD FOR PNEUMONIA TINs**



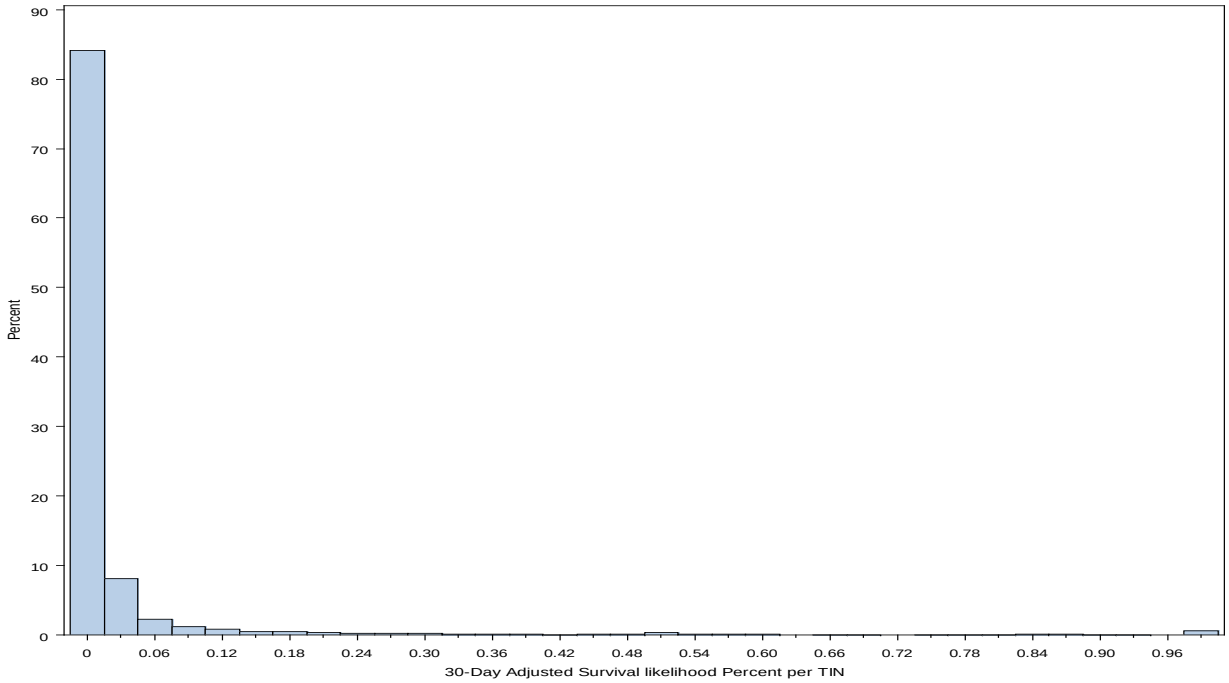
The following chart is a bar graph, showing the distribution of TINs' average probability of no avoidable ED utilization per 30-day CHF episode for Pneumonia TINs.

Figure 6.2 (c): DISTRIBUTION OF TINs' AVERAGE PROBABILITY OF NO AVOIDABLE ED UTILIZATION PER 30-DAY CHF EPISODE FOR PNEUMONIA TINs



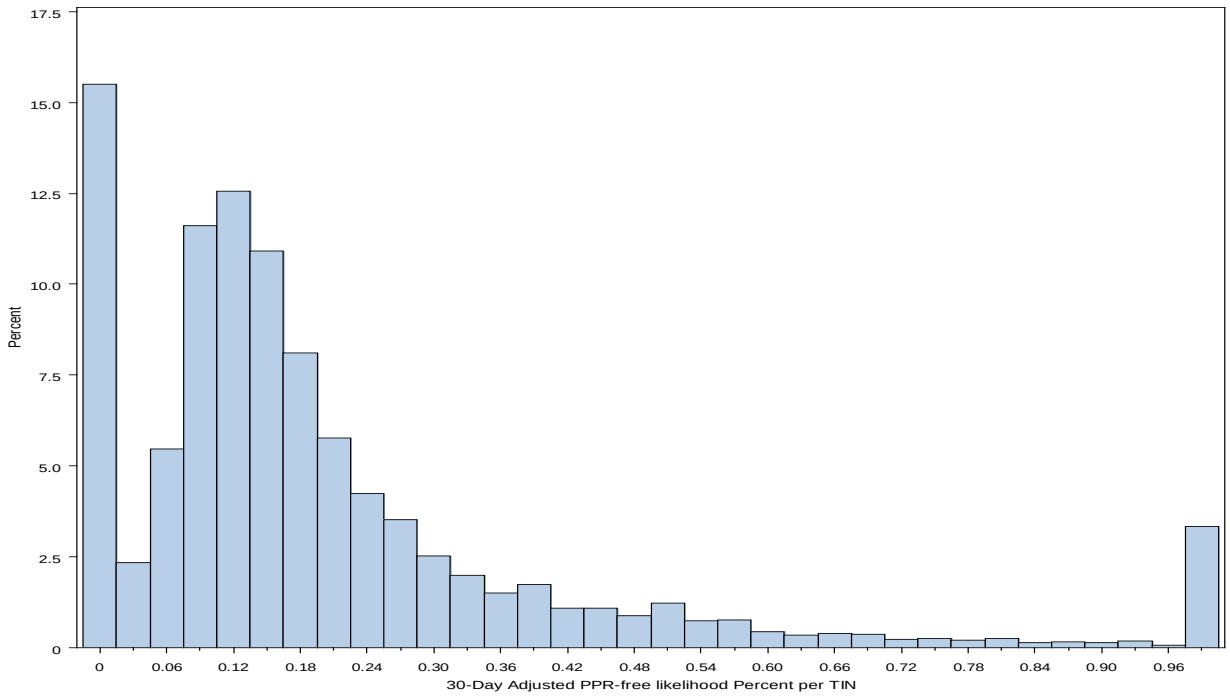
The following chart is a bar graph, showing the distribution of TINs' risk adjusted 30-day survival likelihood for Hip Replacement TINs.

FIGURE 6.3 (a): DISTRIBUTION OF TINs' RISK ADJUSTED 30-DAY SURVIVAL LIKELIHOOD FOR HIP REPLACEMENT TINs



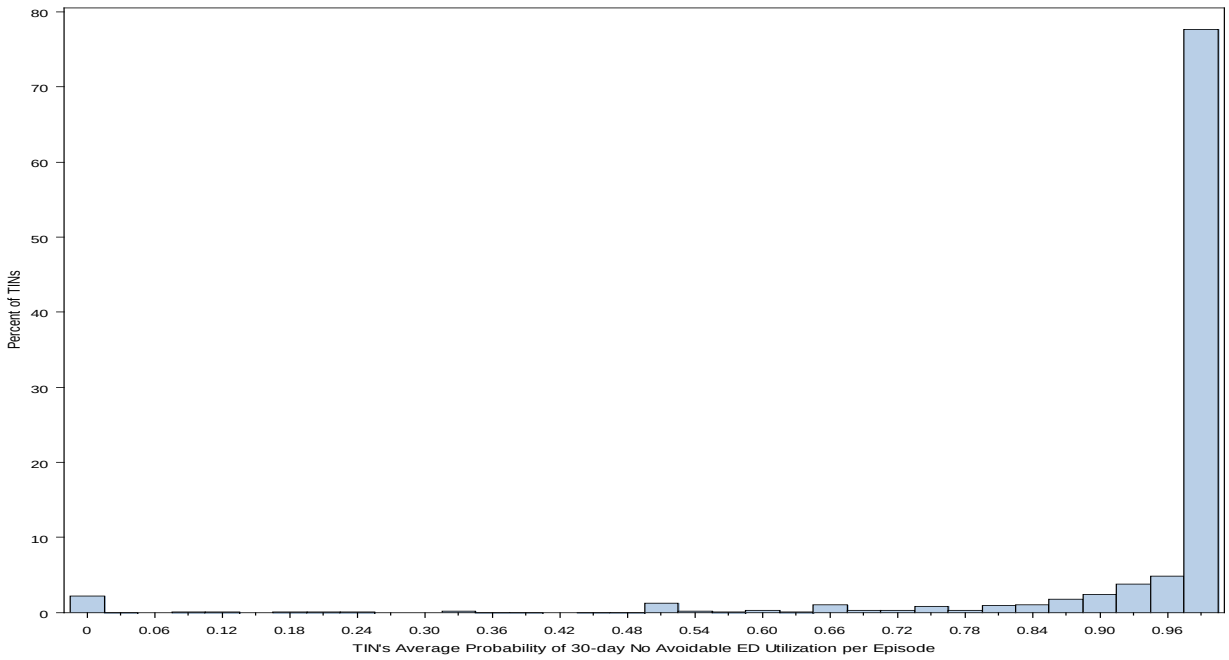
The following chart is a bar graph, showing the distribution of TINs' risk adjusted 30-day potentially preventable rehospitalization free likelihood for Hip Replacement TINs.

FIGURE 6.3 (b): DISTRIBUTION OF TINs' RISK ADJUSTED 30-DAY POTENTIALLY PREVENTABLE REHOSPITALIZATION FREE LIKELIHOOD FOR HIP REPLACEMENT
TINs



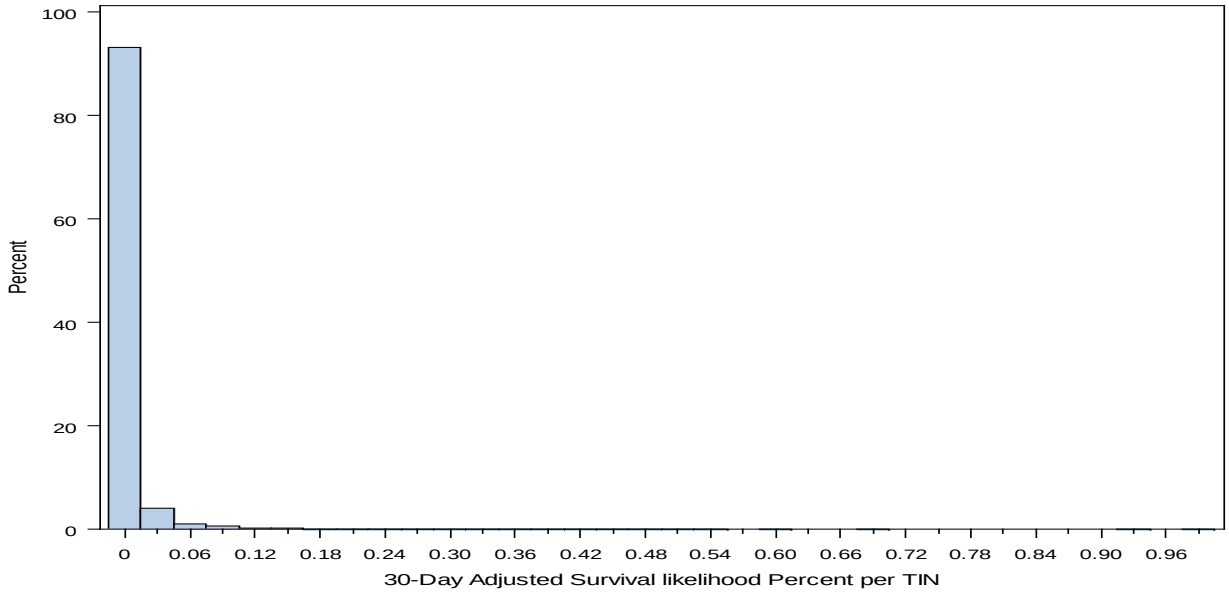
The following chart is a bar graph, showing the distribution of TINs' average probability of no avoidable ED utilization per 30-day Hip Replacement episode for Hip Replacement TINs.

Figure 6.3 (c): DISTRIBUTION OF TINs' AVERAGE PROBABILITY OF NO AVOIDABLE ED UTILIZATION PER 30-DAY HIP REPLACEMENT EPISODE FOR HIP REPLACEMENT TINs



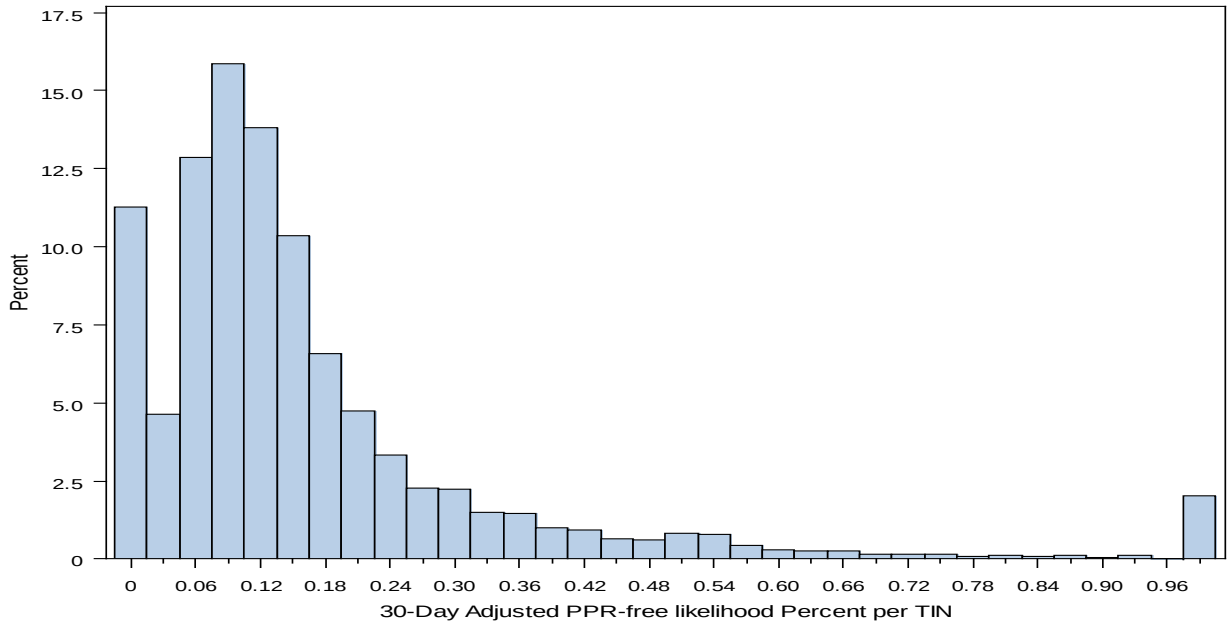
The following chart is a bar graph, showing the distribution of TINs' risk adjusted 30-day survival likelihood for Knee Replacement TINs.

FIGURE 6.4 (a): DISTRIBUTION OF TINs' RISK ADJUSTED 30-DAY SURVIVAL LIKELIHOOD FOR KNEE REPLACEMENT TINs



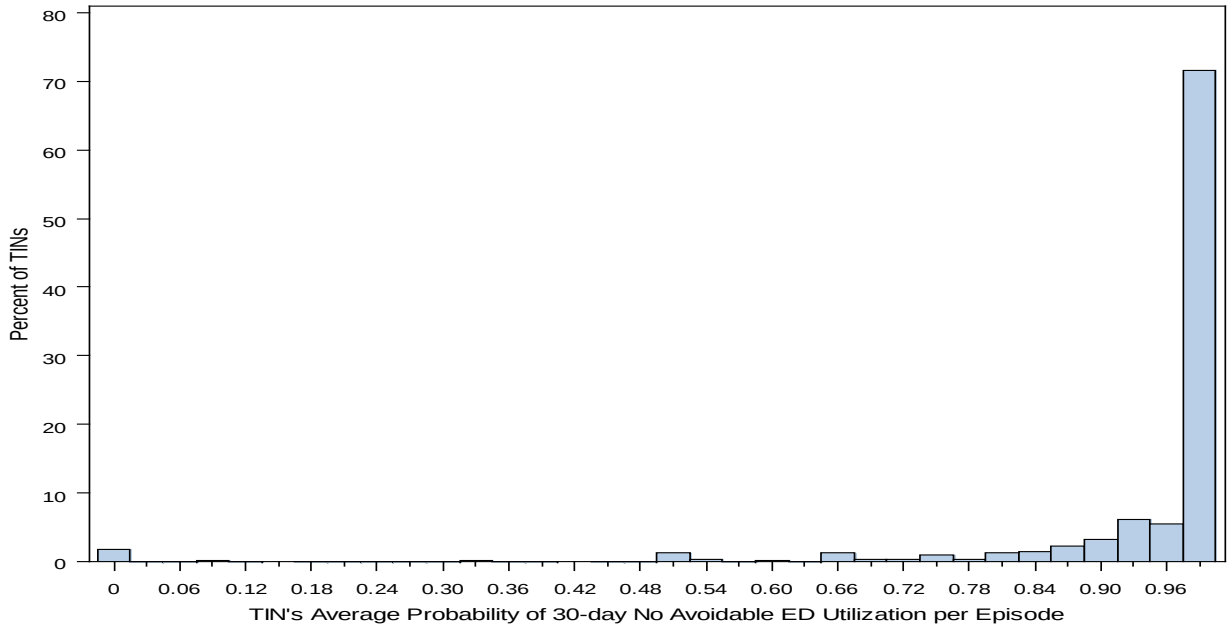
The following chart is a bar graph, showing the distribution of TINs' risk adjusted 30-day potentially preventable rehospitalization free likelihood for Knee Replacement TINs.

FIGURE 6.4 (b): DISTRIBUTION OF TINs' RISK ADJUSTED 30-DAY POTENTIALLY PREVENTABLE REHOSPITALIZATION FREE LIKELIHOOD FOR KNEE REPLACEMENT TINs


17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
Percent
0
0.06
0.12
0.18
0.24
0.30
0.36
0.42
0.48
0.54
0.60
0.66
0.72
0.78
0.84
0.90
0.96
30-Day Adjusted PPR-free likelihood Percent per TIN

The following chart is a bar graph, showing the distribution of TINs' average probability of no avoidable ED utilization per 30-day Knee Replacement episode for Knee Replacement TINs.

Figure 6.4 (c): DISTRIBUTION OF TINs' AVERAGE PROBABILITY OF NO AVOIDABLE ED UTILIZATION PER 30-DAY KNEE REPLACEMENT EPISODE FOR KNEE REPLACEMENT TINs



APPENDIX 7
HOSPITAL COMPARE MEASURES

APPENDIX 7: HOSPITAL COMPARE MEASURES

Table 7A: CORRELATION MATRIX FOR AMI HOSPITAL COMPARE MEASURES

	AMI_1	AMI_2	AMI_3	AMI_4	AMI_5	AMI_7A	AMI_8A
AMI_1 Patients Given Aspirin at Arrival	1.00000						
AMI_2 Patients Given Aspirin at Discharge	0.50779 <.0001	1.00000					
AMI_3 Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction	0.32771 <.0001	0.40719 <.0001	1.00000				
AMI_4 Patients Given Smoking Cessation Advice/Counseling	0.14901 <.0001	0.15769 <.0001	0.14503 <.0001	1.000			
AMI_5 Patients Given Beta Blocker at Discharge	0.41952 <.0001	0.68610 <.0001	0.44440 <.0001	0.18353 <.0001	1.000		
AMI_7A Patients Given Fibrinolytic Medication Within 30 Minutes Of Arrival	0.06173 <.0001	0.07148 <.0001	0.04445 <.0001	0.02822 <.0001	0.06856 <.0001	1.00000	
AMI_8A Patients Given PCI Within 90 Minutes Of Arrival	0.14766 <.0001	0.16260 <.0001	0.17422 <.0001	0.11056 <.0001	0.15642 <.0001	0.06240 <.0001	1.00000 <.0001

TABLE 7B: CORRELATION MATRIX FOR SURGICAL CARE HOSPITAL COMPARE MEASURES

	Surg_Inf_1	Surg_Inf_2	Surg_Inf_3	Surg_Inf_4	Surg_Inf_6	Surg_VTE_1	Surg_VTE_2
Surg_Inf_1 Patients given Antibiotic at right time	1.00000						
Surg_Inf_2 Patients given right kind of Antibiotic	0.39074 <.0001	1.000					
Surg_Inf_3 Patients' Antibiotic stopped at right time	0.37852 <.0001	0.45698 <.0001	1.00000				
Surg_Inf_4 Heart Surgery Patients with Blood Sugar under Control	0.27584 <.0001	0.27171 <.0001	0.40377 <.0001	1.000			
Surg_Inf_6 Patient receiving safe hair removal	0.28264 <.0001	0.17563 <.0001	0.31722 <.0001	0.16426 <.0001	1.000		
Surg_VTE_1 Patients who received Tx to prevent blood clots after surgery	0.38047 <.0001	0.29064 <.0001	0.41441 <.0001	0.27268 <.0001	0.21655 <.0001	1.000	
Surg_VTE_2 Surg-VTE-2: Patients who got Tx at the right time to prevent blood clots after surgery	0.35546 <.0001	0.29513 <.0001	0.42491 <.0001	0.25561 <.0001	0.21278 <.0001	0.94669 <.0001	1.0000

TABLE 7C: CORRELATION MATRIX FOR PNEUMONIA HOSPITAL COMPARE MEASURES

	PNEU_1	PNEU_2	PNEU_3	PNEU_4	PNEU_5	PNEU_6	PNEU_7
PNEU_1 **Patients Given Oxygenation Assessment**	**1.00000**						
PNEU_2 **Patients Assessed and Given Pneumococcal Vaccination**	**0.27349 <.0001**	**1.00000**					
PNEU_3 **Patients Receiving ED Blood Culture Prior to First Hospital Antibiotic**	**0.38372 <.0001**	**0.45031 <.0001**	**1.00000**				
PNEU_4 **Smoking Cessation Counseling**	**0.28450 <.0001**	**0.51954 <.0001**	**0.27426 <.0001**	**1.00000**			
PNEU_5 **Patients Given Initial Antibiotic(s) within 6 Hours After Arrival**	**0.31946 <.0001**	**0.48740 <.0001**	**0.53789 <.0001**	**0.26185 <.0001**	**1.00000**		
PNEU_6 **Patients Given the Most Appropriate Initial Antibiotic**	**0.38789 <.0001**	**0.42004 <.0001**	**0.38661 <.0001**	**0.34824 <.0001**	**0.48994**	**1.00000**	
PNEU_7 **Patients Assessed and Given Influenza Vaccination**	**0.23113 <.0001**	**0.86893 <.0001**	**0.40957 <.0001**	**0.46617 <.0001**	**0.47749 <.0001**	**0.39713 <.0001**	**1.000**

APPENDIX 8
AHRQ PATIENT SAFETY INDICATORS

TABLE 8.A: CORRELATION MATRIX FOR PATIENT SAFETY INDICATORS

	PSI_5_pc	PSI_6_pc	PSI_7_pc	PSI_11_pc	PSI_12_pc	PSI_14_pc	PSI_15_pc
PSI_5_pc Foreign body left during procedure	1.000						
PSI_6_pc Iatrogenic Pneumothorax	-0.00115 0.9078	1.0000					
PSI_7_pc Catheter related blood infections	0.04417 <.0001	0.03213 0.0012	1.00000				
PSI_11_pc Postoperative respiratory failure	-0.06810 <.0001	-0.01282 0.1971	0.09127 <.0001	1.00000			
PSI_12_pc Postoperative sepsis	-0.04710 <.0001	0.08016 <.0001	0.33045 <.0001	0.01368 0.1687	1.00000		
PSI_14_pc Postoperative wound dehiscence	-0.01942 0.0508	-0.07894 <.0001	-0.07325 <.0001	0.04537 <.0001	0.03412 0.0006	1.0000	
PSI_15_pc Accidental puncture or laceration	0.05782 <.0001	0.15822 <.0001	-0.02148 0.0307	-0.06837 <.0001	0.04406 <.0001	-0.02631 0.0081	1.00000

APPENDIX 9
HOSPITAL COMPARE MEASURES INCLUDED IN QUALITY COMPOSITE FOR MS-DRG CONDITIONS

HOSPITAL COMPARE MEASURE SETS INCLUDED IN QUALITY COMPOSITE FOR SELECTED MS-DRG CONDITIONS

Condition	AMI Measure Set	CHF Measure Set	Pneumonia Measure Set	Surgical Care Improvement Project Measure Set
Medical AMI	X			
CHF		X		
Pneumonia			X	
COPD				
Bronchitis				
Acute Ischemic Stroke				
Stroke with Cerebral Infarct				
Medical Back Pain				
AMI with CABG	X			X
AMI with PTCA	X			X
Hip Repl.				X
Knee Repl.				X
Hip Frac.				X
Lap. Chole.				X
Non-Lap. Chole				X
Back Pain w Spi. Fu.				X
Back Pain w Other Back Proc				X

APPENDIX 10
PATIENT SAFETY INDICATORS INCLUDED IN QUALITY COMPOSITE FOR MS-DRG CONDITIONS

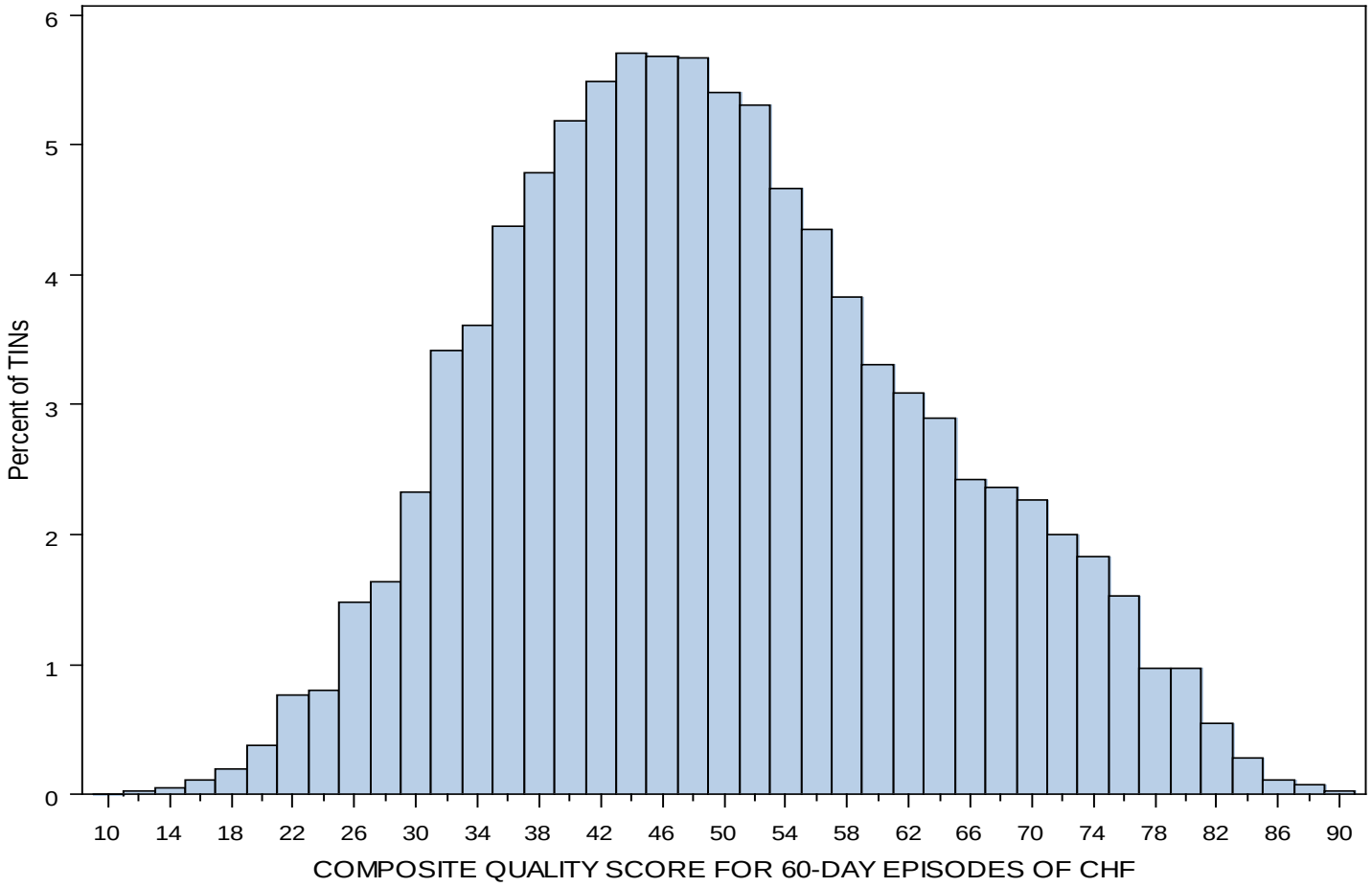
AHRQ PATIENT SAFETY INDICATOR MEASURES INCLUDED IN QUALITY COMPOSITE FOR SELECTED MS-DRG CONDITIONS

Condition	Foreign body left during procedure	Iatrogenic Pneumothorax	CV Cath. related blood inf.	Postop. resp. failure	Postop. sepsis	Postop. wound dehiscence	Accidental puncture/ laceration
Medical AMI		X	X				
CHF		X	X				
Pneumonia		X					
COPD		X	X				
Bronchitis		X	X				
Acute Ischemic Stroke		X	X				
Stroke with Cerebral Infarct		X	X				
Medical Back Pain		X	X				
AMI with CABG	X		X	X	X	X	X
AMI with PTCA	X		X	X	X	X	X
Hip Repl.	X	X	X	X	X	X	X
Knee Repl.	X	X	X	X	X	X	X
Hip Frac.	X	X	X	X	X	X	X
Lap. Chole.	X	X	X	X	X	X	X
Non-Lap. Chole	X	X	X	X	X	X	X
Back Pain w Spi. Fu.	X	X	X	X	X	X	X
Back Pain w Other Back Proc	X	X	X	X	X	X	X

APPENDIX 11
QUALITY COMPOSITE FOR MS-DRG CONDITIONS

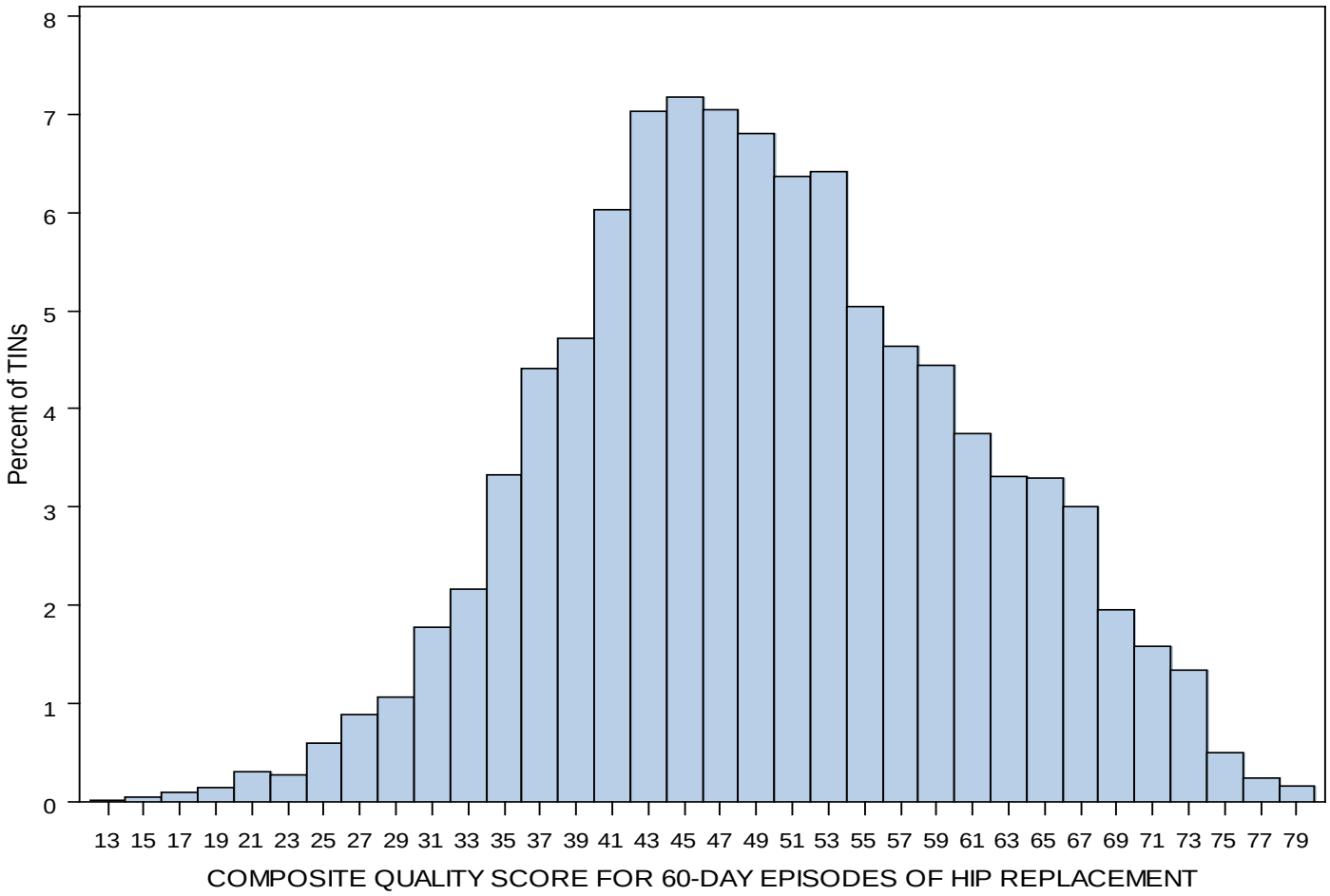
The chart below is a bar graph showing the distribution of composite quality scores for 60-day CHF episodes across CHF TINs.

Figure 11.A: DISTRIBUTION OF COMPOSITE QUALITY SCORES FOR 60-DAY CHF EPISODES ACROSS CHF TINs



The chart below is a bar graph showing the distribution of composite quality scores for 60-day Hip Replacement episodes across Hip Replacement TINs.

Figure 11.B: DISTRIBUTION OF COMPOSITE QUALITY SCORE FOR 60-DAY HIP REPLACEMENT EPISODES ACROSS HIP REPLACEMENT TINs



APPENDIX 12
THE MEDICARE PHYSICIAN QUALITY REPORTING SYSTEM (PQRS): QUALITY MEASUREMENT AND BENEFICIARY ATTRIBUTION

The Medicare Physician Quality Reporting System (PQRS): Quality Measurement and Beneficiary Attribution

January 2012

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The Medicare Physician Quality Reporting System (PQRS): Quality Measurement and Beneficiary Attribution

Abstract

The purpose of this paper is to present data on physician participation in Medicare's Physician Quality Reporting System (PQRS) and to explore the potential for PQRS reporting to provide a basis for attributing the cost and quality of care of Medicare beneficiaries to specific physicians. Using data from five states for the years 2008 (the first full year of the program) and 2009, we examined the number and type of physicians who are reporting PQRS measures and the types of measures that are reported. PQRS reporting is increasing rapidly for all types of physicians. Practitioner assistants have the highest participation rates, but most of the reports are submitted by medical specialists. We compared the PQRS reporting physician to the physician who provided the plurality of the beneficiary's non-hospital evaluation and management (NH-E&M) visits. Although PQRS reporting physicians provide only 17 percent of the beneficiary's NH-E&M visits in 2009, the physician who provided the plurality of visits provided only 50 percent of such visits. PQRS-reporting alone cannot solve the essential problem of attribution in FFS Medicare, but as PQRS participation increases, it could help improve both attribution and the quality of health care services delivered to Medicare beneficiaries.

I. Introduction

Under the Patient Protection and Affordable Care Act of 2010 (abbreviated ACA), the Medicare program is required to incorporate measures of "value" into the payment systems for health care providers including physicians and hospitals in traditional fee-for-service (FFS) Medicare. Considerable progress has been made in recent years developing measures of health care quality that are computable from claims data. Examples are appropriate screening, performance of monitoring tests for the chronically ill, preventable emergency department visits, hospitalizations and readmissions. However, many quality measures, including many measures of health outcomes and functional status are not claims-computable, nor are many process measures of quality for which physicians cannot submit a bill.

In mid-2007 physicians were given the opportunity to report a new set of quality measures for Medicare beneficiaries under the Centers for Medicare and Medicaid Services (CMS) Physician Quality Reporting System or PQRS.[1] These measures include both process quality measures and outcome measures such as the patient's blood pressure and HbA1c level. Although PRRS participation currently is voluntary, it provides a model of what could be done on a larger universal basis.

We analyze data from the first two full years of PQRS reporting (2008 and 2009) in five states to address the following questions:

1. What types of physicians report PQRS measures?

2. What types of measures do they report?

3. What are the trends in reporting from 2008 to 2009?

[1] Note that, when first introduced, PQRS was termed the Physician Quality Reporting Initiative, a name that was changed in 2011 to Physician Quality Reporting *System*. For simplicity, we will use PQRS refer to both versions throughout this report.

We also discuss the possibility of using PQRS reporting as the basis for attributing care to specific physicians, asking:

1. Are multiple physicians reporting on the same beneficiary?
2. Are physicians selectively reporting on beneficiaries?
3. What percent of their primary care do PQRS-reported beneficiaries receive from the PQRS-reporting physicians?
4. How does the PQRS reporting physician compare to the physician seen most frequently by the beneficiary?

II. The PQRS system

Recent efforts for greater accountability in the U.S. healthcare system include increased collection, and in some cases public dissemination, of data on health care quality at the health plan, hospital and physician level (McIntyre, Rogers and Heier, 2001).

Early quality reporting efforts included hospital-specific mortality data reported by CMS (Daley, et al., 1988), and the Healthcare Effectiveness Data and Information Set (HEDIS) for beneficiaries enrolled in private health plans in Medicare. CMS has expanded quality reporting to include the Outcome and Assessment Information Set (OASIS) system for home health[2] and the Minimum Data Set (MDS) system for nursing homes.[3] Quality reporting systems at the individual physician level have been slower to develop. New York State published data on mortality rates for cardiovascular surgeons (Mukamel and Mushlin, 1998) and those data currently are available for eight states.[4]

Until recently, information on the quality of health care services at the individual physician level in the Medicare program was limited to measures based on administrative claims data.[5] The 2006 Tax Relief and Health Care Act (TRHCA) (P.L. 109-432) authorized CMS to establish the PQRS, which enables physicians and other eligible "professionals"[6] to report additional data on health care quality and health outcomes beyond the measures available in traditional administrative (e.g., claims) data. The reporting system is voluntary. The first reporting period was the second half of 2007 (CMS, 2008a).

The PQRS measures are developed and approved by organizations such as the National Quality Form (NQF) and National Committee for Quality Assurance (NCQA).[7] Examples include:

- **Diabetes Mellitus: Hemoglobin A1c Poor Control in Diabetes Mellitus.** Developed by the NCQA. A patient aged 18 through 75 years with diabetes mellitus whose most recent hemoglobin A1c was greater than nine percent.

[2] http://www.cms.hhs.gov/OASIS/02_Background.asp#TopOfPage
[3] http://www.cms.hhs.gov/NursingHomeQualityInits/01_Overview.asp#TopOfPage
[4] http://www.healthcarechoices.org/profile.htm
[5] The material that follows in this section is taken from the CMS website http:/www.cms.hhs.gov/pqri/
[6] Throughout the paper we use the term " physician" to refer to the reporting unit, but "eligible professionals" include Doctor of Medicine, Doctor of Osteopathy, Doctor of Podiatric Medicine, Doctor of Optometry, Doctor of Oral Surgery, Doctor of Dental Medicine, Doctor of Chiropractic, Physician Assistant, Nurse Practitioner, Clinical Nurse Specialist, Certified Registered Nurse Anesthetist (and Anesthesiologist Assistant), Certified Nurse Midwife, Clinical Social Worker, Clinical Psychologist, Registered Dietician, Nutrition Professional, Audiologists (as of 1/1/2009), Physical Therapist, Occupational Therapist, Qualified Speech-Language Therapist (as of 7/1/2009). (http://www.cms.hhs.gov/PQRI/Downloads/EligibleProfessionals.pdf)
[7] A list of the 267 measures for 2012 can be found at http://www.cms.gov/PQRS/15_MeasuresCodes.asp#TopOfPage

- **Coronary Artery Disease (CAD):** Oral Antiplatelet Therapy Prescribed for Patients with CAD. Developed by the American Medical Association-sponsored Physician Consortium on Performance Improvement. A patient aged 18 years and older with a diagnosis of CAD who was prescribed oral antiplatelet therapy.

These examples illustrate that the PQRS quality measures address both process and health outcomes. Some measures (e.g., the diabetes measure, above) represent undesirable outcomes, while others (e.g., the CAD measure, above) represent desirable outcomes. New measures are added each year and measures from previous years occasionally are deleted.

Currently, physicians earn an incentive payment simply for reporting PQRS measures. There are no rewards or penalties tied to the care described by the PQRS measures. In 2008, physicians who successfully completed the reporting requirements received an incentive payment equal to 1.5 percent of their total estimated Medicare Part B Physician Fee Schedule (PFS) allowed charges for covered professional services furnished during that same reporting period. The percentage was increased to 2 percent in 2009 and 2010. In 2011 the payment was reduced to one percent of the physician's estimated Part B billings for professional services. From 2012 to 2014 the incentive payment is reduced further to 0.5 percent. Beginning in 2015, physicians will be subject to a 1.5 percent *penalty* for not reporting PQRS measures and the penalty increases to 2 percent from 2016 on. In order to earn an incentive payment, physicians must report on at least three quality measures and must report on at least eighty percent of the beneficiaries who were eligible for each measure.

Initially, PQRS measures were reported by individual physicians, but beginning in 2010, group practices had the option to report at the group level,[8] with the same incentive award applied to the Part B allowed charges furnished by the group. In 2009, physicians could report PQRS measures in two different ways: through their Part B claims[9] or through a PQRS-qualified registry. Starting in 2010, practices also could report PQRS measures through electronic health records.

Attributing quality measures to physicians

As CMS and other payers move towards value-based purchasing, it becomes necessary to link quality measures to specific physicians and practices. There is little point in developing elaborate measures of health care quality unless the care that beneficiaries receive (or fail to receive) can be attributed to a particular health care provider or set of providers. There are several types of attribution systems currently in use. In *ex ante* systems, the physicians know in advance which beneficiaries will be attributed to their practices, whereas in *ex post* systems, beneficiaries are assigned to physicians at the end of a reporting period. In active attribution systems, the physician and patient agree that the beneficiary's care will be attributed to the specific physician, whereas in passive attribution systems, beneficiaries are assigned to physicians without either the beneficiary's or physician's consent. Assigning beneficiaries to the physician who provided the plurality of the beneficiary's non-hospital E&M visits is an example of an *ex post,* passive attribution system.

[8] Individual physician's can choose to report either as individuals or part of a group practice, but not both. For further information on group practice reporting, see: http://www.cms.hhs.gov/PQRI/22_Group_Practice_Reporting_Option.asp.

[9] An example of a Part B claim with a PQRS report can be found in the Implementation Guide at: https://www.cms.gov/PQRS/03_How_To_Get_Started.asp#TopOfPage.

The United Kingdom's National Health Service is an example of an active, *ex ante* system, with efforts to link quality of care to payments (Roland, 2004). Examples of passive *ex post* attribution include the CMS Medicare Physician Group Practice Demonstration (CMS, 2009) and the CMS Resource Use Report initiative (CMS, 2008b).

Active, *ex ante* attribution is difficult in the traditional FFS Medicare program because beneficiaries are not restricted in their choice of physicians. The structure of the program invites uncoordinated care. But because PQRS reporting is physician-initiated, it has the potential to serve as a model for an active attribution system. In its current form, PQRS reporting is somewhat *ex post*, because physicians can decide whether or not to submit PQRS reports on specific measures and thus, to a degree, specific beneficiaries. An important question addressed in this analysis is whether physicians selectively choose beneficiaries on whom to report.

Physicians differ in the types of patients they treat and the settings in which they provide care. Some physicians treat patients primarily in inpatient settings, while others provide primary care in outpatient settings. The PQRS system includes measures that are applicable to both inpatient and outpatient care, and thus PQRS reporting has the potential to serve as the basis for attribution for both types of physicians.

There are many possible attribution rules. For example, the care of Medicare beneficiaries could be attributed to the physician from whom the beneficiary obtained most of her office visits or largest dollar volume of her Medicare claims (a plurality rule). Alternatively, every physician who submitted a bill for a beneficiary could be assigned a part of the responsibility for the beneficiary's cost and quality of care based on the proportion of dollars or visits attributable to each physician (a proportionate rule). Mehrotra, et al. (2010) compared eleven different attribution algorithms and found that assignment of physicians to cost categories is sensitive to the choice of algorithm. In our analysis, we compare two methods of assigning beneficiaries to physicians: (1) the physician who accounted for the plurality of the beneficiary's non-hospital evaluation and management (NH-E&M) visits; and (2) beneficiaries on whom the physician reported a PQRS measure.

III. Data and results

Our analysis is based on a 100 percent sample of 2008 and 2009 Medicare claims data from five states: California, Colorado, New Jersey, North Dakota, and Florida. The states were chosen by CMS for use in a larger analysis of Medicare physician payment policy and represent a mix of regions, average levels of utilization and cost and urbanicity.

We obtained PQRS data directly from the Part B claims submitted by physicians, rather than from registry data. The registry data were deemed by CMS to be less reliable during 2008 and we excluded registry data in 2009 to maintain consistency across the two years' results.

Throughout this analysis we refer to the entities that report PQRS measures as "physicians." In fact, PQRS data are reported by national provider identifiers or NPIs, which might represent anything from a cardiovascular surgeon to a nurse practitioner, a clinical lab or a grocery store (e.g., an in-store clinic). For claims payment purposes, including the PQRS incentive payments, NPIs are grouped into TINs (tax identification numbers). The mapping of NPIs into TINs is not necessarily unique. An individual NPI can bill under more than one TIN. In this analysis we report our results by NPI rather than TIN, because the PQRS measures are reported at the NPI level.

In some analyses, it is helpful to characterize a "visit" to a physician. However, claims data, and thus PQRS reports represent "services" rather than "visits," *per se*. In order to apply the "plurality of NH-E&M visits attribution rule, we aggregated claims into visits using the rule that all claims with the same dates of service made to the same provider constituted one visit.

A. Descriptive analysis

Table 1 shows the percent of physicians who submitted PQRS reports in 2008 and 2009. Physicians were classified into four categories (primary care, medical specialist, surgical specialist, and practitioner assistant) based on the specialty codes in claims data. (The number of NPIs falling outside these categories was less than 0.01 percent in both 2008 and 2009.) Practitioner assistants had the highest participation rates in both years, but the percentage of physicians filing PQRS reports increased substantially in all four groups, particularly among primary care physicians (and surgeons).

Table 1: Percent of NPIs filing at least one PQRS report

Type of NPI	Percent of all NPIs reporting a PQRS measure: 2008	Percent of PQRS-reporting NPIs by type of physician: 2009
Primary care	9.0	22.3
Medical specialist	16.0	23.9
Surgical specialist	6.8	14.8
Practitioner assistant	20.3	29.0
Total	**13.8**	**23.0**

Table 2 shows that medical specialists accounted for the majority of PQRS reports in both 2008 and 2009. However, primary care physicians[10] increased their percentage of all reports by seven percentage points from 2008 to 2009. A table showing greater detail on the types of physicians reporting PQRS measures can be found in the Appendix.

Table 2: Percent of all PQRS reporting NPIs by type of physician

Type of NPI	Percent of PQRS-reporting NPIs by type of physician: 2008	Percent of PQRS-reporting NPIs by type of physician: 2009
Primary care	14.0	21.0
Medical specialist	67.0	59.1
Surgical specialist	5.9	7.7
Practitioner assistant	13.1	12.2
Total percent	**100.0**	**100.0**
Total number of PQRS-reporting NPIs	**24,154**	**40,428**

Table 3 shows the fifteen most frequently reported non-hospital PQRS measures cross-tabulated by the type of provider.

[10] Primary care providers include: general practice, family practice and internal medicine. Medical specialists include: allergy/immunology, otolaryngology, anesthesiology, cardiology, dermatology, interventional pain management, gastroenterology, osteopathic manipulative therapy, neurology, ophthalmology, pathology, physical medicine and rehabilitation, psychiatry, pulmonary disease, diagnostic radiology, chiropractic, nuclear medicine, nephrology, optometry, infectious disease, endocrinology, podiatry, psychologist, audiologist, physical therapist, rheumatology, occupational therapist, registered dietician, pain management, addiction medicine licensed clinical social worker, critical care, hematology, hematology/oncology, preventive medicine, neuropsychiatry, radiation oncology, emergency medicine, interventional radiology, optician, gynecologist/oncologist, and medical oncology. Surgical specialists include: general surgery, obstetrics gynecology, oral surgery, orthopedic surgery, plastic and reconstructive surgery, colorectal surgery, thoracic surgery, urology, hand surgery, peripheral vascular disease, vascular surgery, cardiac surgery, maxillofacial surgery, and surgical oncology. Practitioner assistants include: anesthesiologist assistance, certified nurse midwife, CRNA, clinical laboratory, certified clinical nurse specialist, physician assistant, and nurse practitioner.

Table 3: Most frequently reported PQRS Quality Data Codes (QDC) in 2008 and 2009 and Percent of PQRS Reports Filed By Each Type of Physician

QDC indicator and description	PQRS # and Description	Primary Care	Medical Specialists	Surgical Specialists	Practitioner Assistants	Total
G8445: No prescriptions were generated during encounter	#125: HIT - Adoption/Use of e-Prescribing	37.6	35.7	50.5	19.3	36.4
G8447: Patient encounter was documented using a CCHIT certified EMR	#124: HIT - Adoption/Use of Health Information Technology (Electronic Health Records)	10.0	8.8	12.3	7.9	9.3
G8446: Some or all prescriptions generated during encounter were handwritten or phoned in	#125: HIT - Adoption/Use of e-Prescribing	17.0	5.5	7.5	6.4	8.5
G8443: All prescriptions created during encounter were generated using a qualified e-Prescribing system	#125: HIT - Adoption/Use of e-Prescribing	16.8	5.1	5.6	5.2	8.0
2027F: Optic nerve head evaluation performed	#12: Primary Open Angle Glaucoma: Optic Nerve Evaluation	0.0	7.5	0.0	0.0	4.9
2019F: Dilated macular exam performed	#14: Age-Related Macular Degeneration: Dilated Macular Examination	0.0	6.8	0.0	0.0	4.5
4048F: Documentation of administration of prophylactic antibiotic	#20/#30: Perioperative Care: Timing of Antibiotic Prophylaxis - Ordering Physician/Administering Physician	0.1	4.8	3.1	25.8	4.3
3120F: 12-Lead ECG performed	#54/#55: Electrocardiogram Performed for Non-Traumatic Chest Pain/for Syncope	1.2	5.5	0.2	3.9	4.1
G8448: Patient encounter was documented using a non-CCHIT certified EMR	#124: HIT - Adoption/Use of Health Information Technology (Electronic Health Records)	0.6	5.4	1.2	1.1	3.8

QDC indicator and description	PQRS # and Description	Primary Care	Medical Specialists	Surgical Specialists	Practitioner Assistants	Total
4011F: Oral antiplatelet therapy prescribed	#6: Oral Antiplatelet Therapy Prescribed for Patients with Coronary Artery Disease	1.5	4.1	0.3	5.4	3.3
1000F: Tobacco use assessed	#114: Inquiry Regarding Tobacco Use	3.8	2.5	5.4	1.8	3.0
1036F: Current tobacco non-user	#114: Inquiry Regarding Tobacco Use	3.6	2.5	4.3	1.6	2.9
4047F: Documentation of order for prophylactic antibiotic	#20/#30: Perioperative Care: Timing of Antibiotic Prophylaxis - Ordering Physician/Administering Physician	0.0	3.0	6.0	13.2	2.8
1123F: Advance Care Planning Discussed and Documented	#47: Advance Care Plan	6.0	0.8	1.0	6.9	2.3
G8427: Current Medication Documented	#130: Universal Documentation and Verification of Current Medications in the Medical Record	1.7	2.0	2.5	1.5	1.9
Percent of top measures reported by each type of physician		24.7	65.9	5.9	3.5	100.0
Top 15 measures as a percent of all measures reported		67.4	67.5	64.8	66.5	67.2
Total number of 2008 and 2009 reports of the top 15 measures		3,587,713	9,596,699	857,167	512,788	14,554,367

The first four measures could be termed administrative process measures and can be completed easily by the physician or the practice. The remainder of the most frequent measures, however, could be termed either process quality of care measures or health outcome measures. Altogether, these fifteen measures account for approximately 67 percent of all reported measures in 2008 and 2009. Most of the top 15 measures were filed by medical specialists (65.9 percent) or physicians in primary care (24.7 percent).

B. PQRS reporting as an attribution algorithm

As noted earlier, reporting a PQRS quality measure on a beneficiary could be interpreted as an indication that the physician is willing to take responsibility for at least one aspect of the beneficiary's care. In this section we examine questions related to PQRS as a potential basis for beneficiary attribution.

The first question is whether there is a one-to-one relationship between a physician and a beneficiary with a PQRS report or whether multiple physicians are reporting on the same beneficiary.

Table 4: Number of different NPIs submitting PQRS reports on the same beneficiary

Number of NPIs submitting a PQRS report on the same beneficiary	2008 (Percent)	2009 (Percent)
1	73.4	52.8
2	18.0	25.1
3	5.4	11.6
4	1.9	5.4
5 or more	1.3	5.1
Total Percent	100.0	100.0
Total number of beneficiaries	1,213,249	2,906,515
Average Number of NPIs	1.41	1.90

Note: The unit of analysis is the beneficiary.

Table 4 shows that the percentage of beneficiaries receiving PQRS reports from multiple physicians increased from 2008 to 2009. Overall, 53 percent of all beneficiaries who had a PQRS report in both 2008 and 2009 had at least one report from the same NPI in both years (data not shown). Based on this short time trend, it appears that PQRS reporting, like many other attribution rules such as proportional attribution, will not provide unique pairings of beneficiaries and physicians. However, PQRS reporting remains an *active* attribution method on the part of the physician and thus still could be a useful way to assign the same beneficiary to multiple physicians.

Next we examine whether physicians selectively are reporting on some beneficiaries and not others. Table 5 compares the age, sex and Hierarchical Condition Category (HCC) risk scores[11] of reported beneficiaries to beneficiaries *who saw PQRS reporting providers* but on whom no PQRS measure was submitted. The results show that reported beneficiaries were slightly older and more likely to male. They also were less likely to be non-white and dual eligible.

Table 5: Comparison of PQRS reported and non-reported beneficiaries: 2008 and 2009

Variable	2008: Non-reported beneficiaries	2008: Reported beneficiaries	Difference	2009: Non-reported beneficiaries	2009: Reported beneficiaries	Difference
Age (years)	74.83	76.55	1.72	75.12	76.00	0.87
Male (percent)	41.19	42.70	1.52	41.91	40.93	-0.98
Non-White	15.18	13.84	-1.34	15.27	13.40	-1.87

[11] The HCC risk scores are used to adjust payments to private health plans (Medicare Advantage) contracting with the Medicare program.

(percent)						
Dual Eligible (percent)	20.09	17.83	-2.26	19.45	16.07	-3.38
Overall HCC Risk score	2.03	2.40	0.37	2.00	2.07	0.07
Diabetes cohort HCC risk score	3.58	3.79	0.21	3.48	3.50	0.01
CHF Cohort HCC risk score	4.95	5.16	0.21	4.89	4.90	0.00
Arthritis HCC risk score	3.58	3.89	0.32	3.51	3.54	0.03
Depression HCC risk score	3.97	4.53	0.56	3.90	4.01	0.11
Myocardial Infarction HCC risk score	4.56	4.77	0.21	4.50	4.48	-0.02
Stroke HCC Risk score	5.01	5.29	0.29	4.94	4.92	-0.02
COPD cohort HCC Risk	4.22	4.53	0.31	4.15	4.17	0.02

Note: All differences are statistically significant at the 0.05 minimum with the exception of the CHF and stroke HCC scores in 2009.

One would expect the sample of beneficiaries on whom a report is filed to be in worse health, on average, than non-reported beneficiaries because many PQRS measures are appropriate only for beneficiaries who have a chronic health condition. The data on HCC risk scores in Table 5 shows that is indeed the case. Both the overall HCC risk score and the disease-specific scores are uniformly higher for reported than non-reported beneficiaries.

We compared PQRS-reporting to another popular attribution rule: the physician providing the plurality of non-hospital evaluation and management visits to the beneficiary, which we refer to as the "plurality rule." The plurality rule results in the assignment of a beneficiary to one and only one physician in contrast to a proportionate assignment rule that allocates performance measures to all the physicians who treated the patients based on the proportion of the beneficiary's total billings or visits from each physician.

Our first comparison is the percent of a beneficiary's NH-E&M visits provided by the PQRS-reporting NPI versus the plurality NPI (Table 6). The percent of NH-E&M visits provided by the plurality NPI is virtually certain to be higher than the percent provided by the PQRS-reporting NPI, but the former provides a useful benchmark percentage for FFS Medicare beneficiaries.

Table 6: Average percent of visits by type of NPI provided by the PQRS-reporting and plurality NPIs, with attribution overlap – 2008 and 2009

	2008: primary care	2008: medical specialist	2008: surgical specialist	2008: practitioner assistant	Total	2009: primary care	2009: medical specialist	2009: surgical specialist	2009: practitioner assistant	Total
Average percent of NH-E&M visits provided by the PQRS-reporting NPI	28.4	7.9	15.4	6.9	10.9	38.9	11.1	17.7	8.8	17.0
Number of beneficiary/PQRS NPI combinations	219,556	1,323,682	85,401	85,731	1,714,370	1,110,993	3,792,557	387,436	235,768	5,526,754
Average percent of NH-E&M visits provided by the plurality NPI	59.3	41.5	47.3	42.9	50.5	58.6	40.9	46.7	43.2	50.0
Number of beneficiary/plurality NPI combinations	3,584,333	3,113,751	646,006	219,101	7,563,191	3,495,845	2,957,612	622,020	237,334	7,312,811
Overlap of PQRS and plurality NPI (percent)	50.2	24.9	33.6	16.1	28.2	55.0	26.4	26.7	12.7	31.5

The unit of analysis in Table 6 is a beneficiary-NPI combination, because the beneficiary could have received a PQRS report or NH-E&M visits from more than one physician. Overall, the PQRS-reporting physician (NPI) provided 10.9 percent of NH-E&M visits for their attributed beneficiaries in 2008 and 17.0 in 2009. The highest percentage in 2009 was for primary care physicians (38.9 percent) and the lowest was for practitioner assistants (8.8 percent). Interestingly, only about half of all NH-E&M visits are provided by the plurality NPI in both 2008 and 2009, reflecting the diversity of physicians that Medicare beneficiaries see for their basic care.

For some beneficiaries the PQRS report is the only information submitted by a physician on a beneficiary. For example, in results not shown in Table 6, we found that 31 percent of beneficiaries with a PQRS report from a primary care physician had no other NH-E&M visits to that physician in 2008.

The last row in Table 6 shows the overlap of PQRS reporting with the plurality assignment rule. For primary care physicians, 50.2 percent of the beneficiaries on whom the physician reported a PQRS measures also saw that physician for the plurality of their NH-E&M visits. That percentage increases for primary care and medical specialists in 2009 versus 2008, but decreases for surgical specialists and practitioner assistants.

We also examined the total number of NPIs who would have attributed beneficiaries under the PQRS and plurality of NH-E&M visits rules. We found that in 2008, 80.5 percent of NPIs would have attributed beneficiaries under plurality of NH-E&M visits rule versus only 13.8 percent under PQRS-based attribution.[12] The same percentages for 2009 were 80.7 percent for the plurality rule and 23.0 percent for PQRS-based attribution. Thus, if the attribution rule is to be used to profile physicians for payment purposes, the plurality rule currently covers far more physicians than PQRS-reporting.

IV. Conclusions

The PQRS system represents an important intervention that has the potential to improve the quantity and quality of data on the health care services that are provided to Medicare beneficiaries. The measures were developed and endorsed by national organizations. Many of the PQRS measures are not computable from administrative data. If PQRS reporting expands in the future, its effect likely will extend beyond FFS Medicare, because commercial insurers have been quick to adopt other successful innovations in the Medicare program such as prospective hospital payment and relative-value-based physician reimbursement.

At this point, the PQRS system still is in its infancy. Participation was limited in 2008, the first full year of the program but increased from 13.8 to 23.0 percent of physicians (NPIs) from 2008 to 2009 in our five state samples. In 2008, medical specialists were the most frequent reporters, but the percentage of reporters who were primary care physicians increased seven percentage points from 2008 to 2009. Currently, the most frequently reported measures are "administrative" process measures involving health information technology and e-prescribing, but a number of process quality and health outcome measures also are found in the fifteen most frequently reported measures.

Currently, there does not seem to be strong evidence of physician's "cherry-picking" patients on which to report PQRS measures, though that issue bears close monitoring in the future. As expected, HCC risk scores generally are higher for reported beneficiaries than non-reported beneficiaries.

[12] The latter percentage is shown in Table 1.

Even in 2009, the PQRS reporting physician provided only 17 percent of the beneficiary's NH-E&M visits. However, that low percentage must be kept in perspective, as only half of the beneficiary's NH-E&M visits were provided by the physician who provided the plurality of such visits to the beneficiary.

PQRS-based attribution alone cannot solve the essential problem of attribution in FFS Medicare. In a health insurance plan like FFS Medicare, all attribution systems represent an attempt to impose some type of responsibility structure on an uncoordinated care system in which no physician is held accountable for the beneficiary's overall care.

It would be a mistake to draw any firm conclusions regarding either problems or opportunities represented by the PQRS system at this point. Taking the longer view, it is important to appreciate the accomplishment of having 267 consensus-based quality measures available for reporting at the individual physician level in 2012.

An attribution system that incorporated PQRS reporting would have the advantage of being an active (physician/patient-initiated) attribution system and could evolve into a true active, *ex ante* system in which the physician takes responsibility for a beneficiary's care at the beginning of a reporting period. PQRS-based attribution will require much higher levels of participation than the 23 percent we found in 2009 data, but participation is likely to increase for physicians who see a substantial number of Medicare beneficiaries when the reward for participation converts to a penalty for non-participation in 2015. Incorporating PQRS results into physician payment reform in Medicare also would spur participation. Any attempt to improve the quality of health care services in the U.S. requires data on quality, and PQRS reporting is an important step in that direction.

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Appendix

Table A1: Specialty of PQRS-reporting NPIs

Physician Specialty	Type[13]	2008 (Percent)	2009 (Percent)
Emergency medicine	MS	20.91	13.41
Internal medicine	PC	7.45	11.00
Anesthesiology	MS	11.30	9.18
Family practice	PC	5.33	8.76
Diagnostic radiology	MS	6.65	5.43
Physician assistant	PA	5.05	4.53
Ophthalmology	MS	4.82	4.43
Cardiology	MS	2.96	4.24
CRNA	PA	5.31	3.81
Nurse practitioner	PA	2.55	3.73
Optometry	MS	2.96	2.57
Physical therapist	MS	4.08	2.41
Orthopedic surgery	SS	1.40	2.13
Pathology	MS	3.05	2.05
Dermatology	MS	0.28	1.66
Obstetrics/gynecology	SS	0.41	1.53
Hematology/oncology	MS	1.54	1.44
Gastroenterology	MS	0.48	1.40
General surgery	SS	1.35	1.30
Urology	SS	1.12	1.28
Pulmonary disease	MS	0.61	1.12
Neurology	MS	0.63	1.11
Podiatry	MS	0.26	1.07
Other		13.95	17.64
Total		**100.00**	**100.00**

[13] PC=Primary care; MS = Medical specialty; SS = surgical specialty; PA = physician assistant

APPENDIX 13
USING AVOIDABLE EMERGENCY DEPARTMENT (ED) VISITS AS A PERFORMANCE MEASURE FOR MEDICARE PHYSICIANS' PRACTICES

Using Avoidable Emergency Department (ED) Visits as a Performance Measure for Medicare Physicians' Practices

Medicare/Medicaid Research and Demonstration
Task Order Contract (MRAD/TOC)
HHSM-500-2005-00027I, T.O. 4

University of Minnesota[14]

May 16, 2011

I. Background

A. Introduction

Visits to the emergency department (ED) are extremely costly and, because some of them potentially are avoidable, ED visits also may be indicative of poor care management. Billings, et al. (2000) developed an algorithm[15] to analyze ED visits and assign probabilities that the visit falls into several categories of appropriateness. The algorithm has been used to assess the appropriateness of ED visits at the community or facility level, but to our knowledge has not been applied previously to individual physicians or physician practices.

In this report, we explain how the Billings algorithm works, and we apply it to individual physician practices (represented by tax identification numbers or TINs). We then present illustrative data from one year in one state, using three different rules to attribute beneficiaries to TINs. The discussion is limited to the Billings algorithm itself. We do not conduct empirical analyses of other important issues including risk-adjusting quality measures, the year-to-year stability of the measure, the predictive accuracy of the measure (e.g., shrinkage estimators) or its importance relative to other performance measures. Those topics are discussed in other reports associated with this project.

B. How the Billings algorithm works

Each ED visit has at least one diagnosis code, but may have multiple diagnosis codes.[16] *Based on clinical judgment*, the Billings algorithm takes *each of 640 diagnosis codes* and assigns *probabilities* to the following four categories of appropriateness of the ED:

I. Non-emergent – Cases where immediate care is not required within 12 hours.

II. Emergent – primary care treatable – Care is needed within 12 hours, but care could be provided in a typical primary care setting.

III. Emergent – ED care needed, but preventable /avoidable – Immediate care in an ED setting is needed, but the condition potentially could have been prevented or avoided with timely and effective ambulatory care.

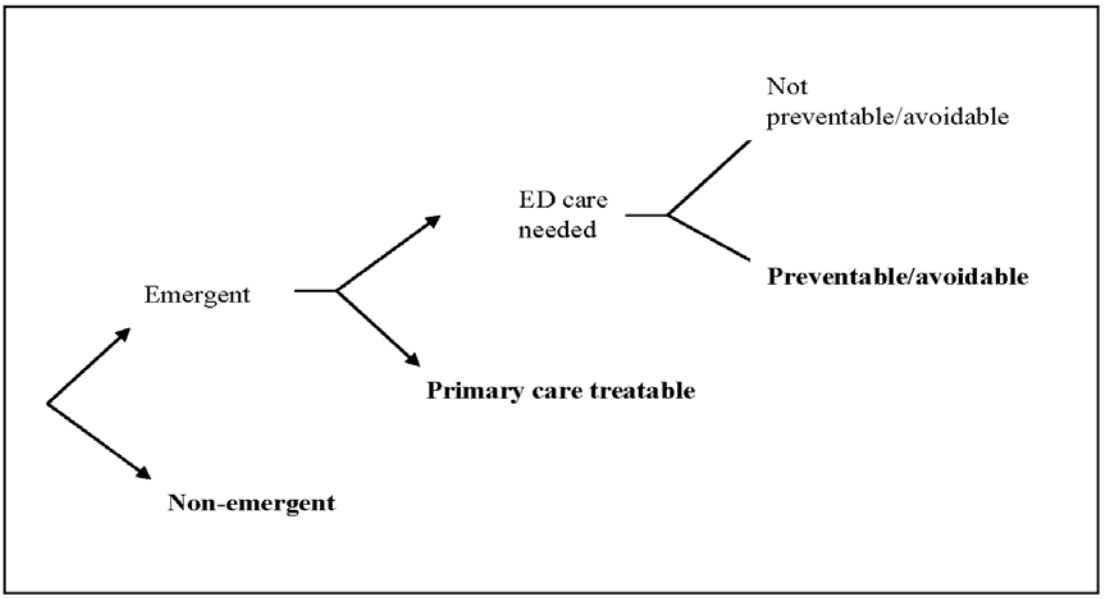
IV. Emergent – ED care needed, and not preventable/avoidable – Immediate care in an ED setting is needed, and the condition could not have been prevented/avoided with ambulatory

[14] Contributing authors in alphabetical order were Robert Coulam (Simmons College), Bryan Dowd, Robert Kane, Medha Karmarker, Dave Knutson, Shri Parashuram and Tami Swenson.
[15] Downloaded from http://www.ahrq.gov/data/safetynet/toolsoft.htm May 2009.
[16] We explain how multiple diagnoses were treated later in the text.

care.

The probabilities across the four categories sum to 1.0 for any given diagnosis. Diagnoses with insufficient sample size were assigned by Billings, et al. to an "unclassified" category. In addition, there are diagnoses that fall under injuries, mental health, alcohol and substance abuse. Those diagnoses are relatively infrequent and are not assigned probabilities. In our analyses, they are excluded entirely from the performance measure calculations. The categories of appropriateness are shown diagrammatically in Figure 1.

Figure 1: Algorithm for Classifying Emergency Department Utilization, New York University-United Health Fund of New York



Some examples of diagnoses and probabilities assigned by the Billings algorithm are shown below. These probabilities were derived using New York City ED data. Discharge diagnoses were used to identify the classification of the visit. (More details are available at http://wagner.nyu.edu/chpsr/index.html?p=25.)

Table 1: Examples of diagnoses and associated appropriateness probabilities assigned by the Billings algorithm

	Non-emergent	Emergent – primary care treatable	Emergent – ED care needed, but preventable /avoidable	Emergent – ED care needed, and not preventable / avoidable	Sum of probabilities
Acute myocardial infarction, not otherwise specified, initial (diagnosis code 410.91)	0.00	0.00	0.00	1.00	1.00
Angina pectoris NEC/NOs (diagnosis code 413.9)	0.00	0.00	1.00	0.00	1.00
Hypertension, not otherwise specified (diagnosis code 401.9)	0.61	0.17	0.21	0.00	1.00
Diabetic ketoacidosis (diagnosis code 250.1)	0.00	0.00	0.00	1.00	1.00
Carpal tunnel syndrome (diagnosis code 354.0)	1.00	0.00	0.00	0.00	1.00

We used Medicare inpatient and outpatient claims to identify emergency room visits and their accompanying diagnoses. Using only outpatient claims would have resulted in missed ED visits that resulted in a hospitalization.[17] We used the revenue codes recommended by ResDAC (http://www.resdac.org/ddvh/NewFilesCodeRefLimiations/REV_CNTR_TB.htm) to identify emergency room claims. Claims with revenue codes 0450 (emergency room-general classification), 0451(emergency room-emtala emergency medical screening services, effective 10/96); 0452(emergency room-ER beyond emtala screening, effective 10/96); 0456 (emergency room-urgent care, effective 10/96); 0459 (emergency room-other); and 0981 (emergency room – professional fee) were designated as emergency room claims. Claims on the same day in the same site (all inpatient or all outpatient) were treated as a single visit, but if a beneficiary had both an inpatient ED claim and an outpatient ED claim on the same day, it was considered as two ED visits. Once a claim was identified as having an ED component, the diagnoses were taken from the claims data.

We applied the Billings algorithm to the ED visit's diagnosis codes to determine the probabilities of each of the four types of appropriateness for each diagnosis. The diagnosis with the highest score for "emergent-ED care needed: not preventable/avoidable (injuries included)" was identified as the diagnosis for the remainder of the analysis. This approach minimized the likelihood that a TIN would be penalized for an ED visit that truly was appropriate. In case of ties, the diagnosis scoring highest for "emergent-ED care needed: preventable/avoidable," "emergent-primary care treatable," and "non-emergent," in descending order, was used for the remainder of the analysis. Using the single diagnosis derived in this manner, each visit was assigned probabilities for each level of appropriateness. This approach generated four probability "scores" for each ED visit. For any single visit the scores (probabilities) sum to one. (See illustrative example, below.)

From these data, we developed two scores for each tax identification number (TIN):

1. The number of ED visits per beneficiary assigned to the TIN; and

[17] We also attempted to identify ED visits by place-of-service codes in physcian/carrier data. Out of 8,773 beneficiaries with ED visits in any of the claims sets (physician/carrier, inpatient, outpatient), only 76 beneficiaries appeared only in physician/carrier data. We were concerned about the reliability of place-of-service codes to identify ED visits and thus relied exclusively on the inpatient and outpatient claims.

2. The four average scores per ED visit for the TIN.

The first score is simply the total number of ED visits by beneficiaries assigned to the TIN divided by the total number of beneficiaries assigned to the TIN. To arrive at the second set of scores, we added the probability scores in each category of appropriateness across all the beneficiaries assigned to the TIN and divided by the total number of ED visits by beneficiaries assigned to the TIN.

The Billings algorithm is diagnosis specific and the assignment of appropriateness is based on a single diagnosis, without considering the presence of additional diagnoses. In our application, the presence of an additional diagnosis that would have caused the visit to be rated more appropriate is not a problem because we chose the diagnosis that gave the visit the maximum probability of being rated appropriate. Thus, the potential problem is confined to the case in which multiple inappropriate diagnoses, when combined, could result in the visit being deemed appropriate. Examining this latter possibility is one of our recommendations at the end of this report.

II. A simple numerical example

A simple numerical example will help to clarify our analysis of ED visits. Consider a single TIN with four beneficiaries attributed to it. Suppose that Beneficiary 1 has two ED visits (Visits A and B), Beneficiary 2 has one ED visit (Visit C) and Beneficiaries 3 and 4 have no ED visits during the observation period. Visits A and C have two diagnoses each, while visit B has only one diagnosis.

The first measure of ED use is calculated by dividing the three ED visits by Beneficiaries 1 and 2 by the total of four beneficiaries attributed to the practice. The result is 0.75 ED visits per beneficiary for this TIN.

The following table shows how the second measure is calculated. First, Diagnosis 1 (DX 1) is eliminated for Visit A because Diagnosis 2 has a higher probability of "emergent – not primary care treatable or preventable." Diagnosis 2 is eliminated for Visit C for the same reason. *The eliminated diagnoses are shown by the shaded columns in the table*. That leaves one diagnosis per visit on which the probabilities of the four categories of appropriateness for each visit are based. The probabilities for each visit are summed across the three visits and divided by three (visits) to obtain the average probability score for each category for that TIN, as shown in the far right-hand column.

Table 2: A numerical example of the second ED performance measure for a single TIN (four beneficiaries)

Categories of appropriateness (Measure 2)	Bene 1, Visit A: DX 1	Bene 1, Visit A: DX 2	Bene 1, Visit B: DX1	Bene 2, Visit C:DX 1	Bene 2, Visit C:DX 2	Bene 3: No visits	Bene 4: No visits	Average Score per ED visit
Non-emergent	0.10	0.20	0.00	0.20	0.30			(0.20+0.00+0.20) / 3 = **0.13**
Emergent – primary care treatable	0.40	0.35	0.05	0.55	0.55			(0.35+0.05+0.55) / 3 = **0.33**
Emergent – but preventable	0.40	0.35	0.05	0.00	0.10			(0.35+0.05+0.00) / 3 = **0.13**
Emergent – not primary care treatable or preventable	0.00	0.10	0.90	0.25	0.05			(0.10+0.90+0.25) / 3 = **0.41**
TOTAL	1.00	1.00	1.00	1.00	1.00	Not applicable	Not applicable	1.00
Measure 1: Total ED visits per beneficiary for this TIN	3 visits / 4 beneficiaries = **0.75**							

III. The steps in creating the analytic data file

The following steps explain how we created the analytic data files for the measures described above using the 2008 Colorado data.

A. Acumen provided data on seven types of institutional and non-institutional claims (inpatient, outpatient, home health, hospice, SNF, physician, DME) and the enrollment data from the EDB file.

B. We counted ED visits using revenue centers *for all aged and disabled* Medicare beneficiaries, including dually eligible beneficiaries. Claims with revenue codes 0450, 0451, 0452, 0456, 0459 and 0981 were designated as emergency room claims. Multiple claims for the same beneficiary that appeared in only inpatient or outpatient data on the same day were counted as one visit, while claims appearing in *both* inpatient and outpatient data on the same day were counted as two separate visits.

C. We downloaded the Billings SAS code and ran it against those files to produce probabilities for each diagnosis for each visit in each of the appropriateness categories shown in Figure 1, above.

D. We selected the diagnosis for each visit that had the highest probability of appropriateness as described above, and then used the probability distributions across the categories of appropriateness corresponding to that diagnosis.

E. That produced a TIN-level analytic file with:

a. The number of beneficiaries assigned to each TIN

b. The total number of ED visits. We then divided the total number of ED visits by the total number of attributed beneficiaries to arrive at the first ED measure: the number of ED visits per attributed beneficiary.

c. The total probability score across all ED visits for each category of appropriateness. We then divided the total probability score for each category of appropriateness by the number of ED visits by beneficiaries attributed to the TIN to arrive at the second ED measure: the appropriateness of ED use conditional on having some ED use.

F. These two measures can be computed at the TIN level using any attribution algorithm. We tested three different attribution algorithms as described in the Appendix.

IV. Results from the 2008 Colorado data: ED visits using different methods of attribution

We applied the methods described above to the 2008 Colorado data using three different attribution rules: The three rules are:

1. Plurality of evaluation and management (E&M) visits;
2. Proportionate attribution based on the proportion of E&M visits (output not shown in this draft); and
3. Full attribution of cost and quality to any TIN billing for the patient.

We explain the results under the first attribution rule – plurality of E&M visits. The interpretation is the same for the other two attribution rules. The results are discussed in the last section.

A. Attribution based on a plurality of E&M visits

Table 3: Plurality attribution rule

Total attributed beneficiaries	257,198
Beneficiaries with ED visits	105,543
Total TINs	2,525
TINS having beneficiaries with ED visits	2,158
TINS having no beneficiaries with ED visits	367
Total ED visits	239,286

Figure 2: Measure 1: ED visits per attributed beneficiary per TIN {TINs with no ED visits per attributed beneficiary = 367} [Mean= 0.92, SEM=0.02, Range=0-16]

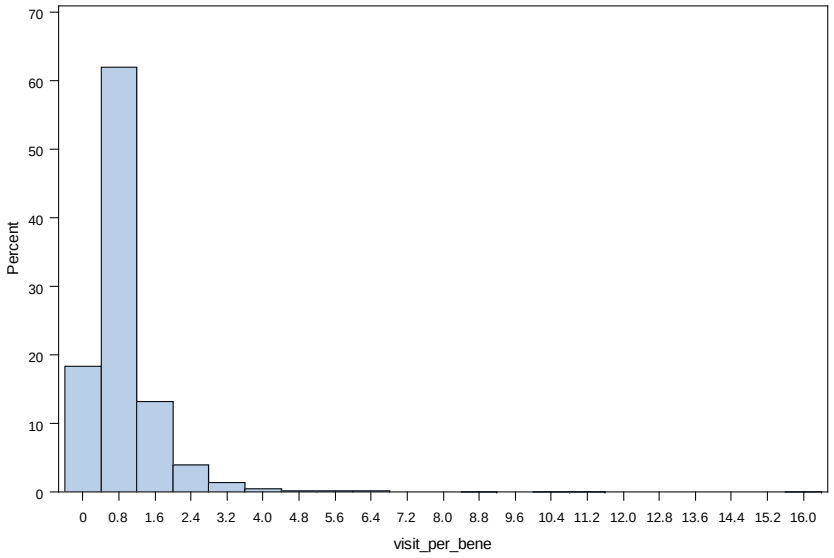


Figure 2 is a bar graph showing the distribution of ED visits attributed per beneficiary per TIN. The graph is interpreted as follows:

1. The vertical axis measures the percent of TINs corresponding to each level of ED visits per beneficiary.

2. The bar on the far left represents the 367 TINs with no ED visits.

3. There are some TINs on the far right with an extraordinary number of ED visits per beneficiary. These likely are TINS with a small number of attributed beneficiaries who made frequent use of the ED.

Figure 3: Measure 2: Score of [non emergent visits] per ED visit per TIN (TINs with score of 0= 316) [mean =0.17, SEM=0.003, Range=0-1]

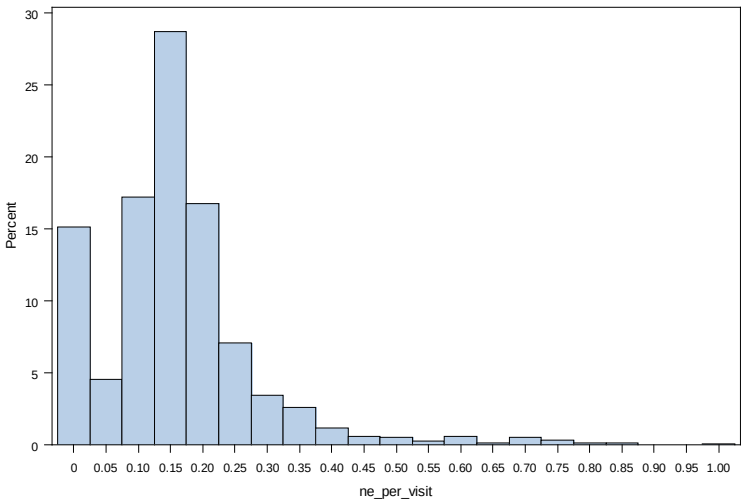


Figure 3 is a bar graph showing the score of non emergent visits per ED visit per TIN. The graph is interpreted as follows:

1. The vertical axis measures the percent of TINs corresponding to each level (percentage) of non-emergent ED visits per ED visit (per TIN).

2. The bar on the far left represents the 316 TINs with no non-emergent ED visits.

3. The horizontal axis is the percent of ED visits that were non-emergent according to the Billings algorithm.

Figure 4: Measure 2: Score [emergency primary care treatable visits] per ED visit per TIN (TINs with score of 0= 162) [Mean=0.17, SEM=0.002, Range=0-1]

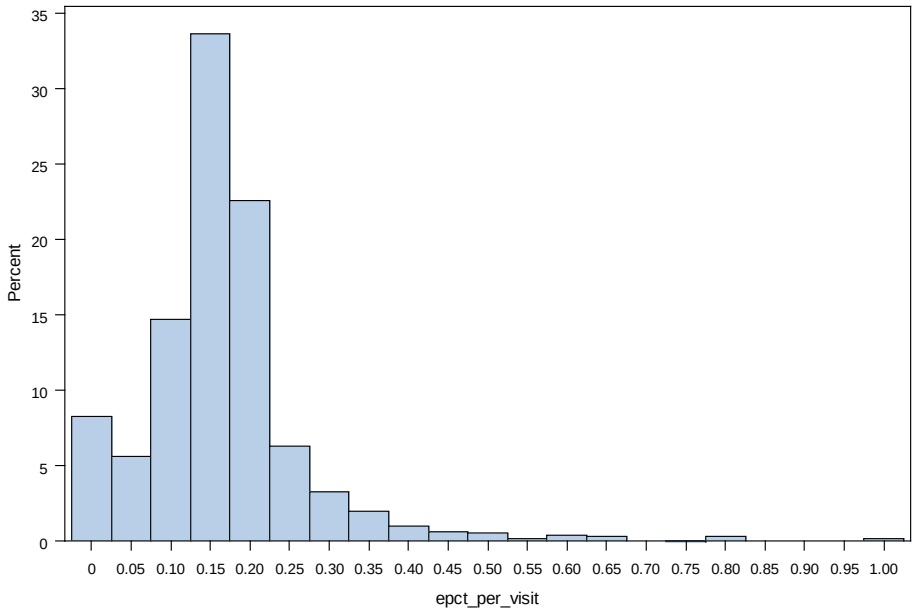


Figure 4 is a bar graph showing the score of emergency primary care treatable visits per ED visit per TIN. The graph is interpreted as follows:

1. The vertical axis measures the percent of TINs corresponding to each level (percentage) of emergent but primary care treatable ED visits per ED visit (per TIN).

2. The bar on the far left represents the 162 TINs with no emergent but primary care treatable ED visits.

3. The horizontal axis is the percent of ED visits that were emergent but primary care treatable according to the Billings algorithm.

Figure 5: Measure 2: Score [emergent care needed-preventable or avoidable visits] per ED visit per TIN (TINs with score of 0= 533) [Mean=0.08, SEM=0.002, Range=0-1]

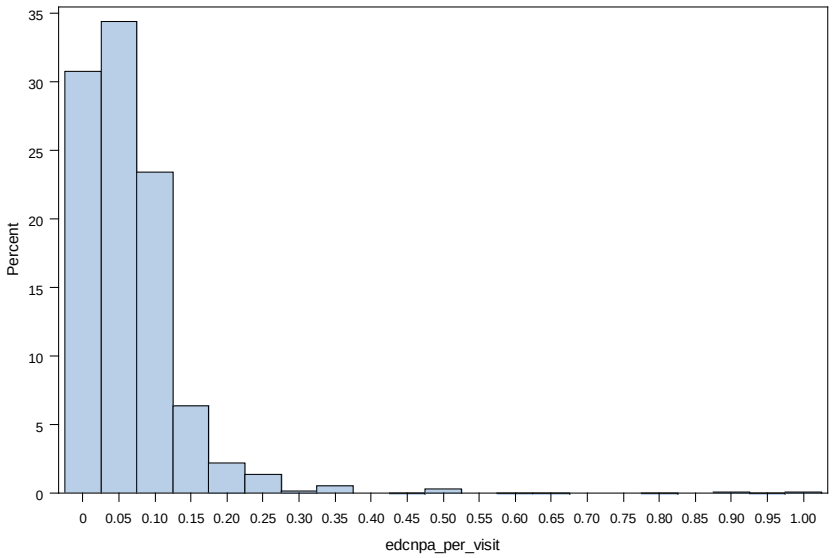


Figure 5 is a bar graph showing the score of emergent care needed-preventable or avoidable visits per ED visit per TIN. The graph is interpreted as follows:

1. The vertical axis measures the percent of TINs corresponding to each level (percentage) of emergent but preventable/avoidable ED visits per ED visit (per TIN).

2. The bar on the far left represents the 533 TINs with no emergent but preventable/avoidable ED visits.

3. The horizontal axis is the percent of ED visits that were emergent but preventable/avoidable according to the Billings algorithm.

Figure 6: Measure: Score emergency care needed-not preventable or avoidable visits per ED visit per TIN (TINs with score of 0=39) [Mean= 0.58, SEM= 0.004, Range=0-1]

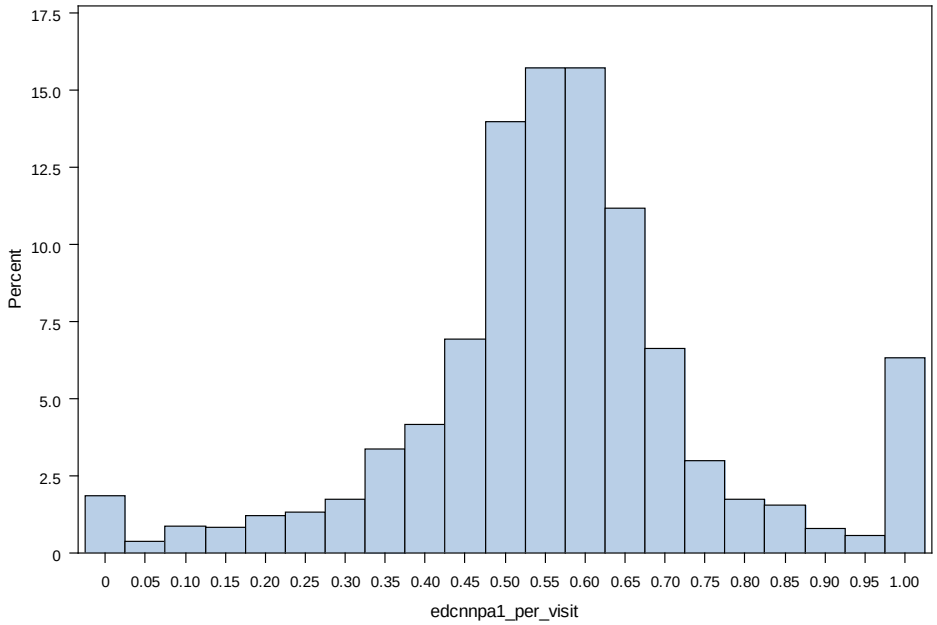


Figure 6 is a bar graph showing the score of emergency care needed-not preventable or avoidable visits per ED visit per TIN. The graph is interpreted as follows:

1. The vertical axis measures the percent of TINs corresponding to each level (percentage) of emergent and not primary care treatable or preventable/avoidable ED visits per ED visit (per TIN)

2. The bar on the far left represents the 533 TINs with no emergent and not primary care treatable/avoidable ED visits.

3. The horizontal axis is the percent of ED visits that were emergent and not primary care treatable or preventable/avoidable according to the Billings algorithm.

B. Attribution based on the proportion of E&M visits

Table 4: Proportionate attribution rule

Total attributable beneficiaries	257198
Beneficiaries with ED visits	105543
Total TINs	3095
TINS having beneficiaries with ED visits	2895
TINS having no beneficiaries with ED visits	200
Total ED visits	239386

Figure 7: Measure 1: ED visits per attributed beneficiary per TIN {TINs with no ED visits per attributable beneficiaries are 200} [Mean=0.95, SEM=0.02]

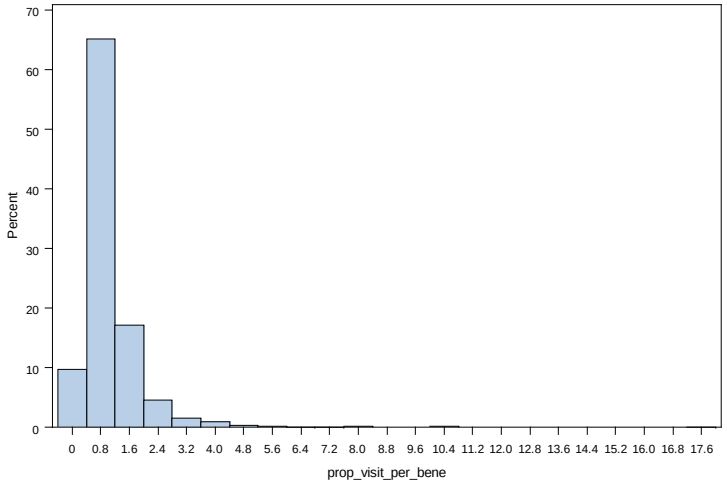


Figure 7 is a bar graph showing the ED visits per attributed beneficiary per TIN.

Figure 8: Measure 2: Score of [non emergent visits] per ED visit per TIN (TINs with score of=253) Mean=0.17, SEM=0.004

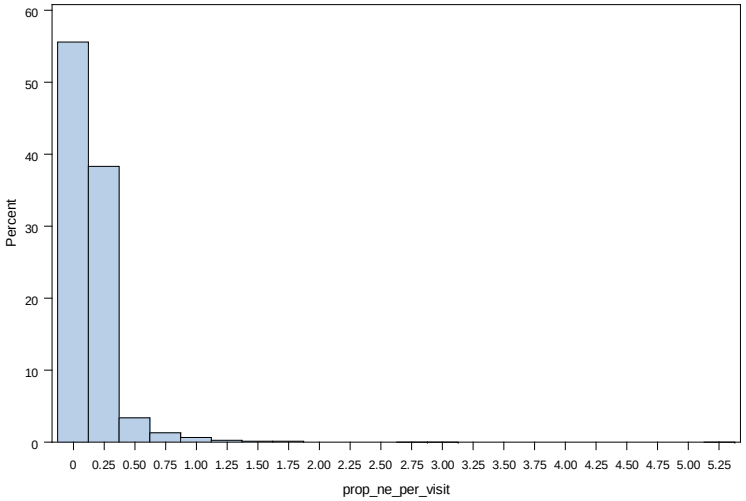


Figure 8 is a bar graph showing the score of non emergent visits per ED visit per TIN.

Figure 9: Measure 2: Score [emergency primary care treatable] per ED visit per TIN (TINs with score of 0=110) Mean=0.17, SEM=0.002

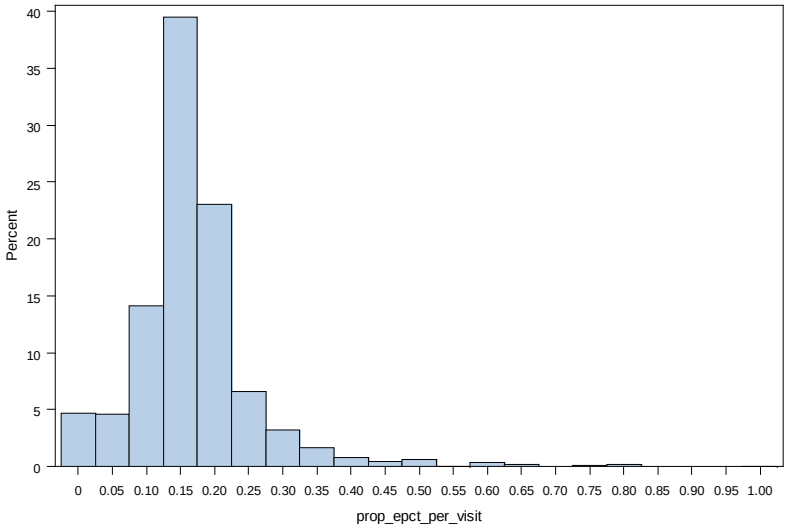


Figure 9 is a bar graph showing the score of emergency primary care treatable visits per ED visit per TIN.

Figure 10: Measure 2: Score [emergent care needed-preventable or avoidable visits] per ED visit per TIN (TINs with score of 0=412)Mean=0.08, SEM=0.001

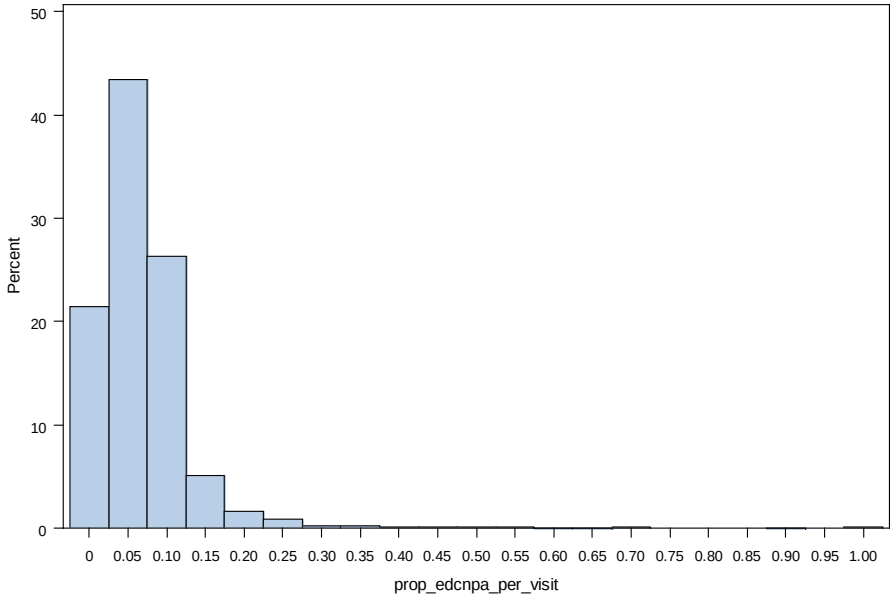


Figure 10 is a bar graph showing the score of emergent care needed-preventable or avoidable visits per ED visit per TIN.

Figure 11: Measure 2: Score emergency care needed-not preventable or avoidable visits per ED visit per TIN (TINs with score of 0=36) Mean=0.58, SEM=0.003

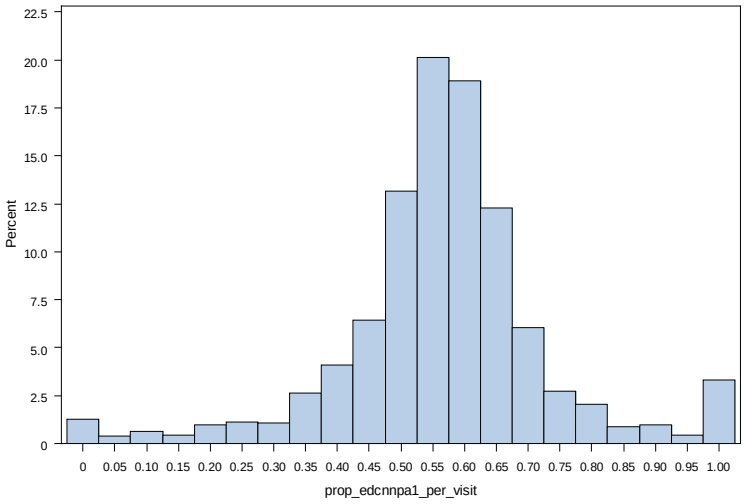


Figure 11 is a bar graph showing the score of emergency care needed-not preventable or avoidable visits per ED visit per TIN.

C. Attribution based on any E&M bill for the patient

Table 5: Attribution based on "any E&M bill"

Total attributed beneficiaries	257198
Beneficiaries with ED visits	105543
Total TINs	3095
TINS having beneficiaries with ED visits	2895
TINS having no beneficiaries with ED visits	200
Total ED visits	239286

Figure 12: Measure 1: ED visits per attributed beneficiary per TIN[18] {TINs with no ED visits per attributed beneficiary are 200} [Mean= 1.23, SEM= 0.02, Range= 0.13-17.5]

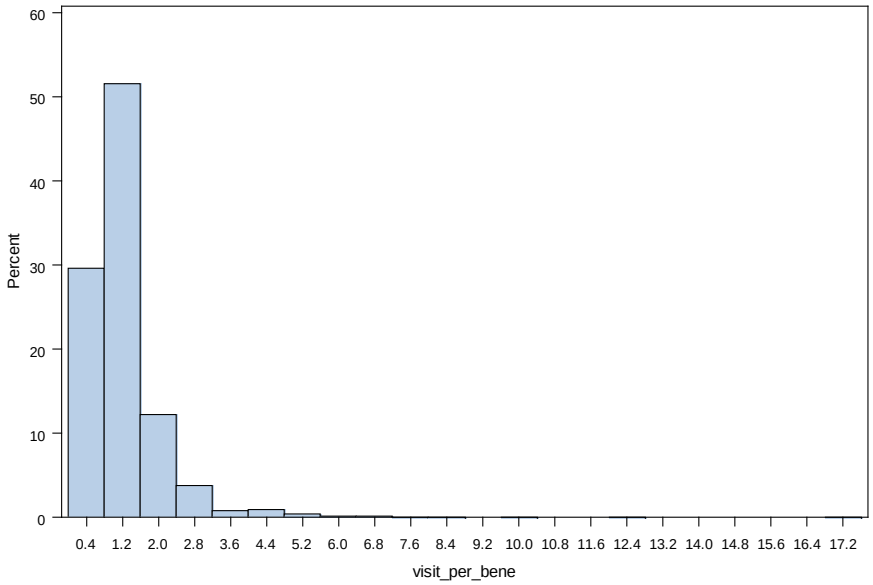


Figure 12 is a bar graph showing the distribution of ED visits attributed per beneficiary per TIN.

[18] The "any bill" attribution rule (#3) is not useful for calculating ED visits per beneficiary because the same visit appears in the numerator of every TIN that billed an E&M visit for the beneficiary with no recognition of the proportion of E&M visits accounted for by the provider.

Figure 13: Measure 2: Score of [non emergent visits] per ED visit per TIN (TINs with score of 0= 253) [mean =0.17, SEM= 0.004, Range= 0-1]

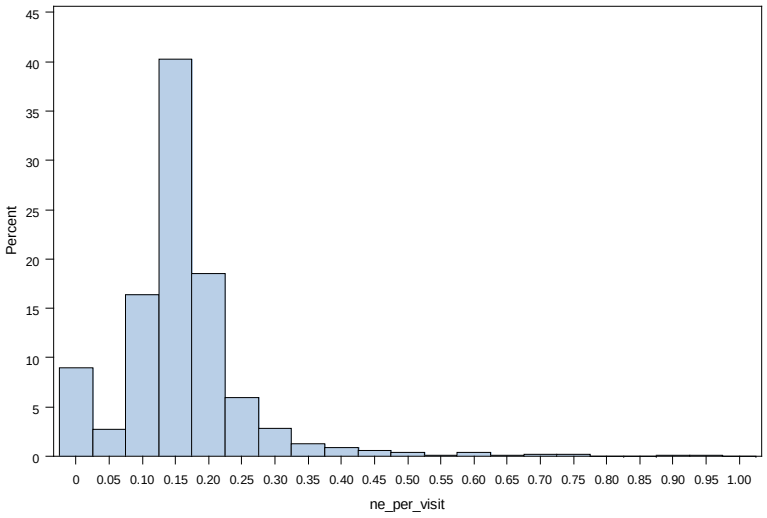


Figure 13 is a bar graph showing the score of non emergent visits per ED visit per TIN.

Figure 14: Measure 2: Score [emergency primary care treatable] per ED visit per TIN (TINs with score of 0=110) [Mean= 0.17, SEM= 0.001, Range=0-1]

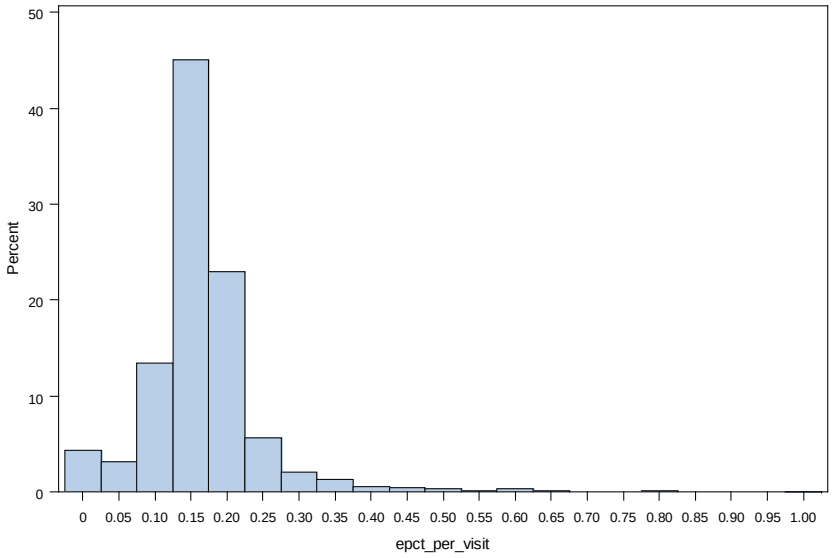


Figure 14 is a bar graph showing the score of emergency primary care treatable visits per ED visit per TIN.

Figure 15: Measure 2: Score [emergent care needed-preventable or avoidable visits] per ED visit per TIN (TINs with score of 0=412) [Mean= 0.08, SEM= 0.001, Range=0-1]

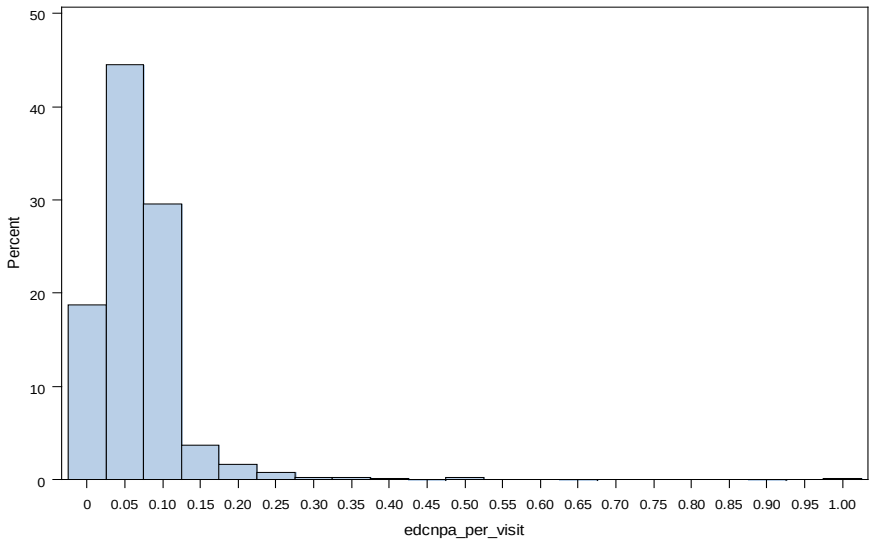


Figure 15 is a bar graph showing the score of emergent care needed-preventable or avoidable visits per ED visit per TIN.

Figure 16: Measure 2: Score emergency care needed-not preventable or avoidable visits per ED visit per TIN (TINs with score of 0=36) [Mean= 0.58, SEM=0.003, Range=0-1]

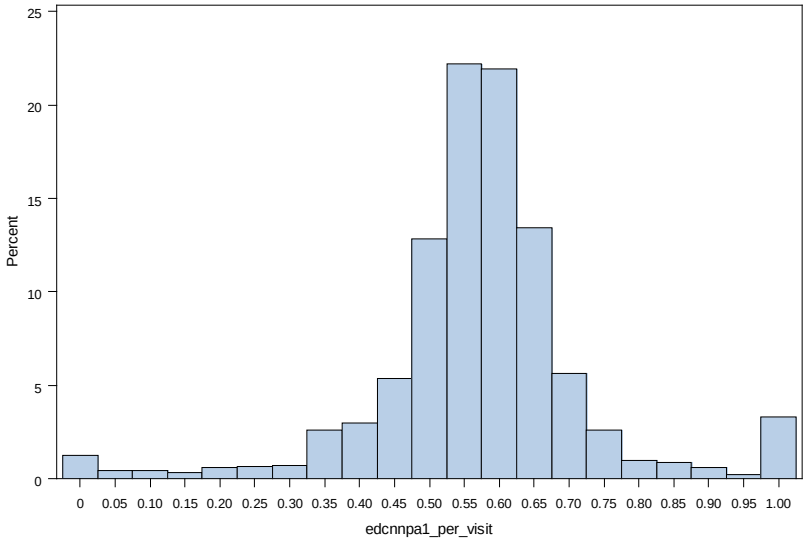


Figure 16 is a bar graph showing the score of emergency care needed-not preventable or avoidable visits per ED visit per TIN.

V. Policy discussion

A. Empirical results

1. General

There were 257,198 beneficiaries represented in the 2008 Colorado data. Under the "plurality of E&M visits" attribution rule, 2,525 TINs had some beneficiaries assigned to them. Under the proportionate and "any E&M bill" attribution rules, 3,095 TINs had some beneficiaries attributed to them. Thus, the plurality rule reduces the number of TINs that are profiled by about 18.4 percent from 3,095 to 2,525.

2. Measure 1: ED visits per attributed beneficiary

Although approximately 40 percent of the Medicare beneficiaries in our sample had no ED visits, the remainder made frequent use of emergency departments. Only about 6.5 percent of the TINs in the Colorado data had no beneficiaries with ED visits and the average number of ED visits per beneficiary was 0.92 under the plurality attribution rule, or almost one ED visit per attributed Colorado beneficiary in 2008.[19]

Is the number of ED visits per beneficiary a useful measure for a value-based modifier? Certainly many factors influence use of the ED that are beyond the physician's control. Some market areas may have greater access to EDs or their close, but less expensive substitutes, e.g., urgent care clinics. Although a single physician might not be able to affect the market-wide supply of those lower cost alternatives to the ED, including ED visits in a value-based modifier might give the physician community an incentive to press for greater access to those lower cost alternatives.

A more difficult situation arises if some beneficiary populations have inherently higher rates of ED use for reasons beyond the physician's control.[20] This is a subset of the general problem of risk-adjusting quality measures. Suppose that beneficiaries in low income areas are more likely to use the ED. If ED use is not adjusted for beneficiary income, then physicians serving low-income beneficiaries will be penalized by higher ED use in their attributed beneficiary population. However, it would be unfortunate if the adjustment for income became equivalent to accepting higher ED use as an intractable characteristic of lower income beneficiaries. That equivalency would be even more objectionable if the quality measure was a health outcome or process-of-care measure requiring adherence to medication, for example, and adherence was characteristically lower in lower income populations.

3. Measure 2: Appropriateness of ED visits – Four measures

a. Non-emergent visits

Under all three attribution rules, the average probability that an ED visit was non-emergent was 0.17. However, examination of the histograms reveals that different attribution rules produce small differences in the *distribution* of TINs across probabilities. That is true for any of the appropriate categories under Measure 2.

Extrapolated to the population level, a rough interpretation is that 17 percent of ED visits to these Colorado TINs were judged to be non-emergent by the Billings algorithm. Under the plurality attribution rule, there were 2,209 TINs (87.5 percent) that had at least one beneficiary with a non-emergent ED visit. That number rises to 2,842 under the proportionate or "any ED bill" attribution

[19] As noted earlier, the "any bill" attribution rule (#3) is not useful for calculating ED visits per beneficiary because the same visit appears in the numerator of every TIN that billed an E&M visit for the beneficiary.

[20] The issue of physician control is exacerbated by the use of our post-hoc attribution rules in which patients are assigned to physicians without the consent or foreknowledge of either the physician or the patient.

rules.

b. Emergent but primary care treatable

The average probability of emergent, but primary care treatable, ED visits also was 0.17 across all three attribution rules. Under the plurality attribution rule, there were 2,363 TINs who had at least one beneficiary with an emergent, but primary care treatable ED visit. That number rises to 2,985 under the proportionate or "any ED bill" attribution rules.

c. Emergent but preventable or avoidable

The average probability of emergent, but primary care treatable, ED visits was 0.08 across all three attribution rules. Under the plurality attribution rule, there were 1,992 TINs who had at least one beneficiary with an emergent, but preventable or avoidable ED visit. That number rises to 2,683 under the proportionate or "any ED bill" attribution rules.

d. Emergent and neither primary care treatable nor preventable or avoidable

The average probability of emergent and neither primary care treatable nor preventable or avoidable ED visits also was 0.58 across all three attribution rules. Under the plurality attribution rule, there were only 39 TINs whose ED visits all were judged as inappropriate by the Billings algorithm. That number falls to 36 under the proportionate or "any ED bill" attribution rules.

VI. Summary

Nearly 60 percent of all ED visits by Medicare beneficiaries to Colorado physicians (TINs) in 2008 were in some sense appropriate, that is, they were truly emergent and not primary care treatable or preventable or avoidable. However, that leaves approximately 40 percent of these expensive visits that were in some sense inappropriate as judged by the Billings algorithm.

Overall, the most problematic ED visits are those that were non-emergent, or emergent but the condition could have been treated in a primary care setting rather than the ED. Each of these categories accounted for approximately 17 percent of all ED visits, while emergent visits that were preventable or avoidable accounted for only 8 percent of all visits.

While better management of the patient's medical condition is a laudable goal, it appears from these analyses that the greatest short-term reduction in inappropriate ED use could be achieved by directing patients away from the ED for the care they need at that point in time, rather than better management of their medical condition. Non-emergent and emergent but primary care treatable ED visits account for approximately 80 percent of all inappropriate ED use.[21]

We found that the attribution rule makes a small difference in the number of ED visits per TIN, but no difference in the mean probabilities across the four categories of appropriateness. However, the *distribution* of probability scores across practices is affected to a degree by the choice of attribution rule.

Our findings suggest that ED visits meet several useful criteria for a physician performance measure.

1. ED use and inappropriate ED use are important outcomes from both a financial and patient safety perspective.
2. Better access to non-ED treatment sites has the potential to reduce non-emergent ED visits and emergent ED visits that are primary care treatable. These two categories account for approximately 80 percent of all *inappropriate* ED use.
3. Physicians and the hospitals in which they practice are in a position to provide and

[21] We add 17 percent for non-emergent ED visits, plus 17 percent for emergent but primary care treatable ED visits and divide by 42 percent of ED visits that are inappropriate for all reasons.

encourage better access to non-ED treatment sites.

4. Inclusion of ED use and inappropriate ED use in a value-based modifier would provide an incentive for physicians to engage in activities that improve access to non-ED treatment sites.

If the Billings algorithm were considered for inclusion in a value-based modifier, there are several validity checks that we would suggest. The Billings algorithm was based on data from New York City EDs. The criteria for a preventable/avoidable ED visit in New York might be quite different than for the same visit in rural Wyoming. We would recommend that a panel of experts consider whether the algorithm needs to be recalibrated for different parts of the country.

Second, the Billings algorithm considers one diagnosis at a time when considering the appropriateness of the ED visits. We would recommend that a panel of experts consider whether the presence of multiple diagnosis should alter the appropriateness scoring of the ED visits for some combinations of diagnoses.

Appendix
Attribution Algorithms

Attribution of patients to physician practices (represented by tax identification numbers or TINs in our analyses) can be a complex problem, both conceptually and computationally. Those problems are made more complex when working with less that full geographic sample, for example, the 2008 Colorado data that was the basis for our early analyses or the 2008 and 2009 five or ten state samples that are the basis for our later analyses.

In the beneficiary level analysis we have tested three attribution rules, not including our initial analyses of PQRS-based attribution. The three rules are:

4. Plurality of evaluation and management (E&M) visits;

5. Proportionate attribution based on the proportion of E&M visits; and

6. Full attribution of cost and quality to any TIN billing for an E&M visit for the patient.

A numerical example is shown below. Consider three beneficiaries whose E&M visits are distributed across three TINs in the following proportions: \

Table A1: Proportion of E&M visits by beneficiaries to each TIN

	TIN 1	TIN 2	TIN 3	Number of ED visits
Beneficiary 1	0.0	0.2	0.8	2
Beneficiary 2	0.1	0.4	0.5	1
Beneficiary 3	0.9	0.1	0.0	0

Now consider the first attribution rule (plurality of ED visits). The shaded cells in the table below show the assignment of beneficiaries to TINs under that rule (based on the results in the table above).

Table A2: Measure 1 scores under the first (plurality) attribution rule

	TIN 1	TIN 2	TIN 3	Number of ED visits
Beneficiary 1	0.0	0.2	0.8	2
Beneficiary 2	0.1	0.4	0.5	1
Beneficiary 3	0.9	0.1	0.0	0
Scores on Measure 1 (ED visits per attributed beneficiary)	0 ED visits divided by 1 attributed beneficiary = 0.0	TIN 2 is dropped from the analysis because no beneficiaries were attributed to TIN 2	3 ED visits divided by 2 attributed beneficiaries = 1.5	

Under the first attribution rule, TIN 3 would be charged with both ED visits for Beneficiary 1, as well as the one ED visit by Beneficiary 2. Beneficiary 3 would be attributed to TIN 1, but Beneficiary 3 had no ED visits. Notice that there will be fewer TINs in the analysis under attribution rule #1, but the same total number of beneficiaries.

Next consider the second (proportionate) attribution rule, shown in Table A2. Under the proportionate attribution rule, TIN 1 is charged with 0.1 of Beneficiary 2's ED visit; TIN 2 is charged with 0.2 of Beneficiary 1's two ED visit and 0.4 of Beneficiary 2's ED visit; and TIN 3 is charged with 0.8 of Beneficiary 1's two ED visits and 0.5 of Beneficiary 2's

ED visit. TIN 1 has 0.1 + 0.9 = 1.0 beneficiaries in its denominator, while TIN 2 has 0.2 + 0.4 + 0.1 = 0.7 beneficiaries in its denominator. TIN 3 has 1.3 beneficiaries in its denominator.

Table A2: Measure 1 scores under the second (proportionate) attribution rule

	TIN 1	TIN 2	TIN 3	Number of ED visits
Beneficiary 1	0.0	0.2	0.8	2
Beneficiary 2	0.1	0.4	0.5	1
Beneficiary 3	0.9	0.1	0.0	0
Scores on Measure 1 (ED visits per attributed beneficiary)	[(2 x 0.0) + (1 x 0.1) + (0 x 0.9)] / 1.0 attributed beneficiaries = 0.10	[(2 x 0.2) + (1 x 0.4) + (0 x 0.9)] = 0.8 / 0.7 attributed beneficiaries = 1.14	(2 x 0.8) + (1 x 0.5) + (0 x 0.0) = 2.1 / 1.3 attributed beneficiaries = 1.61	

Finally, consider the third (any E&M bill) attribution rule. Notice that in Table A3, the proportions have been replaced by entries of 1.0 if the TIN had any E&M bill for the beneficiary, and zero otherwise.

Table A3: Measure 1 scores under the third (any E&M bill) attribution rule

	TIN 1	TIN 2	TIN 3	Number of ED visits
Beneficiary 1	0.0	1.0	1.0	2
Beneficiary 2	1.0	1.0	1.0	1
Beneficiary 3	1.0	1.0	0.0	0
Scores on Measure 1 (ED visits per attributed beneficiary)	[(2 x 0.0) + (1 x 1.0) + (0 x 1.0)] / 2 attributed beneficiaries = 0.5	[(2 x 1.0) + (1 x 1.0) + (0 x 1.0)] = 3.0 / 3 attributed beneficiaries = 1.0	(2 x 1.0) + (1 x 1.0) + (0 x 0.0) = 3.0 / 2 attributed beneficiaries = 1.5	

Under the "any E&M bill" attribution rule, TINs 2 and 3 would be charged with the two ED visits for Beneficiary 1, and all TINs would be charged with the visit for Beneficiary 2.

Incomplete geographic coverage in our analytic samples

Our analytic samples cover only Colorado or a sample of five states, not the entire U.S. The difficulty that surfaces with incomplete geography is that some beneficiaries seeing TINs in states from which our samples were drawn also see TINs located outside that geographic unit. In other words, some beneficiaries seeing TINs in Colorado in 2008 also received care from TINs outside Colorado.

Our sampling frame for the 2008 Colorado data was all TINs located in Colorado, based on the TIN's billing address. We then collected all the claims for all the beneficiaries see by those Colorado TINs Visits to non-Colorado TINs were excluded when calculating the TIN that accounts for the most (plurality) of the beneficiary's E&M visits under attribution rule #1, and the proportion of E&M visits under attribute rule #2. Non-Colorado TINs were excluded

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APPENDIX 14
USING DATA ENVELOPMENT ANALYSIS IN A VALUE-BASED MODIFIER PAYMENT SYSTEM FOR PHYSICIANS

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Division of Health Policy and Management

Alternative Approaches to Measuring Physician Resource Use
Medicare/Medicaid Research and Demonstration
Task Order Contract (MRAD/TOC)
HHSM-500-2005-00027I, T.O. 4

USING DATA ENVELOPMENT ANALYSIS

IN A VALUE-BASED MODIFIER PAYMENT SYSTEM

FOR PHYSICIANS

Revised: December 16, 2011

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HHSM-500-2005-00027I, T.O. 4
University of Minnesota
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Introduction

The value-based modifier (VBM) payment system is designed to reward high performing physicians and physician practices.[22] The concepts of "value" and "high performance" involve consideration of both the quality of care provided by the physician and the associated cost of caring for beneficiaries. Individual cost and quality measures must be aggregated into a composite index of performance. In order to focus on that task, this paper begins with several key assumptions:

The Centers for Medicare and Medicaid Services (CMS) has selected appropriate measures of risk-adjust cost and quality of care.

CMS has selected an algorithm by which beneficiaries, along with their cost and quality measures, are attributed to individual physicians, tax identification numbers (TINS), group practices, or other accountable units.

CMS has decided how the data on individual beneficiaries will be aggregated into a measure at the "accountable" level, e.g., a physician, TIN or group practice.

At that point, the question is how the individual measures of cost and quality should be combined to produce a single metric of performance for the VBM payment system. Data envelopment analysis, or DEA, provides one approach. DEA has been used in hundreds of studies of efficiency. The majority of these studies focus on hospital efficiency (Mutter, et al. (2011)), but there have been applications to physician practices as well (Andes, et al., 2002).

Please note that in the text that follows, we combine all quality measures together in the examples. We did this for simplicity's sake, when we were developing this work. However, our final payment reform proposals, detailed in the main text of this Final Report, insist on condition-specific measures and incentives. The examples that follow are thus illustrative of the DEA method, but inconsistent with our final proposals in this one respect.

[22] Throughout the paper we use the terms "physician" and "practice" interchangeably. DEA analysis could be applied to either physicians or practices given satisfactory measures of cost and quality at the appropriate level, which could be individual physicians or group practices. In our empirical work we use the tax identification number or TIN as the unit of analysis, which enables us to analyze data at the level of group practices.

The DEA approach

The "theory" underlying this application of DEA is relatively straightforward. The physician who treats a Medicare beneficiary provides services in return for Medicare payments and beneficiary copayments. The physician strongly influences which services will be provided and thus the level of Medicare funds allocated to the care of each beneficiary. In the DEA model, those funds are treated as the *input* to the production of outputs of interest. The question that DEA addresses is, "What are the Medicare program, the taxpayers who fund it, and the beneficiaries getting for their money?" In other words, "What "outputs" of value are being produced from the "input" of Medicare dollars?"

The ultimate output of interest is the beneficiary's health or functional status. Unfortunately, health and functional status measures are not collected on a 100 percent sample of Medicare beneficiaries. Therefore, we have to use other quality measures.

For the empirical work described later in the paper we chose two types of quality of care measures that can be computed from Medicare claims data and have been vetted by national quality organizations:

(1) Inappropriate utilization that might have been avoided (e.g., through investment in less costly types of care); and

(2) Claims-computable measures of quality of care.

Our measure of risk-adjusted cost is Medicare payments to providers on behalf of a beneficiary over the course of one year. We use the CMS hierarchical condition categories (HCCs) and demographic variables to risk-adjust costs. Our "accountable unit" or "provider" is a TIN, and we attribute beneficiaries to the TIN that provided the majority of the beneficiary's non-hospital evaluation and management visits.

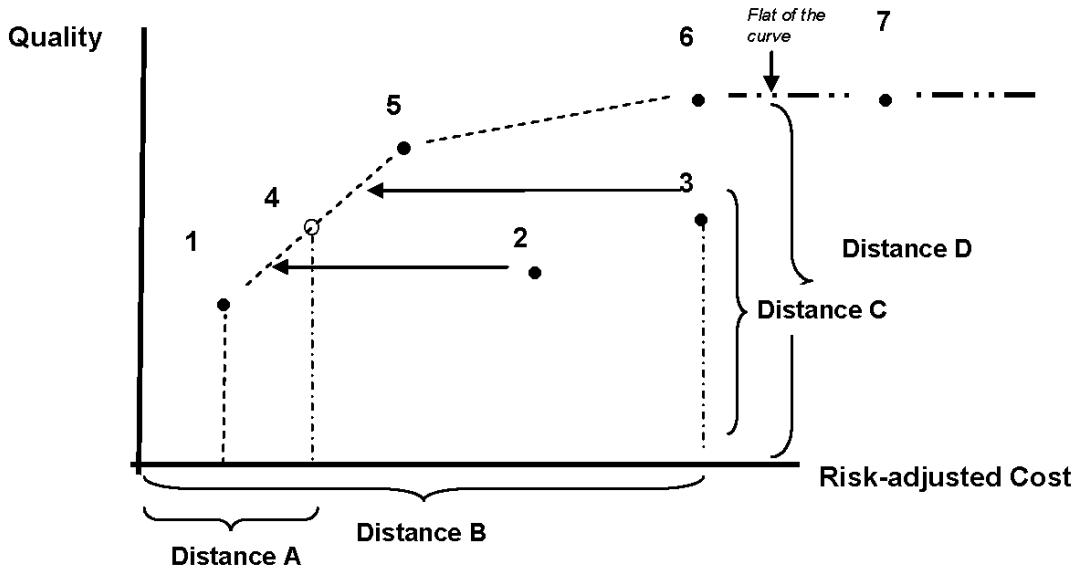
We emphasize that nothing about the DEA approach requires the use of these specific measures or attribution rules. CMS can choose any cost and quality measures it likes and any attribution rule. There even could be multiple measures of cost, such as inpatient costs versus outpatient costs. The only requirement is that there are some measures of cost and quality that are aggregated to some "accountable unit" or "provider."

A diagrammatic example of DEA analysis is shown in Figure 1. Suppose there is only one quality measure, shown on the vertical axis – and one cost measure -- risk-adjusted cost, shown on the horizontal axis. We thus have the inputs on the horizontal axis (less is better) and the single output on the vertical axis (more is better). Thus, a practice that is higher on the vertical axis has better quality for the same resources, and a practice that is farther to the left on the horizontal axis has lower cost for the same quality.

Assume there are seven practices. If we take quality and cost data for all seven and plot them on the graph, the outermost points define a "frontier." Practices 1, 5, and 6 are on that frontier – it is a cost-quality frontier in that there is no practice that has a better result on one variable (cost or quality), without having a worse result on the other. The frontier is defined not only by those practices, but by the straight lines connecting them. DEA is a *linear* programming algorithm and thus the frontier is defined by the linear line segments connecting practices on the frontier.

Figure 1. An example of DEA analysis and definition of input and output efficiency

Figure 1. An example of DEA analysis and definition of input and output efficiency



The DEA problem takes the following form: [23]

Minimize with respect to θ_i, λ: θ_i

Subject to:

$$\sum_{s=1}^{N} \lambda_s y_s - y_i \geq 0$$

$$\theta_i x_i - \sum_{s=1}^{N} \lambda_s x_s \geq 0$$

$$\sum_{s=1}^{N} \lambda_s \geq 0$$

Where s = 1,.i.., N indexes the practice

y is a vector of 1,…,M outputs

x is vector of 1,…,K inputs

θ = input efficiency.

In the case of one input and one output, input efficiency for the s^{th} practice simply is the intersection of the horizontal line extending left from the practice's point in the cost/quality space with the frontier line, which can be computed with high-school algebra. When a second quality

[23] This formulation assumes variable returns to scale.

measures is added, the frontier becomes a two-dimensional plane. More quality measures create a multi-dimensional output surface, but the principle is the same.

Practices 1, 5 and 6 are producing the maximum amount of quality for their given level of risk-adjusted cost. Although Practice 7 is on the frontier, Practice 6 is producing the same level of quality at lower cost, and our preferred measure of efficiency (input efficiency, explained below) will distinguish these two practices for precisely that reason. Relationships of the practices inside the frontier are more easily distinguished from frontier practices:

Practice 2 is not on the frontier because Practice 1 is producing the same level of quality at lower cost.

Practice 3 is not on the frontier, either. Even though there is no actual practice producing the same level of quality at lower cost, an important assumption underlying DEA is that the frontier defined by Practices 1, 4, 5, 6 and 7 is continuous,[24] and thus there is a hypothetical Practice 4 that could produce the same level of quality as Practice 3 but at the cost indicated by Practice 4.[25]

DEA analysis produces two measures of efficiency: input efficiency and output efficiency.

- Input efficiency measures the degree to which a practice could reduce its risk-adjusted cost while maintaining the same level of quality. That is, for any given level of quality – a horizontal line on Figure 1 – what is the ratio of cost of a *frontier* practice to the cost of a specific *actual* practice. Practice 3, for example, has the same quality as (hypothetical) Practice 4. Practice 3's input efficiency is defined as the ratio of Practice 4's cost to Practice 3's cost, or Distance A divided by Distance B in the figure.

  Thus, practices on the frontier have an input efficiency of 1.0, because, by definition of the frontier, there is no practice farther west along a given horizontal line defining a particular level of quality.
- Output efficiency measures the degree to which a practice could increase quality, holding risk-adjusted cost constant. That is, for any given level of risk-adjusted cost – a vertical line on Figure 1 – what is the ratio of the quality of an *actual* practice to the level of quality of a *frontier* practice? Practice 3, for example, has the same cost as Practice 6 in Figure 1. Practice 3's output efficiency is defined as the ratio of Practice 3's quality to Practice 6's quality, or Distance C divided by Distance D in the figure.

Thus, input efficiency measures the degree to which costs could be reduced without reducing the level of quality. Output efficiency measures the degree to which quality could be

[24] Another important assumption underlying DEA is that the frontier is convex: that is, the frontier must curve upward and to the right as risk-adjusted cost increases. As cost increases, at some point an additional dollar of risk-adjusted cost buys less additional quality than the previous dollar, and further dollars continue to buy less and less.

[25] When there is only one input and one output, the distance from Practice 3 to Practice 4 along the horizontal axis can be computed with high-school algebra. One simply writes down the equation for the line that connects Practices 1 and 5, substitutes Practice 3's value of quality, and solves for risk-adjusted cost, which is Distance A. If there were two quality measures (outputs), then the distances that define input efficiency would be distances to a plane, rather than distances to a line.

increased given the practice's level of costs for practices on the frontier where the slope of the frontier is positive.

In this application, input efficiency clearly is the preferred measure of a practice's performance. The reason is that output efficiency cannot distinguish between practices 6 and 7. For both practices, output efficiency is equal to 1.0 because they both are on the upper part of the frontier (each of them is getting as much quality as is possible for their given cost – that's what it means for them to be on the frontier). However, input efficiency is greater for Practice 6 than Practice 7 because both are producing the same level of quality, but Practice 6 has lower risk-adjusted cost. Practice 7 is said to be on the "flat of the curve" with respect to quality – spending more money but producing no higher quality than Practice 6.

Even input efficiency poses an important challenge, however, because *input efficiency makes no distinction between high and low levels of quality – a practice can be rated highly efficient by producing low quality care at relatively low cost, or high quality care at relatively high cost*. In principle, this would lead to a further question: how much efficient improvement in quality is CMS willing to pay for? (In Figure 1 above, note how much cheaper Practice 1 is versus Practice 6 – is the additional, efficiently produced quality worth the additional cost?) This might be a difficult issue to resolve in principle, but our preliminary results, presented later in the paper, suggest that practices with higher input efficiency scores tend to have both lower costs *and* higher quality than practices with lower efficiency scores.

The example discussed above involved only one input (cost) and one output (one quality measure). That is of course unrealistic for any actual CMS effort to measure the performance of physician practices. Fortunately, one of the important advantages of the DEA model over many other models (e.g., stochastic frontier models) is that it is not limited to one input and one output. There can be multiple inputs and multiple outputs. In this application, that means that there can be multiple cost and quality measures – that is, we can make policy decisions about which cost and quality measures we think should be used to measure the performance of physicians, and the DEA model will permit us to combine the inputs or outputs we have chosen.[26]

Dropping or adding a quality measure could change the rank of a physician relative to other physicians in the peer group. (Not surprisingly, if we dropped or added a measure on which a physician did particularly well or poorly, the physician's relative performance would change.) However, *linear* transformations of any quality measure will not change the relative rank of the physician. Thus, for example, standardizing a quality measure by subtracting its mean and dividing by its standard deviation would not affect the results of DEA analysis. "Importance weights" derived, for example, by weighting each quality measure by the total number of beneficiaries (as opposed to the number in each practice) affected by the measure also would have no effect on the results from DEA analysis.[27]

Nonetheless, there are ways that CMS could give more weight to individual quality

[26] The LIMDEP computer program that we are using for the analysis currently limits the number of inputs and outputs to a total of 19 variables.

[27] However, transformations that differ from one physician to another such as shrinkage estimators will change the relative rankings.

measures. CMS could create composite measures prior to the DEA analysis that give greater weight to some measures. For example, if CMS wanted to give greater weight to diabetes care rather than colon cancer screening, CMS could create a composite measure that did that, then run DEA on the composite measure. Alternatively, CMS could establish minimum floor levels of quality for some measures, denying payment updates to providers who did not meet the minimum quality levels. Conversely, CMS could give bonus payments to providers who scored well on individual quality measures, in addition to, or even regardless of, the provider's input efficiency score from the DEA analysis.

An Empirical Example

We applied DEA analysis to a sample of Medicare claims data from the state of Colorado in 2008. Data were analyzed at the tax identification number (TIN) level. We began with a 100 percent sample of beneficiaries in Colorado in 2008, but limited the DEA analysis to TINs that had patients eligible for all of the quality measures in the analysis. That meant that the TIN had to have at least one diabetic patient, for example. There were 1,201 TINs in our dataset.

The input – risk-adjusted cost – is the residual from two beneficiary-level cost regressions – inpatient and outpatient costs.[28] As noted earlier, the regressors (risk adjustment variables) are the HCC categories and demographic variables used by CMS to pay private Medicare Advantage health plans in the Medicare program.

The quality measures we selected have two critical properties: (1) they are practical for Medicare to derive from claims data for each TIN; and (2) they enjoy a broad consensus among authoritative clinical and policy audiences. The measures we have selected are:

a. Avoidable emergency department (ED) visits (Billings, Parikh and Mijanovich, 2000)
   - Non-emergent ED visits per beneficiary
   - Primary care treatable ED visits per beneficiary
   - Preventable/avoi-dable ED visits per beneficiary[29]

b. Ambulatory care sensitive (ACS) admissions per admission (AHRQ, 2011)

c. Potentially preventable rehospitalizations per admission (Goldfeld, et al., 2007)

d. Claims-computable quality measures (CMS, 2011):[30]
   a. Colon cancer per eligible beneficiary
   b. Breast cancer screening per eligible beneficiary
   c. Outpatient diabetes per eligible beneficiary
   d. HbA1c screening per eligible beneficiary

[28] Inpatient and outpatient costs are analyzed separately because we use a different set of risk adjustment variables in the two equations. The outpatient cost equation includes diagnoses related to the ambulatory care sensitive (ACS) hospitalization conditions, while the inpatient cost equation excludes them.

[29] Bryan E. Dowd, et al., "Using Avoidable Emergency Department (ED) Visits as a Performance Measure for Medicare Physicians' Practices, (DRAFT)" paper submitted by the University of Minnesota pursuant to Medicare/Medicaid Research and Demonstration Task Order Contract (MRAD/TOC) HHSM-500-2005-00027I, T.O. 4, May 16, 2011.

[30] These measures were adjusted to the appropriate denominators.

e. LDL-C screening per eligible beneficiary

f. Medical attention for nephropathy per eligible beneficiary.

We used a simple and common attribution rule: the cost and quality of a beneficiary's care are attributed to the TIN from whom the beneficiary received a plurality of his/her evaluation and management visits. The DEA analysis was run in LIMDEP 9.0 (Greene, 2011).

The DEA algorithm requires all quality measures to be coded so that larger numbers represent higher quality or more desirable outcomes. Thus, avoidable emergency department (ED) admissions, ambulatory care sensitive (ACS) admissions, and potentially preventable rehospitalizations all were "reverse" coded so that larger numbers represent *avoided* undesirable events. The algorithm also requires that all inputs and outputs be positive, which is accomplished simply by adding a sufficiently large constant to each transformed quality measure and risk-adjusted cost. As noted above, none of these linear transformations have any effect on calculation of input efficiency scores. They simply facilitate implementation of the algorithm.

Results

The means and standard deviations of the variables in the analysis are shown in Table 1. These data are for the *original* variables prior to the transformations described above that are required for the DEA analysis.

Table 1. Means and standard deviations of cost and quality variables (N=1,201)

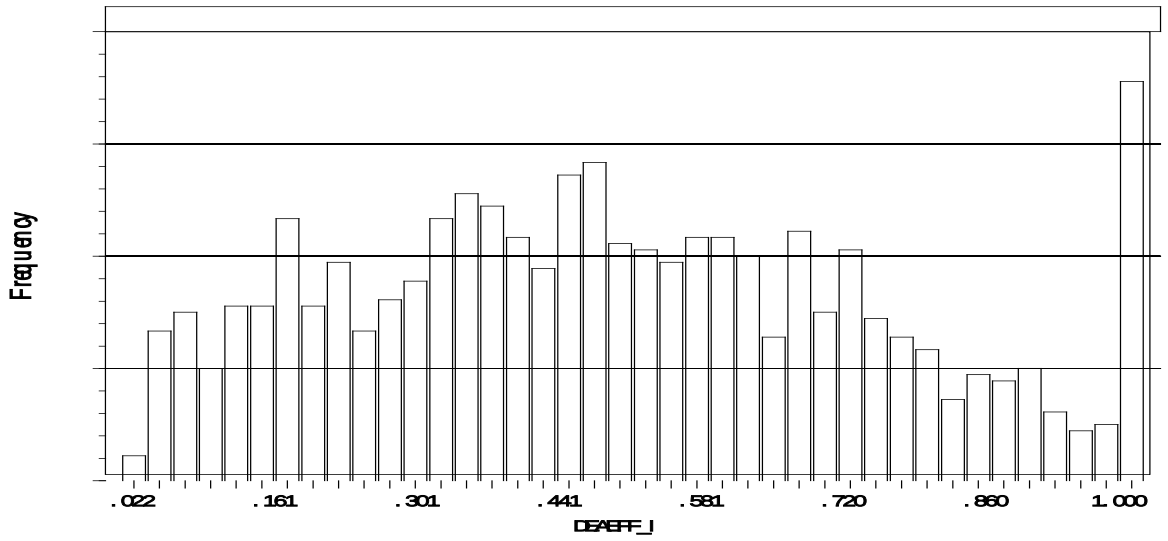
Variable	Mean	Standard Deviation
INPUT		
Risk-adjusted (residual) cost	958.36	3264.16
OUTPUTS		
Non-emergent ED visits per beneficiary	0.144	0.146
Primary care treatable ED visits per beneficiary	0.149	0.124
Preventable/avoidable ED visits per beneficiary	0.0653	0.062
Ambulatory care sensitive (ACS) admissions per admission	0.1070	0.113
Potentially preventable readmissions per admission	0.176	0.198
Colon cancer screening per eligible beneficiary[31]	0.120	0.106
Breast cancer screening per eligible beneficiary	0.216	0.195
Diabetes measures[32]		
HbA1c Screening per eligible beneficiary	0.688	0.351
LDL-C screening per eligible beneficiary	0.549	0.360
Medical attention for nephropathy per eligible beneficiary	0.564	0.301

[31] Measures are calculated for one year. Measures for events that should take place every two years, for example, would need to be doubled to estimate the rate of compliance.

[32] The diabetes measures were added together to form a single composite variable. See Dowd, et al. (2011) for a discussion of the equal weights.

The output from DEA analysis differs from regression analysis. There are no "explanatory" variables and no coefficients with standard errors. *Instead, for each TIN there is an input efficiency score indicating its relative distance to the frontier*. The distribution of input efficiency scores from our sample of data is shown in the bar graph in Figure 2, below.

Figure 2. Distribution of input efficiency scores



In this graph, the variable DEAEFF_1 is the input efficiency score, while the vertical axis shows the frequency with which each score occurs. TINs with an input efficiency score of 1.0 are on the frontier. Smaller scores (<1.0) reflect the distance from the frontier for individual TINs. How does one compute a confidence interval around a TIN's efficiency score? Confidence intervals may be important if DEA efficiency scores are to be used in a VBM payment system, if for no other reason than that CMS might well want to insist that efficiency scores for each TIN must be *significantly different* from the threshold to which payment consequences are attached.

The topic of confidence intervals for DEA efficiency scores is somewhat controversial (Ferrier and Hirschberg, 1997, 1998; Simar and Wilson, 1999). Unlike parametric statistical methods such as ordinary least squares (OLS) regression, DEA is a non-parametric method. There is no counterpart in DEA analysis to the assumption in OLS regression that the error term in the regression is normally distributed. Nonetheless, Simar and Wilson (1998) have proposed computing confidence intervals for efficiency scores using bootstrap methods. Bootstrap estimates of standard errors are used in many applications where the variance of an estimated coefficient or prediction function is not easily computed.[33]

The following table shows the confidence intervals for the input efficiency scores for the

[33] The bootstrap approach proceeds by drawing repeated samples of data *with replacement* from the original sample of data. The function (in this case the input efficiency for the s^{th} TIN) is computed for each bootstrap sample and the bootstrap estimate of the standard error is the square root of the variance of the estimates across the bootstrap samples.

first ten TINs in the 2008 Colorado data based on 100 replications of the DEA analysis.

Table 2. DEA output

(1) TIN	(2) Rank (out of 1,201 – lower is more efficient)	(3) Input efficiency	(4) Bootstrap bias	(5) Corrected efficiency	(6) Standard deviation	(7) Lower 95% confidence limit	(8) Upper 95% confidence limit
1	225	0.7319	-0.6547	1	0.0084	0.0637	0.0895
2	686	0.4311	0.2869	0.718	0.0101	0.1243	0.1597
3	627	0.4625	-0.3441	0.8066	0.0087	0.1048	0.1317
4	433	0.5800	-0.3495	0.9295	0.0193	0.2017	0.2619
5	830	0.3455	-0.1596	0.5052	0.0150	0.1628	0.2094
6	362	0.6242	-0.5340	1	0.0075	0.0780	0.1032
7	487	0.5480	-0.4084	0.9564	0.0107	0.1243	0.1558
8	972	0.2396	-0.1096	0.3492	0.0096	0.1135	0.147
9	595	0.4777	-0.3595	0.8372	0.0090	0.1022	0.1319
10	1155	0.0854	-0.0002	0.0856	0.0094	0.0695	0.1005

The input efficiency "point" estimate (column 3) is taken directly from the DEA estimation analogous to Figure 1.[34] If the corrected efficiency measure (lower or upper) is greater than 1, it is set equal to 1. The confidence intervals are the five and ninety-five percentile values of the distribution of bootstrap results.[35]

What the DEA measures tell us: Comparison of efficient and inefficient TINs

The results of the DEA analysis can be used to divide TINs into high and low efficiency TINs. Recall that input efficiency is a simple ratio: for any given level of quality – a horizontal line on Figure 1 – what is the ratio of cost of a *frontier* practice to the cost of a specific *actual* practice? We can take calculations of input efficiencies and put them into groups of the "most efficient" (the upper decile of input efficiency scores) and least efficient (the lowest decile of input efficiency scores). Table 3 compares the means of the quality and cost variables for practices that are in the highest and lowest deciles (10 percent) of input efficiency. The variables are in their original scales as in Table 1, rather than the linear transformations required for the DEA analysis.

[34] The bias (column 4) arises from use of the bootstrap approach to calculate confidence intervals. The bias is equal to the mean input efficiency estimated across the bootstrap samples (not shown) minus the point estimate (column 3). Note that the bias is negative, so we are subtracting a negative number. The bias-corrected efficiency measure (column 5) is equal to the point estimate (shown in Table 1) minus the estimated bias. As explained above, the standard deviation is the square root of the variance of the estimated efficiency scores for that practice across the 100 bootstrap samples.

[35] The confidence intervals are centered on the corrected efficiency estimates.

Table 3. Comparison of means of quality and cost of most efficient and least efficient TINs

	Lowest input efficiency (Decile #1) N=121	Highest input efficiency (Decile #10) N=120
Risk-adjusted cost residual	$ 3,204.19 (above average cost)	$ -791.20 (below average cost)
Quality measure		
Non-emergent ED visits per beneficiary	0.2372	0.1123
Primary care treatable ED visits per beneficiary	0.2439	0.1015
Preventable/avoidable ED visits per beneficiary	0.1315	0.0252
ACS admissions per admission	0.2465	0.0494
Potentially Preventable Readmissions per admission	0.2904	0.1120
Colon cancer screening per eligible beneficiary	0.0772	0.2747
Breast cancer screening per eligible beneficiary	0.0810	0.2286
Diabetes measures		
HbA1c Screening per eligible beneficiary	0.5340	0.7688
LDL-C screening per eligible beneficiary	0.3606	0.6955
a. Medical attention for nephropathy per eligible beneficiary	0.4333	0.6933

The results in Table 3 show that – compared to low-efficiency TINS – high efficiency TINs have:

a. Uniformly lower average rates of avoidable ED visits, ACS admissions and potentially preventable readmissions;

b. Uniformly higher average rates of preventive care (screening); and

c. Average risk adjusted costs that are over $4,000 ($3,204.19 – (-791.20)) per year lower.

These results constitute an important determination for any VBM system. The results permit us to give cost-quality scores to physician TINS and to say with some justification that a given practice is achieving less additional quality for the additional costs it imposes on the Medicare system. We know this because there are other practices – on the frontier – providing the same level of quality at lower cost.

For practices on the DEA frontier, higher risk-adjusted costs *necessarily* are associated with higher quality. The problem can exist for some practices inside the frontier if the distribution of practices inside the frontier was similar to Practices 3 and 7 in Figure 1. Practices 3 and 7 produce higher quality than Practice 1, but they are less efficient than Practice 1.

However, the DEA results described above suggest that input efficiency combines cost and quality in a way that – as it happens in this empirical example – largely sidesteps the tradeoff of cost and quality. In these data, lower cost practices are also higher quality in our sample. The results show that DEA efficiency scores have identified a set of TINs that have both lower risk-adjusted costs per beneficiary and higher quality scores than their inefficient counterparts. Given that the highly efficient practices are also the high quality practices, we might well conclude that so much of the cost-quality problem has been resolved (in relation to the inefficient practices), that we won't worry about any variation in costs within the group of highly efficient practices. Put differently,

since the high quality practices are low cost, we won't worry about the much smaller variation in costs among these high quality practices.

Thus far, we have compared only the lowest and highest efficiency TINs, but the following figures show the relationship between the deciles of efficiency and cost and quality measures in our analysis. The data are ordered from the least efficient TINs on the left to the most efficient TINs on the right.

Figure 3. Risk-adjusted cost by decile

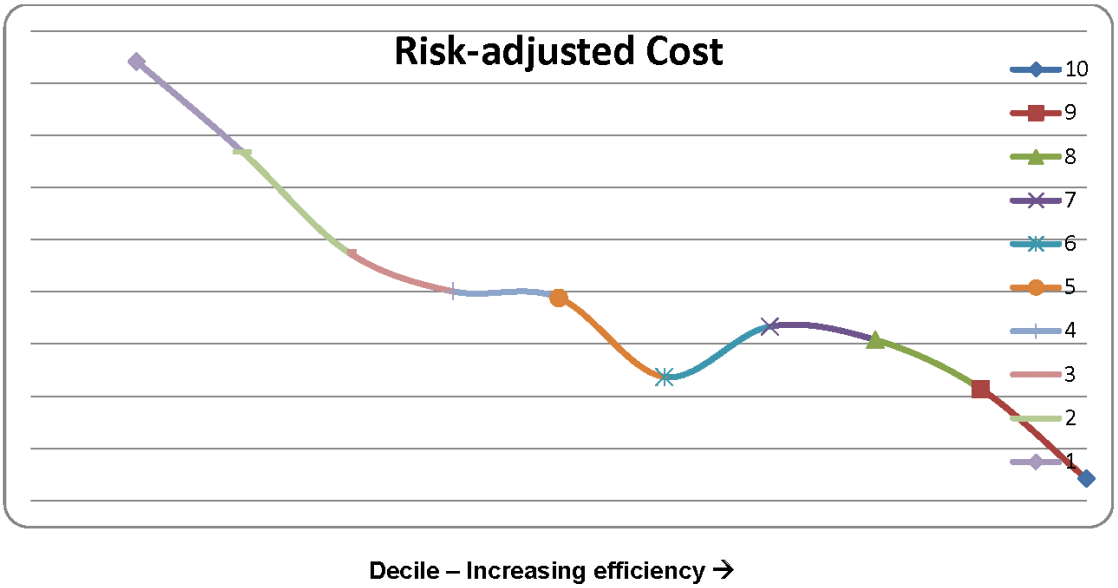
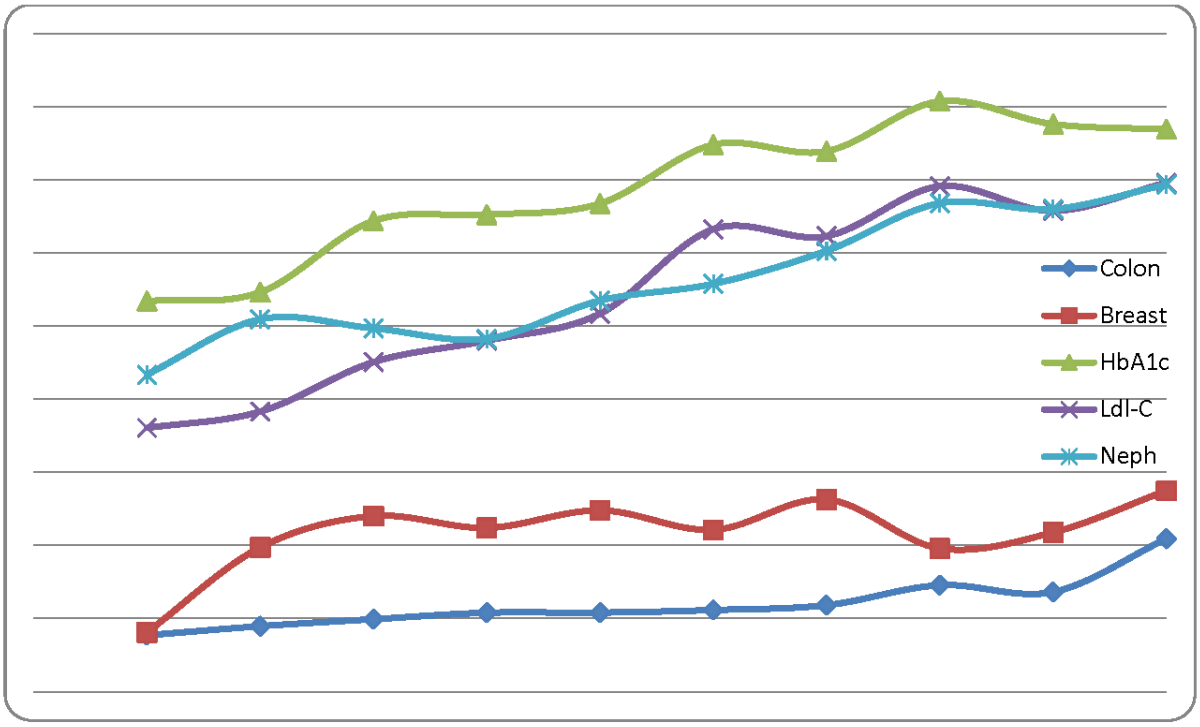


Figure 3 is a line graph that shows that cost (vertical axis) declines sharply from the least efficient TINs (1st decile) to the second, but then remains fairly constant until declining again in the most efficient TINs (9th and 10th deciles).

The next two figures are line graphs that show the relationship between deciles of efficiency for the two types of quality measures. Figure 4 shows quality measures that should increase as efficiency increases. The vertical axis represents the scale for each of the quality measures.

Figure 4. Quality measures that should increase with efficiency



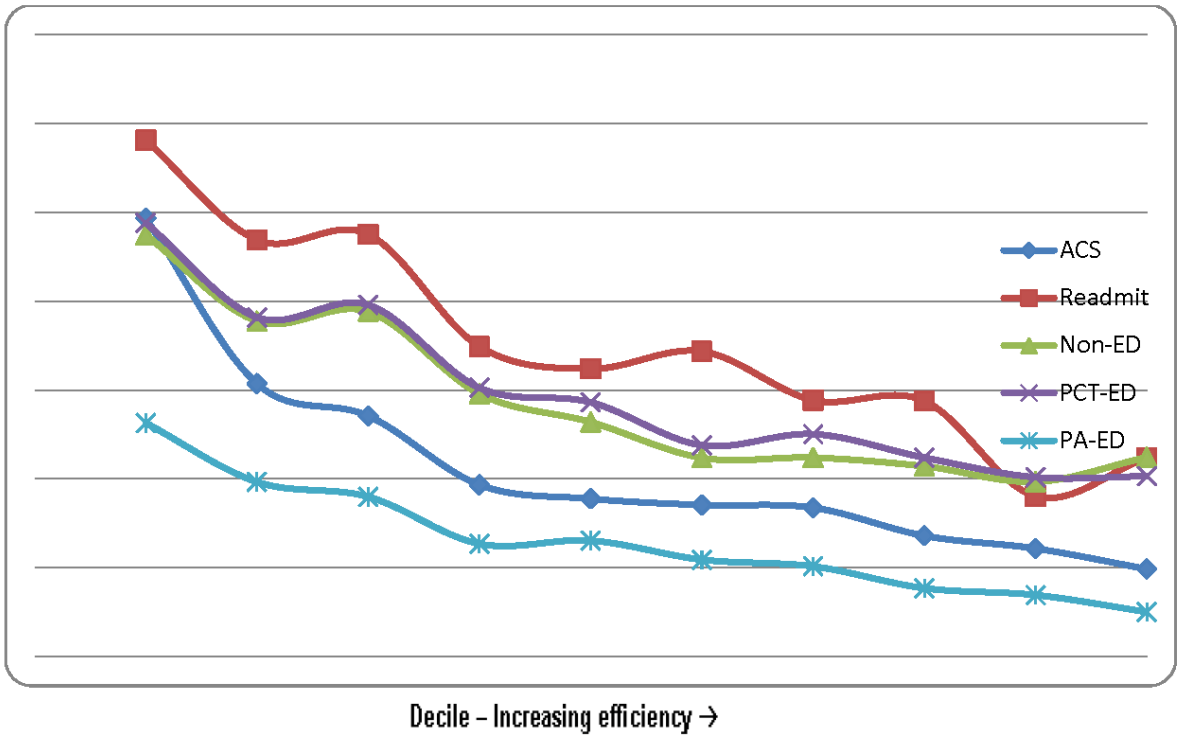
Colon = rate of colon cancer screening per eligible beneficiary
Breast = rate of breast cancer screening per eligible beneficiary
HbA1c = rate of HbA1c screening per eligible beneficiary
Ldl-C = rate of Ldl-C screening per eligible beneficiary
Neph = rate of medical attention for nephropathy per eligible beneficiary

Figure 4 shows that:

- The three diabetes measures (HbA1c, Ldl-C and medical attention for nephropathy) *generally* increase steadily as efficiency increases. Ldl-C exhibits the largest deviation from a steady increase.
- Colon and breast cancer screenings are more even throughout the efficiency range, but are lowest among the least efficient TINs.

Figure 5 is a line graph that shows the measures of inappropriate utilization that should *decrease* as efficiency increases. There is reasonably steady improvement in these quality measures as efficiency increases.

Figure 5. Quality measures that should decrease with efficiency



ACS = ambulatory care sensitive admissions per admission
Readmit = potentially preventable readmissions per admission
NE ED = non-emergent emergency department visits per beneficiary
PCT-ED = primary care treatable emergency department visits per beneficiary
PA-ED = preventable or avoidable emergency department visits per beneficiary

The high values of inappropriate utilization in the lowest decile of efficiency are not surprising, since inappropriate utilization also can have dramatic increase on the TIN's risk-adjusted cost. That fact raises the question, "Does the inclusion of inappropriate utilization unfairly penalize a TIN twice – once for having higher risk adjusted cost and again for having lower quality?" In fact, the TIN is penalized twice, but that may not be inappropriate, since unnecessary ED visits and hospitalizations actually penalize the Medicare program and beneficiaries twice – once for incurring unnecessary costs and again for exposing the beneficiary to the risks associated with any visit to the ED or any hospital admission.

Turning DEA input efficiency into payment policy

How can the results of DEA analysis be converted into value-based payment policy? There are several alternatives. First, the input efficiency score could be used as a continuous measure on which to compute the fee update. Like the RBRVU and DRG weights, this continuous variable

(with an upper bound of 1) could be multiplied by a feasible dollar figure that conformed to the current budget constraint on increased Medicare spending on physician services, to determine the fee increase for individual TINs. In this manner, CMS would give a greater reward *to the extent a practice is closer to the best practices*. Performance measurement here is not a threshold to be achieved, but a continuous incentive across the full range of the practices.

A second alternative is to divide the input efficiency scores into deciles as in Table 3 and base fee updates on the TIN's decile – simply a discretized version of the first option – or choose a cutoff decile and give increases to TINs that were at or above that decile. [36]

Third, information from the DEA analysis could be combined with incentives linked to individual cost or quality measures as discussed earlier in the paper – perhaps denying updates to TINs whose performance on a given quality measure is lower than a predetermined minimum, or giving extra incentive payments to TINs that perform well on specific measures.

Any of these approaches results in information that is easily interpreted by providers. Providers do not have to be familiar with, or even aware of, the DEA methodology (though obviously their interest will increase if the DEA scores are linked to payment policy). The DEA score can be presented as a performance score that combines cost and quality, and each provider could be presented with its decile or other ranking on individual cost and quality measures. In that way, the provider could see immediately which cost or quality measure contributed the most to its overall efficiency ranking.

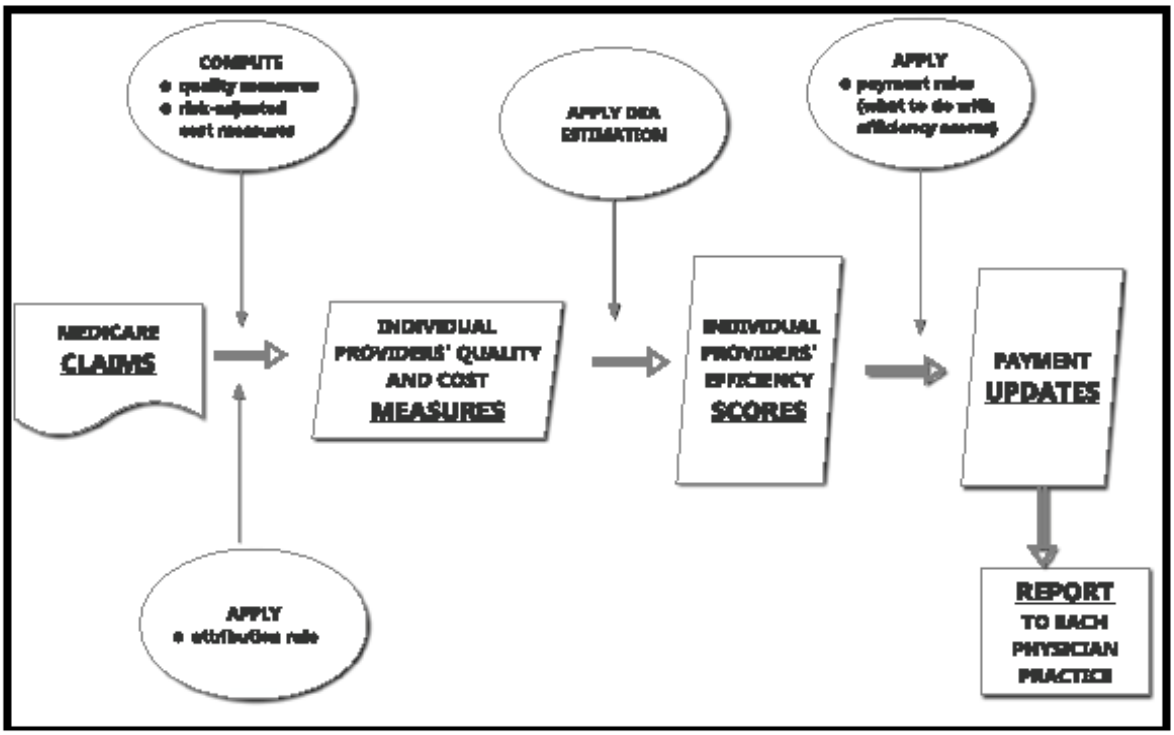
Regardless of the way in which the DEA results are linked to payment policy, it is important to emphasize that all of these approaches would reward practices that are producing relatively higher quality care at relatively lower cost using a methodology that:

- can include multiple measures of cost and quality;
- permits complete flexibility in the measures chosen;
- is practical to implement from current data;
- permits reports to physicians/TINS that identify clearly why overall efficiency scores are high or low.

Figure 6 below shows the basic steps in an implementation of DEA analysis for computing the fee updates and reporting to physicians.

[36] If CMS desired instead to avoid penalizing practices that aren't "too different" from the best practices, it could adopt a rule allowing some distance from the frontier before penalties applied: e.g., give fee increases to practices whose input efficiencies were not statistically different from the frontier value of 1.0. Such a rule would treat DEA results in a manner similar to the hospital mortality and readmission data reported by CMS.

Figure 6. Basic steps from claims data to fee updates using DEA



This would be a major improvement over current practices. It would also be a major improvement over simpler methods (e.g., tiers or quadrants) that have been used or proposed in the past. CMS would have defensible, sophisticated and flexible measure that presented providers with information that was fair, actionable and meaningful.

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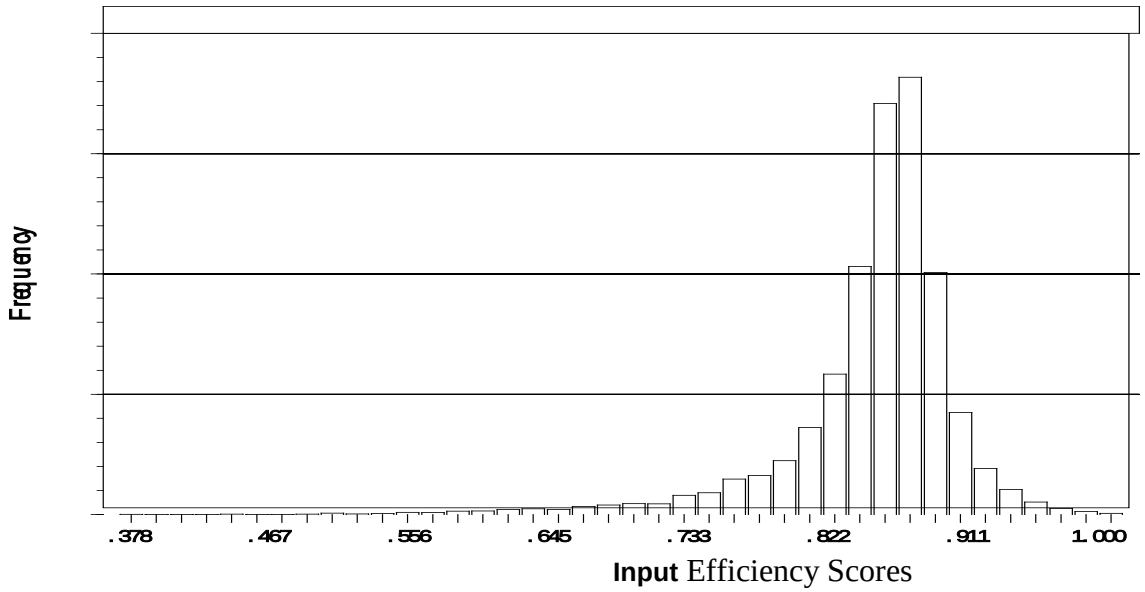
APPENDIX 15
ADDITIONAL DEA HISTOGRAMS AND PLOTS OF QUALITY MEASURES VERSUS COST

This Appendix contains basic data on additional measures not presented in the main text. When there is only one quality measure in the category, it is possible to show the scatter plot of risk adjusted cost versus the quality measure on which the DEA frontier was based. The descriptive statistics for all the measures are found in Table 4.*. In all cases, the sample sizes are determined by TINs who met the criterion of at least twenty eligible patients in both 2008 and 2009. For colon and breast cancer screening, the sample sizes had to be reduced further to accommodate the LIMDEP constraint for DEA analysis.**

A. Colon cancer screening

Of the 23,612 TINs that appeared in both the 2008 and 2009 data and had more than twenty attributable beneficiaries of all types, 22,356 or 95 percent had 20 or beneficiaries who were eligible for colon cancer screening. The distribution of input efficiency scores is shown in the bar graph in the following figure.

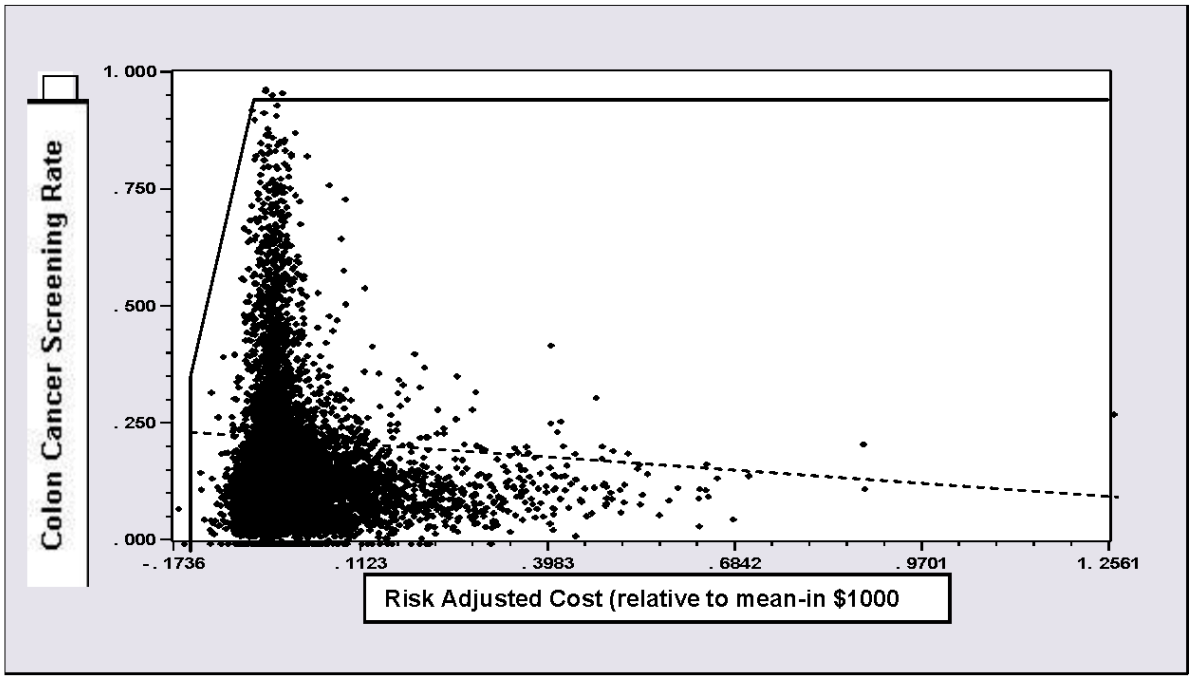
Figure 1. Distribution of input efficiency scores for colon cancer screening (5 state data 2008) N = 11,691



Because there is only one quality "output" it is possible to show a scatter plot of colon cancer screening versus risk adjusted cost on which the input efficiency scores were based. That scatter plot is shown in Figure 2, along with solid lines showing the DEA frontier. The scatter plot shows the importance of individual TINs in defining the frontier. Removal of one of the TINs on the frontier could shift the frontier significantly, but there would be little effect on the TINs that were in the upper and lower quartiles of efficiency. That is why we recommend the latter measures for incentive payments rather than the DEA efficiency score itself. The dotted least squares

regression line shows that colon cancer screening rates generally decline as risk adjusted cost increases.

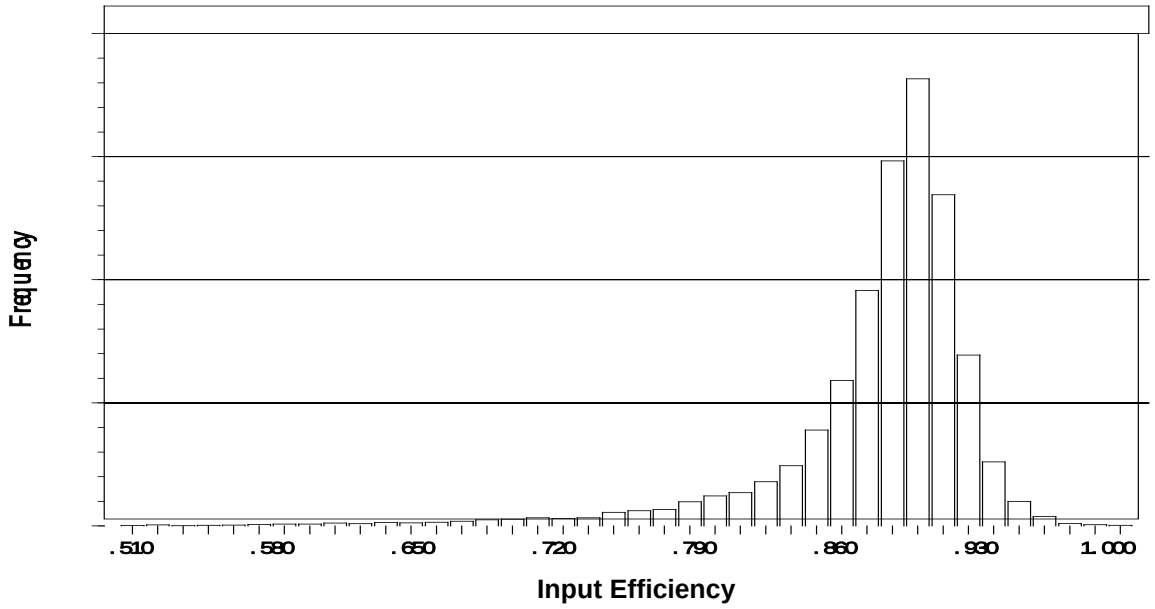
Figure 2. DEA frontier for colon cancer screening (5 state data 2008)



B. Breast cancer screening

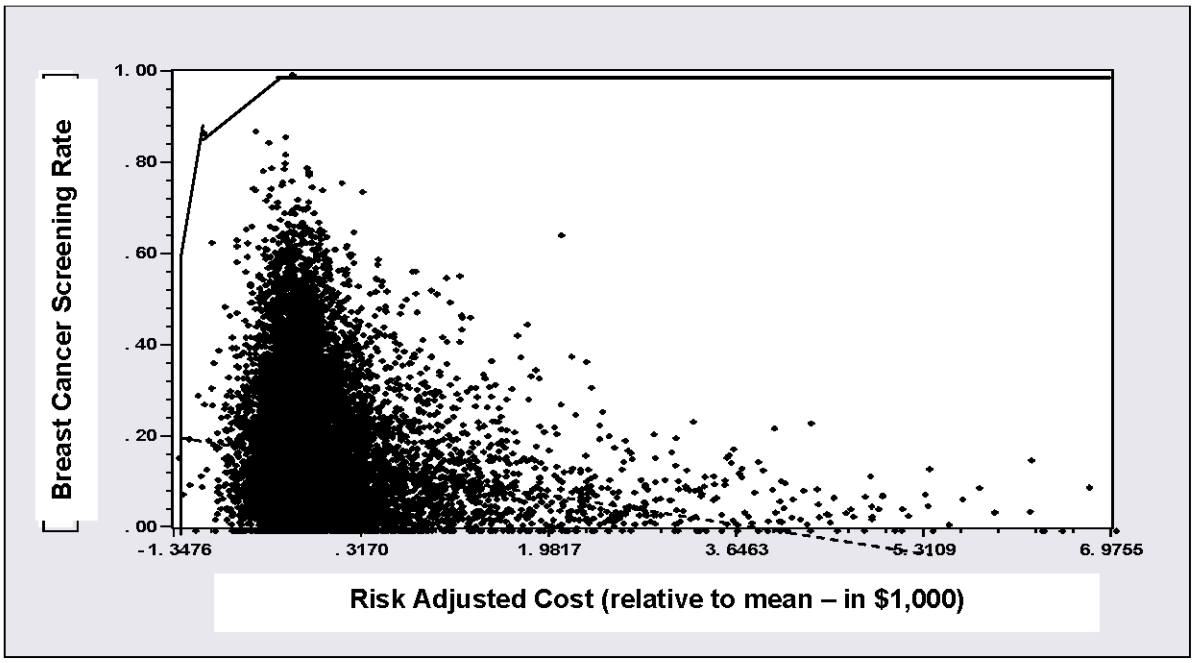
Of the 23,612 TINs that appeared in both the 2008 and 2009 data and had more than twenty attributable beneficiaries of all types, 18,489 or 78percent had 20 or beneficiaries who were eligible for breast cancer screening. The distribution of input efficiency scores for breast cancer screening is shown in the bar graph in Figure 3.

Figure 3. Distribution of input efficiency scores for breast cancer screening (5 state data 2008) N=11,622



The DEA frontier for breast cancer screening is shown in the scatterplot in Figure 4 below. In this case, the fronttier is even more dependent on a few TINs than the frontier for colon cancer screening, once again illustrating the importance of using quartiles of efficiency rather than the DEA efficiency measure itself. The dotted least squares regression line shows that breast cancer screening rates generally decline as risk adjusted cost increases.

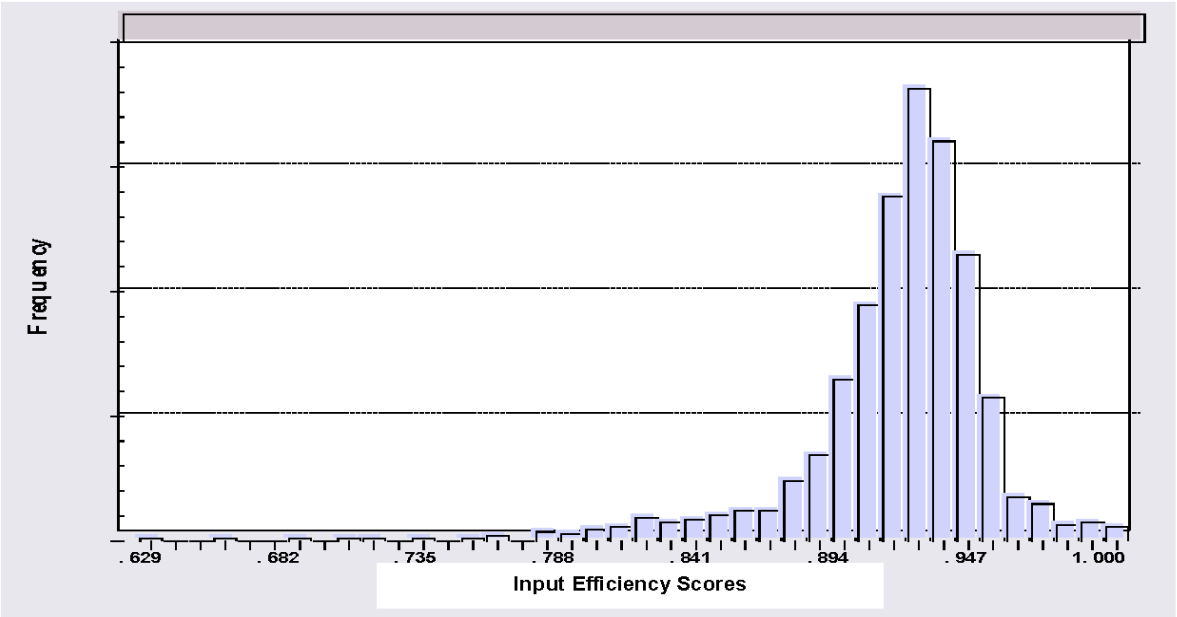
Figure 4. DEA frontier for breast cancer screening (5 state data 2008) N=11,622



C. CVD-Ldl

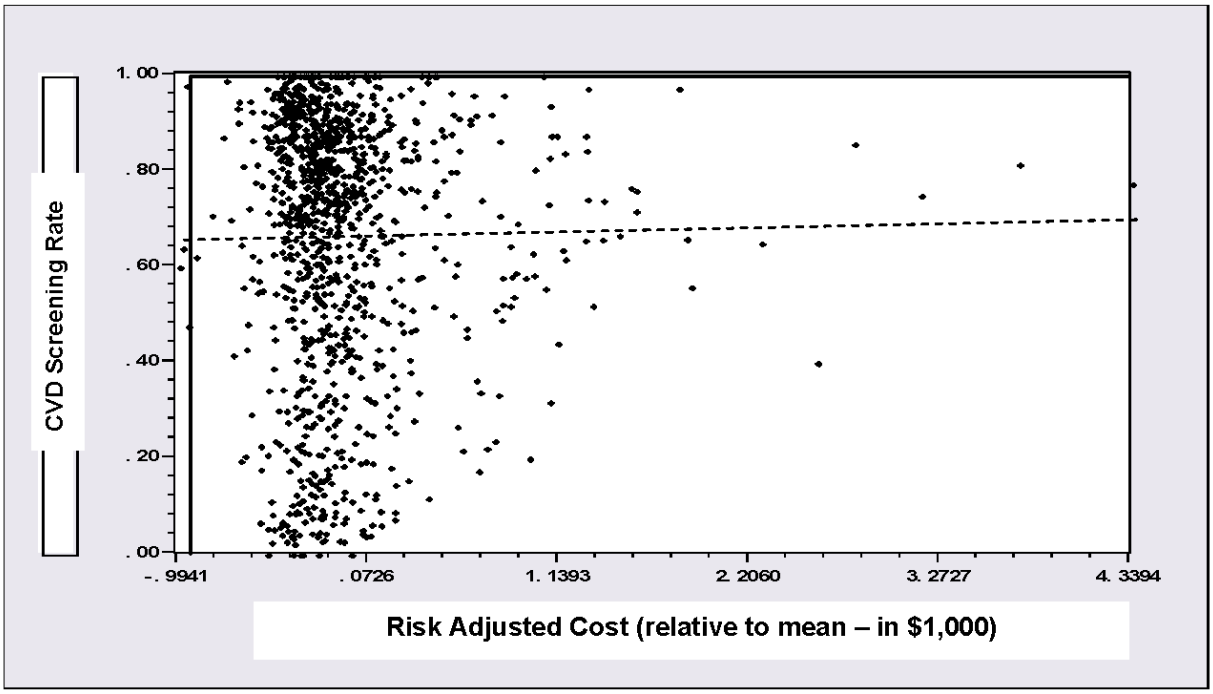
Of the 23,612 TINs that appeared in both the 2008 and 2009 data and had more than twenty attributable beneficiaries of all types, only 1,090 or five percent had 20 or beneficiaries who were eligible for CVD-Ldl testing. The distribution of input efficiency scores is shown in the bar graph in Figure 5 below.

Figure 5. Distribution of input efficiency scores for CVD-Ldl testing (5 state data 2008) N=1,090



The DEA frontier looks quite different for CVD-Ldl testing, as shown in the scatterplot in Figure 6. There is a concentration of TINs with relatively low cost and high quality in the upper left-hand portion of the figure. But overall, quality increases very slightly as risk adjusted cost increases, as shown by the dotted least squares regression line. Because one of the lowest cost TINs also has one of the highest rates of CVD-LdL testing, the frontier is virtually two sides of a rectangle.

Figure 6. DEA frontier for CVD-Ldl testing (5 state data 2008) N = 1,090



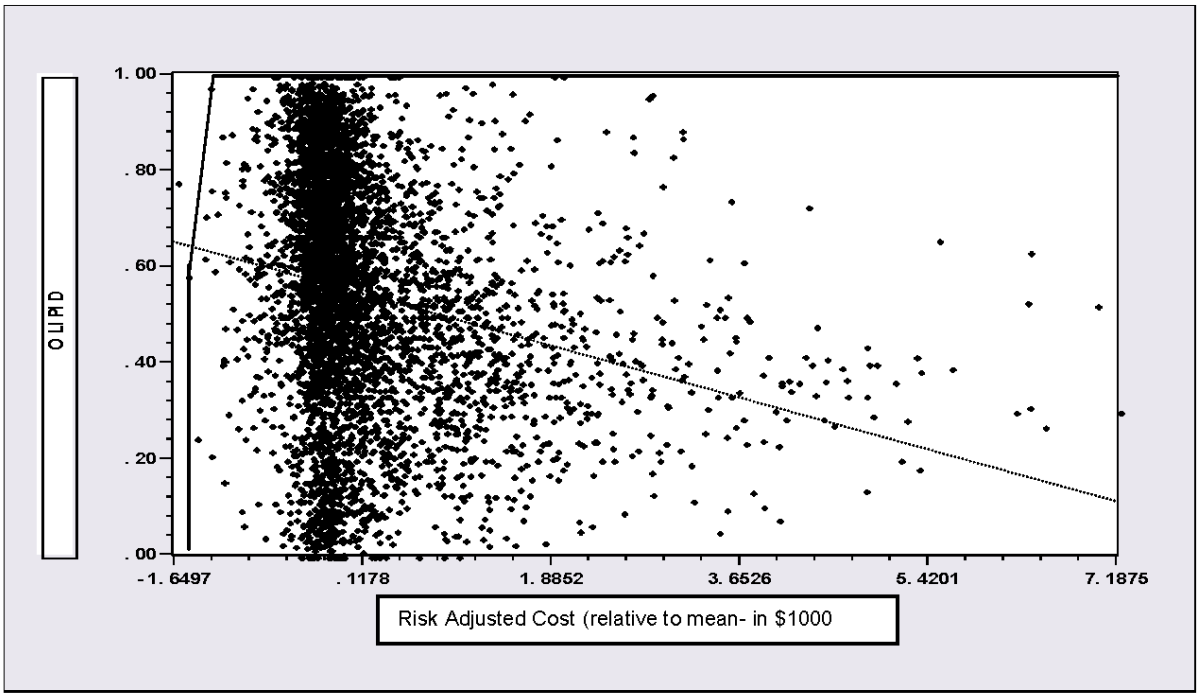
D. Lipid Testing

Of the 23,612 TINs that appeared in both the 2008 and 2009 data and had more than twenty attributable beneficiaries of all types, 4,736 or 20 percent had 20 or beneficiaries who were eligible for lipid testing. The distribution of input efficiency scores is shown in the bar graph in Figure 7 below.

Figure 7. Distribution of input efficiency scores for lipid testing (5 state data 2008) N=1,090

The DEA frontier is shown in a scatterplot of risk adjusted cost versus quality in Figure 8. This frontier looks somewhat similar to that for CVD-Ldl testing, except for lipid testing, quality generally declines as cost increases, as indicated by the dotted least squares regression line. Among lower cost TINs, the concentration appears to be in the higher quality range. As in the case of CVD-Ldl testing the presence of a few lowest cost, higher quality TINs results in a nearly rectangular frontier.

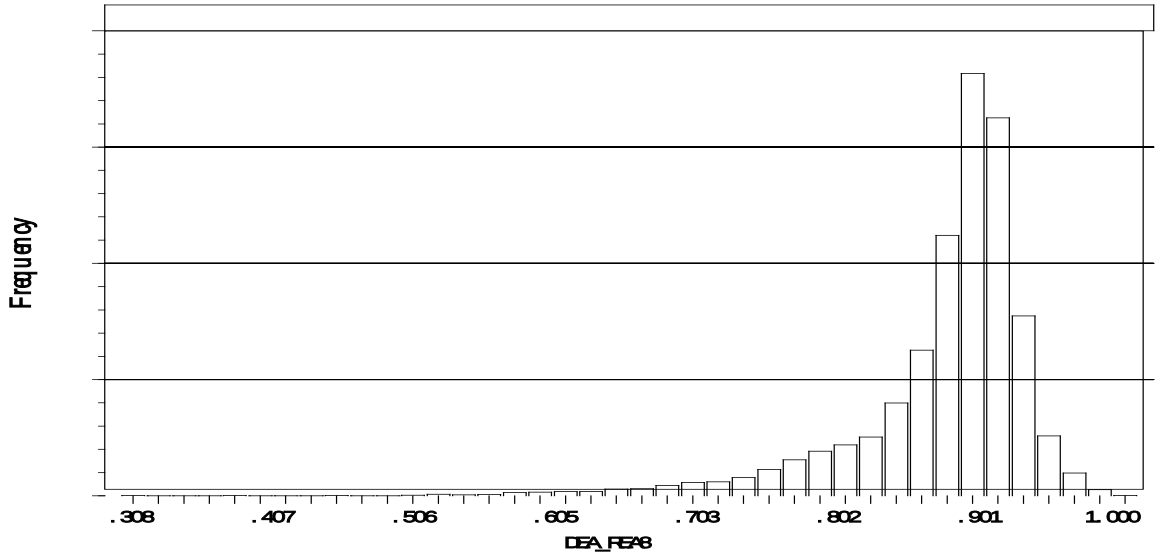
Figure 8. DEA frontier for lipid testing (5 state data 2008) N=4,736



E. Potentially preventable readmissions

Of the 23,612 TINs that appeared in both the 2008 and 2009 data and had more than twenty attributable beneficiaries, 10,026 or 42 percent had 20 or *hospitalized* beneficiaries who thus were eligible for the potentially preventable rehospitalization measure. The distribution of input efficiency scores is shown in the bar graph in Figure 9 below.

Figure 9. Distribution of input efficiency scores for potentially preventable readmissions (5 state data 2008) N=10,026



Reshopitalization were measured over three different periods following the initial hospitalization and thus there were three rehospitalization measures. Thus, it is not possible to plot cost versus quality in a two-dimensional graph.

APPENDIX 16.
DISTRIBUTION OF TINS AND RISK ADJUSTED COST ACROSS RISK ADJUSTED QUALITY TIERS IN DIFFERENT TIN PEER GROUPS

Table 1 (a): CHF: Percentage distribution of TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for Episode Proportion Peer Group 5 (Number of TINs=674)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score < -2	Risk Adjusted Cost z-Score -2 - -1	Risk Adjusted Cost z-Score -1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2	Total
5	0.0%	0.7%	14.5 %	3.9%	1.0%	0.0%	20.1%
4	0.0%	0.1%	14.3 %	5.1%	0.4%	0.1%	19.9%
3	0.1%	0.4%	12.1 %	6.6%	0.7%	0.1%	19.9%
2	0.0%	0.0%	11.1 %	7.9%	0.4%	0.3%	19.4%
1	0.0%	0.0%	9.6%	9.0%	1.0%	0.1%	19.6%
Total	0.1%	1.2%	61.6 %	32.5 %	3.5%	0.1%	100.0%

Table 1 (b): CHF: Average Risk Adjusted 30-day Episode Cost for TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for CHF Episode Proportion Peer Group 5 (Number of TINs=674)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score< -2	Risk Adjusted Cost z-Score- 2 - -1	Risk Adjusted Cost z-Score- 1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2
5	-	*$15,575	*$3,818	$3,915	$17,221	
4	-	*$21,824	*$3,934	$3,474	$14,847	$33,903
3	*$40,195	*$15,946	*$3,360	$3,000	$15,934	$37,747
2	-	-	*$3,176	$3,308	$18,577	$50,205
1	-	-	*$2,867	$3,819	$16,693	$36,321

*Cost is below expected

Table 2 (a): CHF: Percentage distribution of TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for Episode Proportion Peer Group 3 (Number of TINs=3,155)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score < -2	Risk Adjusted Cost z-Score -2 - -1	Risk Adjusted Cost z-Score -1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2	Total
5	0.3%	1.8%	11.0%	5.3%	1.3%	0.4%	20.1%
4	0.1%	1.1%	11.6%	6.1%	0.5%	0.4%	20.0%
3	0.0%	0.9%	11.7%	6.0%	0.9%	0.4%	20.0%
2	0.1%	0.7%	10.2%	6.8%	1.5%	0.7%	20.1%
1	0.0%	0.5%	9.6%	6.7%	2.1%	1.0%	19.8%
Total	0.5%	5.0%	54.3%	31.0%	6.3%	2.9%	100.0%

Table 2 (b): CHF: Average Risk Adjusted 30-day Episode Cost for TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for CHF Episode Proportion Peer Group 3 (Number of TINs=3,155)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score < -2	Risk Adjusted Cost z-Score -2 - -1	Risk Adjusted Cost z-Score -1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2
5	*$7,328	*$4,211	*$1,583	$1,005	$3,980	$8,563
4	*$11,823	*$3,971	*$1,516	$957	$3,786	$12,005
3	-	*$4,195	*$1,397	$852	$4,123	$10,736
2	-$7,922	*$3,988	*$1,320	$839	$4,224	$9,828
1	-	*$4,060	*$1,386	$940	$4,311	$13,721

*Cost is below expected

Table 3 (a): CHF: Percentage distribution of TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for Episode Proportion Peer Group 1 (Number of TINs=9,007)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score < -2	Risk Adjusted Cost z-Score -2 - -1	Risk Adjusted Cost z-Score-1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2	Total
5	0.2%	1.0%	12.4%	5.7%	0.6%	0.2%	20.0%
4	0.0%	0.7%	12.6%	5.8%	0.6%	0.3%	20.0%
3	0.1%	0.5%	12.5%	5.9%	0.6%	0.4%	20.0%
2	0.0%	0.6%	12.3%	5.3%	1.0%	0.7%	20.0%
1	0.0%	0.7%	10.3%	6.7%	1.3%	0.9%	19.9%
Total	0.4%	3.6%	60.0%	29.3%	4.1%	2.5%	100.0%

Table 3 (b): CHF: Average Risk Adjusted 30-day Episode Cost for TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for CHF Episode Proportion Peer Group 1 (Number of TINs=9,007)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score < -2	Risk Adjusted Cost z-Score -2 - -1	Risk Adjusted Cost z-Score - 1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2
5	*$3,900	*$1,428	*$271	$509	$1,805	$5,022
4	*$3,004	*$1,387	*$262	$502	$1,671	$4,274
3	*$3,156	*$1,361	*$220	$548	$1,760	$5,015
2	*$2,446	*$1,394	*$235	$562	$1,824	$5,342
1	*$3,856	*$1,363	*$240	$585	$1,868	$4,933

*Cost is below expected

Table 4 (a): Hip Replacement: Percentage distribution of TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for Episode Proportion Peer Group 5 (Number of TINs=371)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score< -2	Risk Adjusted Cost z-Score-2 - -1	Risk Adjusted Cost z-Score-1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2	Total
5	1.4%	2.2%	9.8%	6.3%	0.3%	0.3%	20.0%
4	0.0%	1.6%	11.7%	5.7%	0.8%	0.3%	19.8%
3	0.0%	1.9%	9.5%	6.8%	1.6%	0.5%	19.8%
2	0.0%	1.9%	7.1%	8.4%	2.2%	0.0%	19.6%
1	0.0%	0.0%	6.0%	9.8%	2.7%	1.4%	18.5%
Total	1.4%	7.6%	44.1%	37.0%	7.6%	1.4%	100.0%

Table 4 (b): Hip Replacement: Average Risk Adjusted 30-day Episode Cost for TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for CHF Episode Proportion Peer Group 5 (Number of TINs=371)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score < -2	Risk Adjusted Cost z-Score -2 - -1	Risk Adjusted Cost z-Score -1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2
5	*$14,003	*$5,995	*$2,306	$725	$4,028	$8,673
4	-	*$5,725	*$2,322	$793	$6,296	$15,491
3	-	*$5,812	*$2,510	$1,141	$5,308	$11,578
2	-	*$6,112	*$2,187	$1,176	$4,817	-
1	-	-	*$2,167	$1,217	$5,864	$14,856

*Cost is below expected

Table 5 (a): Hip Replacement: Percentage distribution of TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for Episode Proportion Peer Group 3 (Number of TINs=335)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score < -2	Risk Adjusted Cost z-Score -2 - -1	Risk Adjusted Cost z-Score - 1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2	Total
5	1.2%	2.1%	9.9%	5.1%	0.9%	0.6%	19.8%
4	0.6%	2.4%	7.8%	8.4%	0.9%	0.0%	20.1%
3	0.0%	2.1%	7.8%	8.1%	1.8%	0.3%	20.1%
2	0.3%	0.9%	9.3%	6.9%	1.8%	0.9%	20.1%
1	0.6%	0.9%	5.1%	8.7%	3.3%	1.2%	19.8%
Total	2.7%	8.4%	39.9%	37.2%	8.7%	3.0%	100.0%

Table 5 (b): Hip Replacement: Average Risk Adjusted 30-day Episode Cost for TINs across Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for CHF Episode Proportion Peer Group 3 (Number of TINs=335**)**

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score< -2	Risk Adjusted Cost z-Score- 2 - -1	Risk Adjusted Cost z-Score -1 - 0	Risk Adjusted Cost z-Score0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2
5	*$10,829	*$5,084	*$1,377	$1,631	$5,189	$7,778
4	*$8,477	*$4,958	*$1,621	$1,648	$4,684	-
3	-	*$4,251	*$1,487	$1,553	$5,431	$10,523
2	*$8,357	*$5,338	*$1,356	$2,130	$5,618	$10,702
1	*$14,292	*$4,604	*$998	$2,026	$4,899	$9,686

*Cost is below expected

Table 6 (a): Hip Replacement: Percentage distribution of TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for Episode Proportion Peer Group 1 (Number of TINs=7,487)

Quality Tier	Risk Adjusted Cost z-Score< -2	Risk Adjusted Cost z-Score-2 - -1	Risk Adjusted Cost z-Score-1 - 0	Risk Adjusted Cost z-Score0 - 1	Risk Adjusted Cost z-Score1-2	Risk Adjusted Cost z-Score>2
5	*$2,652	*$1,139	*$241	$365	$1,275	$3,260
4	*$2,425	*$1,099	*$195	$382	$1,300	$3,194
3	*$2,772	*$1,075	*$171	$408	$1,296	$2,753
2	*$2,886	*$1,143	*$163	$437	$1,363	$3,380
1	*$3,939	*$1,131	*$170	$471	$1,362	$3,457

Table 6 (b): Hip Replacement: Average Risk Adjusted 30-day Episode Cost for TINs across Risk Adjusted Quality Tiers by Average Risk Adjusted 30-day episode cost z-score for CHF Episode Proportion Peer Group 1 (Number of TINs=7,487)

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score< -2	Risk Adjusted Cost z-Score-2 - -1	Risk Adjusted Cost z-Score-1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2	Total
5	0.8%	2.4%	11.1%	4.8%	0.5%	0.5%	20.0%
4	0.3%	1.2%	12.1%	5.6%	0.7%	0.1%	20.0%
3	0.1%	0.8%	11.6%	6.2%	0.9%	0.3%	19.9%
2	0.2%	0.7%	10.5%	6.6%	1.5%	0.6%	20.0%
1	0.2%	0.6%	8.0%	7.7%	2.4%	1.1%	20.0%
Total	1.6%	5.6%	53.3%	30.9%	6.0%	2.6%	100.0%

*Cost is below expected

APPENDIX17.
STABILITY OF TIN's RISK ADJUSTED QUALITY TIERS AND PERFORMANCE SCORES BETWEEN 30- AND 60-DAY EPISODES

Stability of TIN's Risk Adjusted Quality Tiers and Performance Scores between 30- and 60-day episodes of CHF and Hip Replacement

For each of the two conditions, we examined the stability of TIN's risk adjusted quality tiers and TIN performance score (with respect to both quality and cost) over 30- and 60-day episodes. The analysis was performed separately for each episode proportion peer group.

The first step was, for each peer group, to quantify the TINs' risk adjusted quality tiers and risk adjusted cost z-scores into a single performance rank (index). The performance score rank assigned to TINs in each peer group, based on their risk adjusted quality tiers and risk adjusted cost z-scores is shown in Table 1 below. This table is an extension of Table 6-4. An important feature of this assignment of ranks, common to Table 6.4, is that quality trumps cost. In other words, even the highest cost TIN in a higher quality tier receives a higher performance score than the lowest cost TIN in a lower quality tier. Again, the weights used here are illustrative only.

We then used Spearman's rank order correlation and frequency tables to examine the stability of TIN's risk adjusted quality tier and performance rank between 30- and 60- day episodes for TINs across episode proportion peer group for CHF and hip replacement.

Table 1: TIN's Performance Score Rank based on its Quality Tier and Risk-adjusted Cost z-score within a Peer Group

Risk Adjusted Quality Tier	Risk Adjusted Cost z-Score < -2	Risk Adjusted Cost z-Score -2 - -1	Risk Adjusted Cost z-Score -1 - 0	Risk Adjusted Cost z-Score 0 - 1	Risk Adjusted Cost z-Score 1-2	Risk Adjusted Cost z-Score >2
5	*30*	*29*	*28*	*27*	*26*	*25*
4	*24*	*23*	*22*	*21*	*20*	*19*
3	*18*	*17*	*16*	*15*	*14*	*13*
2	*12*	*11*	*10*	*9*	*8*	*7*
1	*6*	*5*	*4*	*3*	*2*	*1*

Table 2 (a). CHF: Stability of TIN's Risk Adjusted Quality Tiers between 30- and 60-day Episodes across TIN Episode Proportion Peer Groups

TIN'S EPISODE PROPORTION PEER GROUP	Rank Order Correlation Coefficient (Rho) between TIN's Risk Adjusted Quality Tier in 30- and 60-day Episode
5	0.62
4	0.60
3	0.53
2	0.53
1	0.52

Table 2 (b). Hip Replacement: Stability of TIN's Risk Adjusted Quality Tiers between 30- and 60-day Episodes across TIN Episode Proportion Peer Groups

TIN'S EPISODE PROPORTION PEER GROUP	Rank Order Correlation Coefficient (Rho) between TIN's Risk Adjusted Quality Tier in 30- and 60-day Episode
5	0.87
4	0.87
3	0.80
2	0.79
1	0.83

The correlation between a TIN's risk adjusted quality tiers for 30- and 60- day episodes of CHF and hip replacement across all peer groups is shown in Tables 2 (a) and 2 (b) . It should be kept in mind that TINs remain in the same proportion peer group for both 30- and 60-day episodes. The correlation coefficients in Tables 2 (a) and 2 (b) show us *how likely the TIN is to remain in the same quality tier within its peer group.* The correlation coefficient of approximately 0.54 for CHF means that only 29 percent[37] of the variation in TIN quality tiers is common between 30- and 60 day episodes of CHF. With a correlation coefficient of approximately 0.82, 67 percent of the variation in TIN quality tiers is common between 30- and 60- day episodes of hip fracture. *Hence, TINs providing higher quality of care compared to their peers in 30-day episodes may not be providing higher quality for 60-day episodes. Similarly, lower quality TINs in 30-day episodes may not be lower quality in 60-day episodes. This is more likely for CHF TINs than hip replacement TINs.*

Table 3 (a) and 3 (b) below show the frequency of TINs in the highest episode proportion peer group, across 30- and 60- day episode risk adjusted quality tiers for CHF and hip fracture respectively. Going from 30- to 60- day episodes of CHF, only 39 percent

[37] Note again that the square of the correlation coefficient (ρ^2) gives the percentage variation that is common between the two variables of interest; while 1-(ρ^2) is the percentage variation between the two variables that is unique.

of TINs in the highest episode proportion peer group remain in the same quality tier, while 31 percent move to higher tiers, and 30 percent move to lower quality tiers. In contrast, 68 percent of hip replacement TINs remain in the same quality tier, going from 30- to 60-day episodes. Meanwhile, 18 percent move to higher quality tiers, while 14 percent move to lower quality tiers. Between 30- and 60- day episodes, 32 percent hip replacement TINs change quality tiers compared to 61 percent CHF TINs, within the highest episode proportion peer group. *Again, hip replacement TINs are more stable with respect to their risk adjusted quality tiers between 30- to 60- day episodes compared to CHF TINs (whose quality scores are more likely to change if mortality, avoidable readmissions and avoidable ED visits are higher for 60-day episodes. CHF TINs that are low quality in 30-day episodes need not be low quality in 60-day episodes, and vice versa.*

Table 3(a). Stability of TIN's Risk Adjusted Quality Tiers between 30- and 60-day Episodes of CHF for TINs in the Highest Episode Proportion Peer Group
(showing number of TINs in peer group, with percent of TINs in parentheses)

TINs in 30-Day Episode Risk Adjusted Quality Tiers	TINs in 60-Day Risk Adjusted Quality Tiers: 1	TINs in 60-Day Risk Adjusted Quality Tiers: 2	TINs in 60-Day Risk Adjusted Quality Tiers: 3	TINs in 60-Day Risk Adjusted Quality Tiers: 4	TINs in 60-Day Risk Adjusted Quality Tiers: 5	Total
1	80 (11.9)	32 (4.8)	18 (2.7)	4 (0.6)	0 (0.0)	134 19.9
2	29 (4.3)	42 (6.2)	33 (4.9)	22 (3.3)	8 (1.2)	134 19.9
3	13 (1.9)	38 (5.6)	35 (5.2)	31 (4.6)	19 (2.8)	136 20.2
4	8 (1.2)	15 (2.2)	32 (4.8)	37 (5.5)	43 (6.4)	135 20.0
5	6 (0.9)	7 (1.0)	16 (24.0)	40 (5.9)	66 (9.8)	135 20.0
Total	136	134	134	134	136	674

Table 3(b). Stability of TIN's Risk Adjusted Quality Tiers between 30- and 60-day Episodes of Hip Replacement for TINs in the Highest Episode Proportion Peer Group (showing number of TINs in peer group, with percent of TINs in parentheses)

TINs in 30-Day Episode Risk Adjusted Quality Tiers	TINs in 60-Day Risk Adjusted Quality Tiers: 1	TINs in 60-Day Risk Adjusted Quality Tiers: 2	TINs in 60-Day Risk Adjusted Quality Tiers: 3	TINs in 60-Day Risk Adjusted Quality Tiers: 4	TINs in 60-Day Risk Adjusted Quality Tiers: 5	Total
1	56 (15.1)	16 (4.3)	2 (0.5)	0 (0.0)	0 (0.0)	74 20.0
2	12 (3.2)	44 (11.9)	18 (4.9)	0 (0.0)	0 (0.0)	74 20.0
3	4 (1.1)	9 (2.4)	45 (12.1)	15 (4.0)	2 (0.5)	75 20.2
4	2 (0.5)	4 (1.1)	6 (1.6)	49 (13.2)	13 (3.5)	74 20.0
5	0 (0.0)	1 (0.3)	4 (1.1)	10 (2.7)	59 (15.9)	74 20.0
Total	74	74	75	74	74	371

The correlation between 30- day and 60-day episode TIN performance rank scores for CHF and hip replacement across all peer groups was no different from that observed for quality tiers . Hence, changes in TIN's performance score ranks, going from 30- to 60- day episodes were more likely to come from changes in TIN's risk adjusted quality tiers than changes in TIN's risk adjusted cost z-scores. *Costs are therefore more stable than quality between 30- and 60-day episodes.* For surgical MS-DRGs like hip replacement, knee replacement, cholecystectomy, back pain etc., there is relatively better stability between 30- and 60-day quality measures (data not shown). But for medical MS-DRGs like CHF, COPD, AMI, Pneumonia, etc., the stability between quality measures or tiers is much poorer between 30- and 60-day episodes. Moreover, 60-day episodes for MS-DRG capture more variation in both cost and quality at the TIN level and would hence be more useful for measuring TIN performance.

The stability of TIN performance measures between 30- and 60-day episodes in part depends on the number of performance score ranks chosen. With fewer performance score ranks, less variation would be captured across cost and quality, but there would be better stability between 30- and 60-day episodes.

We therefore recommend that CMS use 60-day episodes, as they capture more variation in cost, quality and performance across TINs.

APPENDIX 18
REGRESSION RESULTS FROM BENEFICIARY COST ANALYSES

Appendix Table 1: Regression of Non-Inpatient Medicare Expenditures, 2008, 5 State Data

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Intercept	-4013.1410	51.5088	-77.91	<.0001
HCC1:HIV/AIDS	1872.7697	52.8595	35.43	<.0001
HCC2:Septicemia/Shock	1586.2575	27.9458	56.76	<.0001
HCC5:Opportunistic Infections	1245.2402	60.7164	20.51	<.0001
HCC7:Metastatic Cancer and Acute Leukemia	11509.0000	29.5854	389.01	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	4244.7535	33.8277	125.48	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	4369.5404	25.5851	170.78	<.0001
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	1294.1345	12.3968	104.39	<.0001
HCC15:Diabetes with Renal or Periperal Circulatory Manifestation	3411.6830	18.8531	180.96	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	2442.8708	19.9991	122.15	<.0001
HCC17:Diabetes with Acute Complications	1694.8273	83.7550	20.24	<.0001
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	1448.3270	27.1503	53.34	<.0001
HCC19:Diabetes without Complication	867.9566	9.8396	88.21	<.0001
HCC21:Protein-Calorie Malnutrition	1284.4532	33.3310	38.54	<.0001
HCC25:End-Stage Liver Disease	1730.1151	60.5201	28.59	<.0001
HCC26:Cirrhosis of Liver	964.1681	51.4428	18.74	<.0001
HCC27:Chronic Hepatitis	986.6432	47.0538	20.97	<.0001
HCC31:Intestinal Obstruction/Perforation	877.0318	25.2661	34.71	<.0001
HCC32:Pancreatic Disease	1308.4536	29.2450	44.74	<.0001
HCC33:Inflammatory Bowel Disease:	1139.8479	36.4844	31.24	<.0001
HCC37:Bone/Joint/Muscle Infections/Necrosis	2375.3517	33.4964	70.91	<.0001
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1932.6650	15.7859	122.43	<.0001
HCC44:Severe Hematological Disorders	5410.3937	33.4490	161.75	<.0001
HCC45:Disorders of Immunity	5057.6082	36.6540	137.98	<.0001
HCC51:Drug/Alcohol Psychosis	1274.3841	44.7917	28.45	<.0001
HCC52:Drug/Alcohol Dependence	813.6742	38.7151	21.02	<.0001
HCC54:Schizophrenia	1474.0653	27.8146	53.00	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	2082.0958	16.3432	127.40	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	5171.9078	69.7595	74.14	<.0001
HCC68:Paraplegia	5168.7879	80.3944	64.29	<.0001
HCC69:Spinal Cord Disorders/Injuries	2300.5307	40.6913	56.54	<.0001
HCC70:Muscular Dystrophy	2237.4914	152.1078	14.71	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
HCC71:Polyneuropathy:	1969.2338	15.3730	128.10	<.0001
HCC72:Multiple Sclerosis	2958.1522	50.0031	59.16	<.0001
HCC73:Parkinsons and Huntingtons Diseases	3698.7231	27.6601	133.72	<.0001
HCC74:Seizure Disorders and Convulsions	1201.2284	20.8331	57.66	<.0001
HCC75:Coma, Brain Compression/Anoxic Damage	890.0763	77.0048	11.56	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	1907.5728	72.4201	26.34	<.0001
HCC78:Respiratory Arrest	1106.8696	121.6686	9.10	<.0001
HCC79:Cardio-Respiratory Failure and Shock	1436.8959	19.1521	75.03	<.0001
HCC80:Congestive Heart Failure	2069.2990	11.5557	179.07	<.0001
HCC81:Acute Myocardial Infarction	-9.0285	32.6668	-0.28	0.7823
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	728.1794	20.8316	34.96	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction	636.6794	15.0476	42.31	<.0001
HCC92:Specified Heart Arrhythmias:	906.5159	10.9835	82.53	<.0001
HCC95:Cerebral Hemorrhage	1415.2572	51.6287	27.41	<.0001
HCC96:Ischemic or Unspecified Stroke	1570.6128	17.8700	87.89	<.0001
HCC100:Hemiplegia/Hemiparesis	2637.2207	33.5473	78.61	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	669.4944	64.1025	10.44	<.0001
HCC104:Vascular Disease with Complications	2413.6114	22.6137	106.73	<.0001
HCC105:Vascular Disease	1523.7571	10.1975	149.42	<.0001
HCC107:Cystic Fibrosis	3588.4111	214.4087	16.74	<.0001
HCC108:Chronic Obstructive Pulmonary	1740.8980	10.2741	169.45	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	703.7796	36.8460	19.10	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	491.0251	51.8813	9.46	<.0001
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	2873.4440	34.1737	84.08	<.0001
HCC130:Dialysis Status	28011.0000	31.3996	892.07	<.0001
HCC131:Renal Failure	4036.2757	13.7578	293.38	<.0001
HCC132:Nephritis	-18.4136	70.0724	-0.26	0.7927
HCC148:Decubitus Ulcer of Skin	4019.8842	31.5968	127.22	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	2452.9895	21.7105	112.99	<.0001
HCC150:Extensive Third-Degree Burns	991.6769	548.9413	1.81	0.0708
HCC154:Severe Head Injury	545.2203	262.5185	2.08	0.0378
HCC155:Major Head Injury	796.3231	44.2314	18.00	<.0001
HCC157:Vertebral Fractures without Spinal Cord Injury	2225.5155	28.9660	76.83	<.0001
HCC158:Hip Fracture/Dislocation	2351.5495	29.0838	80.85	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
HCC161:Traumatic Amputation	5003.6200	87.8811	56.94	<.0001
HCC164:Major Complications of Medical Care and Trauma	1867.6229	18.7842	99.43	<.0001
HCC174:Major Organ Transplant Status	1683.8946	68.5033	24.58	<.0001
HCC176:Artificial Openings for Feeding or Elimination	2215.6402	39.8850	55.55	<.0001
HCC177:Amputation Status, Lower Limb/Amputation Complications	4524.9756	61.6490	73.40	<.0001
Female, age 35-44	258.6904	51.6296	5.01	<.0001
Female, age 45-54	532.2940	47.0633	11.31	<.0001
Female, age 55-59	1147.2535	49.6698	23.10	<.0001
Female, age 60-64	2293.6826	48.5442	47.25	<.0001
Female, age 65-69	6600.0022	52.0904	126.70	<.0001
Female, age 70-74	6963.8348	52.4277	132.83	<.0001
Female, age 75-79	7481.3802	52.5936	142.25	<.0001
Female, age 80-84	8088.0422	52.8437	153.06	<.0001
Female, age 85-89	8918.2556	53.6512	166.23	<.0001
Female, age 90-94	9667.8430	56.4203	171.35	<.0001
Female, age 95 and older	10080.0000	65.8945	152.97	<.0001
Male, Infant - age 34	14.8224	58.2014	0.25	0.7990
Male, age 35-44	340.6511	51.3865	6.63	<.0001
Male, age 45-54	429.0811	47.1109	9.11	<.0001
Male, age 55-59	938.7891	50.3657	18.64	<.0001
Male, age 60-64	1756.4316	49.2075	35.69	<.0001
Male, age 65-69	6373.4721	52.2655	121.94	<.0001
Male, age 70-74	6782.2408	52.7604	128.55	<.0001
Male, age 75-79	7303.5166	53.0798	137.60	<.0001
Male, age 80-84	7757.0438	53.6910	144.48	<.0001
Male, age 85-89	8464.9728	55.4232	152.73	<.0001
Male, age 90-94	9156.0512	62.6254	146.20	<.0001
Male, age 95 and older	9534.4871	94.6699	100.71	<.0001
African American	1019.2507	13.0587	78.05	<.0001
Other Race/Ethnicity	-1016.1420	25.5157	-39.82	<.0001
Asian	-2068.2672	20.7346	-99.75	<.0001
Hispanic	173.1529	20.3741	8.50	<.0001
Native American	-1099.4045	49.1372	-22.37	<.0001
Disabled Medicare Entitled	5999.6787	30.3896	197.43	<.0001
Medicaid Enrolled	1542.5556	9.8047	157.33	<.0001

Analysis of Variance

Sum of Mean

Source	DF	Squares	Square	F Value	Pr > F
Model	100	5.415966E14	5.415966E12	42501.3	<.0001
Error	1.07E7	1.359082E15	127430546		
Corrected Total	1.07E7	1.900678E15			

Root MSE	11289	R-Square	0.2849
Dependent Mean	7733.31449	Adj R-Sq	0.2849
Coeff Var	145.97252		

Appendix Table 2: Regression of Non-Inpatient Medicare Expenditures, 2009, 5 State Data

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Intercept	-72.4500	57.6421	-1.26	0.2088
HCC1:HIV/AIDS	2032.9793	57.4306	35.40	<.0001
HCC2:Septicemia/Shock	-2567.9623	24.4500	-105.03	<.0001
HCC5:Opportunistic Infections	454.5074	56.2107	8.09	<.0001
HCC7:Metastatic Cancer and Acute Leukemia	5157.6659	26.2515	196.47	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	2981.4749	33.5026	88.99	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	4150.3547	26.8375	154.65	<.0001
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	1423.7576	13.5211	105.30	<.0001
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	3893.6231	19.7244	197.40	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	2486.3586	21.1146	117.76	<.0001
HCC17:Diabetes with Acute Complications	1919.4377	87.4751	21.94	<.0001
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	1750.4521	29.6879	58.96	<.0001
HCC19:Diabetes without Complication	881.9517	10.8198	81.51	<.0001
HCC21:Protein-Calorie Malnutrition	-2013.1213	26.8537	-74.97	<.0001
HCC25:End-Stage Liver Disease	-791.8254	53.9376	-14.68	<.0001
HCC26:Cirrhosis of Liver	563.3158	53.8603	10.46	<.0001
HCC27:Chronic Hepatitis	1297.9829	51.2833	25.31	<.0001
HCC31:Intestinal Obstruction/Perforation	378.7000	24.4074	15.52	<.0001
HCC32:Pancreatic Disease	1391.7289	29.1918	47.68	<.0001
HCC33:Inflammatory Bowel Disease:	1406.9490	37.9936	37.03	<.0001
HCC37:Bone/Joint/Muscle Infections/Necrosis	2698.9699	34.0717	79.21	<.0001
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	2209.5998	17.0162	129.85	<.0001
HCC44:Severe Hematological Disorders	3642.4538	32.0469	113.66	<.0001
HCC45:Disorders of Immunity	4210.2899	35.9036	117.27	<.0001
HCC51:Drug/Alcohol Psychosis	1568.7397	43.8571	35.77	<.0001
HCC52:Drug/Alcohol Dependence	1325.3410	40.0542	33.09	<.0001
HCC54:Schizophrenia	1902.5787	30.3494	62.69	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	2267.6881	17.3773	130.50	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	5824.4454	69.4265	83.89	<.0001
HCC68:Paraplegia	5377.3023	77.1876	69.67	<.0001
HCC69:Spinal Cord Disorders/Injuries	2376.1264	42.2795	56.20	<.0001
HCC70:Muscular Dystrophy	2595.0434	153.3931	16.92	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
HCC71:Polyneuropathy:	2479.3987	16.2319	152.75	<.0001
HCC72:Multiple Sclerosis	3174.4598	53.7757	59.03	<.0001
HCC73:Parkinsons and Huntingtons Diseases	3617.3275	28.6459	126.28	<.0001
HCC74:Seizure Disorders and Convulsions	1401.3631	21.4653	65.29	<.0001
HCC75:Coma, Brain Compression/Anoxic Damage	-4831.7861	54.3987	-88.82	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	-2331.4911	56.6419	-41.16	<.0001
HCC78:Respiratory Arrest	-6147.9145	88.9866	-69.09	<.0001
HCC79:Cardio-Respiratory Failure and Shock	-1561.9730	17.8558	-87.48	<.0001
HCC80:Congestive Heart Failure	1984.5728	12.2680	161.77	<.0001
HCC81:Acute Myocardial Infarction	-1426.1278	29.2929	-48.69	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	1000.7953	22.3742	44.73	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction	914.9672	16.3044	56.12	<.0001
HCC92:Specified Heart Arrhythmias:	728.8749	11.5893	62.89	<.0001
HCC95:Cerebral Hemorrhage	-94.6259	46.6425	-2.03	0.0425
HCC96:Ischemic or Unspecified Stroke	1144.2274	18.5585	61.66	<.0001
HCC100:Hemiplegia/Hemiparesis	2250.9851	31.8553	70.66	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	968.9702	68.7898	14.09	<.0001
HCC104:Vascular Disease with Complications	1905.7235	22.5383	84.55	<.0001
HCC105:Vascular Disease	1811.4262	10.8338	167.20	<.0001
HCC107:Cystic Fibrosis	4767.0169	224.6800	21.22	<.0001
HCC108:Chronic Obstructive Pulmonary	1904.4282	10.9753	173.52	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	-1663.1477	30.3654	-54.77	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	160.4761	48.7707	3.29	0.0010
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	4095.3536	37.6737	108.71	<.0001
HCC130:Dialysis Status	24245.0000	32.7428	740.47	<.0001
HCC131:Renal Failure	3307.4740	13.7219	241.04	<.0001
HCC132:Nephritis	-76.6044	78.0580	-0.98	0.3264
HCC148:Decubitus Ulcer of Skin	441.0029	27.6222	15.97	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	2495.6687	23.2622	107.28	<.0001
HCC150:Extensive Third-Degree Burns	173.0487	503.0663	0.34	0.7309
HCC154:Severe Head Injury	-2845.7328	195.1245	-14.58	<.0001
HCC155:Major Head Injury	1129.4682	44.0776	25.62	<.0001
HCC157:Vertebral Fractures without Spinal Cord Injury	2205.5926	29.1602	75.64	<.0001
HCC158:Hip Fracture/Dislocation	1888.0941	28.4702	66.32	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
HCC161:Traumatic Amputation	4490.7121	87.7170	51.20	<.0001
HCC164:Major Complications of Medical Care and Trauma	2465.1049	18.9675	129.96	<.0001
HCC174:Major Organ Transplant Status	2676.6412	70.7004	37.86	<.0001
HCC176:Artificial Openings for Feeding or Elimination	2392.4598	36.8032	65.01	<.0001
HCC177:Amputation Status, Lower Limb/Amputation Complications	3316.5549	61.1490	54.24	<.0001
Female, age 35-44	174.4941	58.0574	3.01	0.0027
Female, age 45-54	353.1985	52.9319	6.67	<.0001
Female, age 55-59	942.5016	55.8763	16.87	<.0001
Female, age 60-64	1583.3279	54.6267	28.98	<.0001
Female, age 65-69	3084.7920	58.2739	52.94	<.0001
Female, age 70-74	3513.8629	58.6372	59.93	<.0001
Female, age 75-79	4024.8466	58.8254	68.42	<.0001
Female, age 80-84	4618.3774	59.1150	78.13	<.0001
Female, age 85-89	5162.9198	60.0448	85.98	<.0001
Female, age 90-94	5333.2527	63.1913	84.40	<.0001
Female, age 95 and older	4745.8615	73.8872	64.23	<.0001
Male, Infant - age 34	-51.0127	65.4571	-0.78	0.4358
Male, age 35-44	269.3770	57.7872	4.66	<.0001
Male, age 45-54	237.6909	52.9874	4.49	<.0001
Male, age 55-59	588.2119	56.6669	10.38	<.0001
Male, age 60-64	936.4716	55.3870	16.91	<.0001
Male, age 65-69	2791.3170	58.4879	47.72	<.0001
Male, age 70-74	3253.2558	59.0192	55.12	<.0001
Male, age 75-79	3658.6175	59.3767	61.62	<.0001
Male, age 80-84	4032.1907	60.0709	67.12	<.0001
Male, age 85-89	4251.2795	62.0442	68.52	<.0001
Male, age 90-94	4327.9768	70.1963	61.66	<.0001
Male, age 95 and older	3711.7544	106.3274	34.91	<.0001
African American	1312.9163	14.7102	89.25	<.0001
Other Race/Ethnicity	-1047.9140	28.6967	-36.52	<.0001
Asian	-1779.7571	23.3213	-76.31	<.0001
Hispanic	143.4678	22.9154	6.26	<.0001
Native American	-747.6035	55.2557	-13.53	<.0001
Disabled Medicare Entitled	2926.0109	33.4827	87.39	<.0001
Medicaid Enrolled	1006.1763	11.0012	91.46	<.0001

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	100	4.054134E14	4.054134E12	25160.5	<.0001
Error	1.07E7	1.718504E15	161130811		
Corrected Total	1.07E7	2.123918E15			

Root MSE	12694	R-Square	0.1909
Dependent Mean	8054.69209	Adj R-Sq	0.1909
Coeff Var	157.59424		

Appendix Table 3: Inpatient Medicare Expenditures, Two-Part Model of Probit of Any Inpatient Expenditures and Regression of Positive Expenditures, 2008, 5 State Data
Part 1 – Probit

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Intercept	-1.0503	0.0062	28573.32	<.0001
HCC1:HIV/AIDS	0.0460	0.0064	52.55	<.0001
HCC2:Septicemia/Shock	0.0827	0.0033	621.82	<.0001
HCC5:Opportunistic Infections	0.1445	0.0073	391.77	<.0001
HCC7:Metastatic Cancer and Acute Leukemia	0.4009	0.0034	13532.26	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.2446	0.0040	3809.69	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.1611	0.0031	2788.80	<.0001
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0254	0.0015	275.14	<.0001
HCC21:Protein-Calorie Malnutrition	0.0675	0.0040	287.47	<.0001
HCC25:End-Stage Liver Disease	0.3916	0.0072	2921.58	<.0001
HCC26:Cirrhosis of Liver	0.2404	0.0061	1568.96	<.0001
HCC27:Chronic Hepatitis	0.0852	0.0057	221.88	<.0001
HCC31:Intestinal Obstruction/Perforation	0.1748	0.0030	3432.73	<.0001
HCC32:Pancreatic Disease	0.1873	0.0035	2928.99	<.0001
HCC33:Inflammatory Bowel Disease:	0.1231	0.0044	792.89	<.0001
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.1689	0.0040	1800.07	<.0001
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.1402	0.0019	5494.31	<.0001
HCC44:Severe Hematological Disorders	0.2230	0.0039	3205.65	<.0001
HCC45:Disorders of Immunity	0.1244	0.0043	815.82	<.0001
HCC51:Drug/Alcohol Psychosis	0.4297	0.0053	6596.17	<.0001
HCC52:Drug/Alcohol Dependence	0.3860	0.0045	7369.11	<.0001
HCC54:Schizophrenia	0.3337	0.0033	10544.77	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.1674	0.0020	7396.67	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	0.2756	0.0082	1123.26	<.0001
HCC68:Paraplegia	0.3007	0.0095	1013.90	<.0001
HCC69:Spinal Cord Disorders/Injuries	0.1648	0.0048	1176.46	<.0001
HCC70:Muscular Dystrophy	0.0814	0.0181	14.15	0.0002
HCC71:Polyneuropathy:	0.1534	0.0018	7517.89	<.0001
HCC72:Multiple Sclerosis	0.1420	0.0060	580.08	<.0001
HCC73:Parkinsons and Huntingtons Diseases	0.2330	0.0032	5161.98	<.0001
HCC75:Coma, Brain Compression/Anoxic Damage	0.0290	0.0093	10.25	0.0014

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
HCC77:Respirator Dependence/Tracheostomy Status	0.0862	0.0088	94.92	<.0001
HCC78:Respiratory Arrest	0.1399	0.0147	67.57	<.0001
HCC81:Acute Myocardial Infarction	0.1770	0.0039	2095.69	<.0001
HCC92:Specified Heart Arrhythmias:	0.1633	0.0013	15847.63	<.0001
HCC95:Cerebral Hemorrhage	0.1255	0.0061	425.67	<.0001
HCC96:Ischemic or Unspecified Stroke	0.1681	0.0021	6459.16	<.0001
HCC100:Hemiplegia/Hemiparesis	0.1411	0.0039	1275.75	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.0595	0.0077	59.94	<.0001
HCC104:Vascular Disease with Complications	0.1962	0.0027	5456.12	<.0001
HCC105:Vascular Disease	0.1293	0.0012	11480.30	<.0001
HCC107:Cystic Fibrosis	0.3807	0.0250	217.40	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	0.0629	0.0044	208.94	<.0001
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.1811	0.0040	2057.74	<.0001
HCC130:Dialysis Status	0.5826	0.0037	24919.22	<.0001
HCC131:Renal Failure	0.2807	0.0016	31864.88	<.0001
HCC132:Nephritis	0.1462	0.0083	310.53	<.0001
HCC148:Decubitus Ulcer of Skin	0.1240	0.0038	1090.74	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1590	0.0025	3947.38	<.0001
HCC150:Extensive Third-Degree Burns	0.0436	0.0653	1.77	0.1828
HCC154:Severe Head Injury	0.0271	0.0313	0.97	0.3252
HCC155:Major Head Injury	0.0967	0.0052	341.75	<.0001
HCC157:Vertebral Fractures without Spinal Cord Injury	0.1944	0.0034	3274.71	<.0001
HCC158:Hip Fracture/Dislocation	0.1078	0.0034	997.53	<.0001
HCC161:Traumatic Amputation	0.0944	0.0107	74.10	<.0001
HCC164:Major Complications of Medical Care and Trauma	0.1156	0.0022	2741.81	<.0001
HCC174:Major Organ Transplant Status	0.1607	0.0081	393.58	<.0001
HCC176:Artificial Openings for Feeding or Elimination	0.2054	0.0047	1870.31	<.0001
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.2489	0.0074	1110.83	<.0001
Female, age 35-44	-0.1295	0.0062	416.28	<.0001
Female, age 45-54	-0.1600	0.0057	774.87	<.0001
Female, age 55-59	-0.1516	0.0060	622.92	<.0001
Female, age 60-64	-0.1082	0.0058	325.43	<.0001
Female, age 65-69	-0.1450	0.0063	495.29	<.0001
Female, age 70-74	-0.0492	0.0064	49.70	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Female, age 75-79	0.0664	0.0064	123.18	<.0001
Female, age 80-84	0.1750	0.0064	785.98	<.0001
Female, age 85-89	0.2874	0.0065	2026.86	<.0001
Female, age 90-94	0.3710	0.0068	3064.93	<.0001
Female, age 95 and older	0.3797	0.0078	2402.55	<.0001
Male, Infant - age 34	-0.1630	0.0071	510.69	<.0001
Male, age 35-44	-0.1765	0.0062	781.28	<.0001
Male, age 45-54	-0.1731	0.0057	905.56	<.0001
Male, age 55-59	-0.1469	0.0061	567.00	<.0001
Male, age 60-64	-0.1127	0.0059	343.27	<.0001
Male, age 65-69	-0.0955	0.0063	207.20	<.0001
Male, age 70-74	-0.0244	0.0064	9.82	0.0017
Male, age 75-79	0.0753	0.0064	153.40	<.0001
Male, age 80-84	0.1696	0.0065	716.69	<.0001
Male, age 85-89	0.2846	0.0067	1867.73	<.0001
Male, age 90-94	0.3961	0.0075	2865.90	<.0001
Male, age 95 and older	0.4765	0.0111	1913.43	<.0001
African American	0.1049	0.0016	4391.58	<.0001
Other Race/Ethnicity	-0.2257	0.0035	4238.66	<.0001
Asian	-0.4057	0.0029	19676.59	<.0001
Hispanic	-0.1937	0.0026	5533.02	<.0001
Native American	0.0992	0.0059	284.07	<.0001
Disabled Medicare Entitled	0.2166	0.0038	3341.41	<.0001
Medicaid Enrolled	0.0967	0.0012	6546.46	<.0001
HCC19:Diabetes without Complication (w/o ASC diagnoses)	0.0868	0.0012	5376.86	<.0001
HCC79:Cardio-Respiratory Failure and Shock (w/o ASC diagnoses)	0.1807	0.0022	6520.64	<.0001
HCC80:Congestive Heart Failure (w/o ASC diagnoses)	0.2418	0.0013	32684.53	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease (w/o ASC diagnoses)	0.1827	0.0025	5569.33	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction (w/o ASC diagnoses)	0.1319	0.0018	5481.00	<.0001
HCC108:Chronic Obstructive Pulmonary (w/o ASC diagnoses)	0.2558	0.0012	44754.49	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess (w/o ASC diagnoses)	0.1263	0.0061	430.53	<.0001

Part 2 – Regression

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Intercept	14124.0000	177.7021	79.48	<.0001
HCC1:HIV/AIDS	3843.0244	216.2524	17.77	<.0001
HCC2:Septicemia/Shock	4537.4014	86.6506	52.36	<.0001
HCC5:Opportunistic Infections	3539.1438	200.7000	17.63	<.0001
HCC7:Metastatic Cancer and Acute Leukemia	2196.9990	102.2253	21.49	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	1913.0305	122.9617	15.56	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	2073.7080	102.5723	20.22	<.0001
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-242.7492	55.8851	-4.34	<.0001
HCC21:Protein-Calorie Malnutrition	2467.7220	103.6024	23.82	<.0001
HCC25:End-Stage Liver Disease	7070.2339	191.4071	36.94	<.0001
HCC26:Cirrhosis of Liver	1972.7653	179.4767	10.99	<.0001
HCC27:Chronic Hepatitis	2122.7198	184.6632	11.50	<.0001
HCC31:Intestinal Obstruction/Perforation	1764.8499	84.9125	20.78	<.0001
HCC32:Pancreatic Disease	2056.4367	102.1699	20.13	<.0001
HCC33:Inflammatory Bowel Disease:	611.2238	143.0231	4.27	<.0001
HCC37:Bone/Joint/Muscle Infections/Necrosis	3538.2602	113.4637	31.18	<.0001
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	180.6425	63.9639	2.82	0.0047
HCC44:Severe Hematological Disorders	3247.4494	111.6903	29.08	<.0001
HCC45:Disorders of Immunity	973.8158	132.4826	7.35	<.0001
HCC51:Drug/Alcohol Psychosis	1323.1179	139.7649	9.47	<.0001
HCC52:Drug/Alcohol Dependence	1542.8700	129.7845	11.89	<.0001
HCC54:Schizophrenia	2110.3215	104.3496	20.22	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-396.5617	64.1563	-6.18	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	6612.9501	244.6883	27.03	<.0001
HCC68:Paraplegia	5670.2918	274.2342	20.68	<.0001
HCC69:Spinal Cord Disorders/Injuries	1509.3735	148.1933	10.19	<.0001
HCC70:Muscular Dystrophy	2807.2125	598.0816	4.69	<.0001
HCC71:Polyneuropathy:	685.7140	56.2051	12.20	<.0001
HCC72:Multiple Sclerosis	214.2778	201.4403	1.06	0.2875
HCC73:Parkinsons and Huntingtons Diseases	-162.8614	100.8829	-1.61	0.1064
HCC75:Coma, Brain Compression/Anoxic Damage	4802.6964	247.7096	19.39	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	18571.0000	220.6797	84.16	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
HCC78:Respiratory Arrest	9102.5260	364.9704	24.94	<.0001
HCC81:Acute Myocardial Infarction	2119.8387	105.3801	20.12	<.0001
HCC92:Specified Heart Arrhythmias:	404.9418	42.0245	9.64	<.0001
HCC95:Cerebral Hemorrhage	2252.0543	178.4627	12.62	<.0001
HCC96:Ischemic or Unspecified Stroke	407.0904	64.2315	6.34	<.0001
HCC100:Hemiplegia/Hemiparesis	743.8959	114.6578	6.49	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	513.5209	256.1991	2.00	0.0450
HCC104:Vascular Disease with Complications	3468.3804	77.8034	44.58	<.0001
HCC105:Vascular Disease	1003.7289	40.1175	25.02	<.0001
HCC107:Cystic Fibrosis	15714.0000	751.9837	20.90	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	3176.6108	114.1141	27.84	<.0001
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	2419.2969	121.2054	19.96	<.0001
HCC130:Dialysis Status	10978.0000	98.9186	110.98	<.0001
HCC131:Renal Failure	3501.9876	47.1860	74.22	<.0001
HCC132:Nephritis	1561.6298	279.3390	5.59	<.0001
HCC148:Decubitus Ulcer of Skin	2847.1394	100.9628	28.20	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	1796.3259	79.8419	22.50	<.0001
HCC150:Extensive Third-Degree Burns	12922.0000	0.5221	24750.10	<.0001
HCC154:Severe Head Injury	3819.2263	905.1852	4.22	<.0001
HCC155:Major Head Injury	-111.4068	158.5240	-0.70	0.4822
HCC157:Vertebral Fractures without Spinal Cord Injury	387.6743	103.7321	3.74	0.0002
HCC158:Hip Fracture/Dislocation	169.4987	101.9438	1.66	0.0964
HCC161:Traumatic Amputation	1277.9376	271.7693	4.70	<.0001
HCC164:Major Complications of Medical Care and Trauma	1420.6905	64.9149	21.89	<.0001
HCC174:Major Organ Transplant Status	9931.6624	235.1386	42.24	<.0001
HCC176:Artificial Openings for Feeding or Elimination	1996.2250	126.6161	15.77	<.0001
HCC177:Amputation Status, Lower Limb/Amputation Complications	2383.6777	187.5694	12.71	<.0001
Female, age 35-44	-615.8349	222.1024	-2.77	0.0056
Female, age 45-54	-146.5679	201.1024	-0.73	0.4661
Female, age 55-59	656.4500	212.0415	3.10	0.0020
Female, age 60-64	1356.9967	206.8694	6.56	<.0001
Female, age 65-69	812.5352	212.3047	3.83	0.0001
Female, age 70-74	431.5516	213.0823	2.03	0.0428
Female, age 75-79	38.6573	212.9762	0.18	0.8560
Female, age 80-84	-940.4199	213.2058	-4.41	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Female, age 85-89	-2287.0520	215.4240	-10.62	<.0001
Female, age 90-94	-3773.6089	224.4837	-16.81	<.0001
Female, age 95 and older	-4982.0201	258.1718	-19.30	<.0001
Male, Infant - age 34	2584.5324	258.4660	10.00	<.0001
Male, age 35-44	1600.0789	222.2605	7.20	<.0001
Male, age 45-54	2647.1943	200.9060	13.18	<.0001
Male, age 55-59	3669.0413	214.2200	17.13	<.0001
Male, age 60-64	3945.5394	209.8190	18.80	<.0001
Male, age 65-69	3521.2321	213.2717	16.51	<.0001
Male, age 70-74	2816.4908	214.6993	13.12	<.0001
Male, age 75-79	2475.4650	215.1280	11.51	<.0001
Male, age 80-84	1305.8693	216.6907	6.03	<.0001
Male, age 85-89	-321.5741	221.8663	-1.45	0.1472
Male, age 90-94	-2209.9430	244.7424	-9.03	<.0001
Male, age 95 and older	-3529.1267	348.5028	-10.13	<.0001
African American	3776.0094	54.9764	68.68	<.0001
Other Race/Ethnicity	3395.4452	143.0239	23.74	<.0001
Asian	3942.0327	120.3369	32.76	<.0001
Hispanic	2445.9490	98.5347	24.82	<.0001
Native American	309.8605	208.1736	1.49	0.1366
Disabled Medicare Entitled	645.2862	110.8287	5.82	<.0001
Medicaid Enrolled	1254.5543	41.4289	30.28	<.0001
HCC19:Diabetes without Complication (w/o ASC diagnoses)	91.8765	42.1183	2.18	0.0292
HCC79:Cardio-Respiratory Failure and Shock (w/o ASC diagnoses)	3256.8809	62.8155	51.85	<.0001
HCC80:Congestive Heart Failure (w/o ASC diagnoses)	2655.5322	41.8248	63.49	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease (w/o ASC diagnoses)	1303.8367	74.9445	17.40	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction (w/o ASC diagnoses)	-125.0894	58.0735	-2.15	0.0312
HCC108:Chronic Obstructive Pulmonary (w/o ASC diagnoses)	119.2921	38.2382	3.12	0.0018
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess (w/o ASC diagnoses)	1570.2906	171.0283	9.18	<.0001

Model Fit Summary

Number of Endogenous Variables	2
Number of Observations	10665376
Log Likelihood	-38198796
Maximum Absolute Gradient	90.97123
Number of Iterations	94
Optimization Method	Quasi-Newton
AIC	76397980
Schwarz Criterion	76400732

Appendix Table 4: Inpatient Medicare Expenditures, Two-Part Model of Probit of Any Inpatient Expenditures and Regression of Positive Expenditures, 2009, 5 State Data
Part 1 - Probit

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Intercept	-0.8946	0.0061	21675.70	<.0001
HCC1:HIV/AIDS	0.0356	0.0061	34.85	<.0001
HCC2:Septicemia/Shock	-0.1988	0.0026	6077.50	<.0001
HCC5:Opportunistic Infections	0.0753	0.0058	166.47	<.0001
HCC7:Metastatic Cancer and Acute Leukemia	0.0546	0.0028	386.94	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.1343	0.0035	1475.44	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.1338	0.0028	2217.38	<.0001
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0345	0.0015	544.76	<.0001
HCC21:Protein-Calorie Malnutrition	-0.1604	0.0028	3259.55	<.0001
HCC25:End-Stage Liver Disease	0.1198	0.0056	459.05	<.0001
HCC26:Cirrhosis of Liver	0.1767	0.0056	1002.92	<.0001
HCC27:Chronic Hepatitis	0.0905	0.0054	276.43	<.0001
HCC31:Intestinal Obstruction/Perforation	0.1057	0.0025	1742.59	<.0001
HCC32:Pancreatic Disease	0.1707	0.0030	3193.23	<.0001
HCC33:Inflammatory Bowel Disease:	0.1326	0.0040	1107.37	<.0001
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.1831	0.0035	2715.86	<.0001
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.1473	0.0018	6728.41	<.0001
HCC44:Severe Hematological Disorders	0.1474	0.0033	2004.14	<.0001
HCC45:Disorders of Immunity	0.1246	0.0037	1112.08	<.0001
HCC51:Drug/Alcohol Psychosis	0.3624	0.0045	6553.55	<.0001
HCC52:Drug/Alcohol Dependence	0.3511	0.0041	7426.24	<.0001
HCC54:Schizophrenia	0.3437	0.0031	12103.32	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.1689	0.0018	8586.54	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	0.3186	0.0072	1954.28	<.0001
HCC68:Paraplegia	0.3017	0.0079	1465.04	<.0001
HCC69:Spinal Cord Disorders/Injuries	0.1511	0.0044	1184.28	<.0001
HCC70:Muscular Dystrophy	0.1301	0.0161	50.43	<.0001
HCC71:Polyneuropathy:	0.1846	0.0016	12710.99	<.0001
HCC72:Multiple Sclerosis	0.1365	0.0057	583.49	<.0001
HCC73:Parkinsons and Huntingtons Diseases	0.1992	0.0030	4503.15	<.0001
HCC75:Coma, Brain Compression/Anoxic Damage	-0.3535	0.0060	3495.96	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
HCC77:Respirator Dependence/Tracheostomy Status	-0.1835	0.0060	962.03	<.0001
HCC78:Respiratory Arrest	-0.4322	0.0097	1946.76	<.0001
HCC81:Acute Myocardial Infarction	0.0087	0.0030	8.30	0.0040
HCC92:Specified Heart Arrhythmias:	0.1354	0.0012	12365.29	<.0001
HCC95:Cerebral Hemorrhage	-0.0151	0.0049	10.52	0.0012
HCC96:Ischemic or Unspecified Stroke	0.1220	0.0019	4035.75	<.0001
HCC100:Hemiplegia/Hemiparesis	0.0998	0.0033	918.92	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.0954	0.0073	172.32	<.0001
HCC104:Vascular Disease with Complications	0.1582	0.0023	4643.17	<.0001
HCC105:Vascular Disease	0.1437	0.0011	15954.45	<.0001
HCC107:Cystic Fibrosis	0.3921	0.0229	313.98	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1519	0.0032	2295.60	<.0001
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.2290	0.0038	3566.43	<.0001
HCC130:Dialysis Status	0.4582	0.0033	19042.68	<.0001
HCC131:Renal Failure	0.2022	0.0014	20835.31	<.0001
HCC132:Nephritis	0.1509	0.0081	347.25	<.0001
HCC148:Decubitus Ulcer of Skin	-0.0756	0.0029	688.88	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1577	0.0024	4306.68	<.0001
HCC150:Extensive Third-Degree Burns	0.0035	0.0532	0.03	0.8548
HCC154:Severe Head Injury	-0.2874	0.0219	169.18	<.0001
HCC155:Major Head Injury	0.0994	0.0046	476.32	<.0001
HCC157:Vertebral Fractures without Spinal Cord Injury	0.1712	0.0030	3231.60	<.0001
HCC158:Hip Fracture/Dislocation	0.0653	0.0030	489.01	<.0001
HCC161:Traumatic Amputation	0.0915	0.0090	104.81	<.0001
HCC164:Major Complications of Medical Care and Trauma	0.1487	0.0020	5785.36	<.0001
HCC174:Major Organ Transplant Status	0.1925	0.0073	693.59	<.0001
HCC176:Artificial Openings for Feeding or Elimination	0.2004	0.0038	2825.92	<.0001
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.1625	0.0063	669.55	<.0001
Female, age 35-44	-0.1236	0.0062	396.84	<.0001
Female, age 45-54	-0.1585	0.0056	792.71	<.0001
Female, age 55-59	-0.1476	0.0059	615.87	<.0001
Female, age 60-64	-0.1305	0.0058	501.79	<.0001
Female, age 65-69	-0.2694	0.0062	1866.53	<.0001
Female, age 70-74	-0.1692	0.0062	720.23	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Female, age 75-79	-0.0652	0.0062	101.20	<.0001
Female, age 80-84	0.0302	0.0063	27.38	<.0001
Female, age 85-89	0.0982	0.0063	252.62	<.0001
Female, age 90-94	0.1117	0.0067	295.97	<.0001
Female, age 95 and older	0.0068	0.0078	1.54	0.2143
Male, Infant - age 34	-0.1576	0.0070	499.51	<.0001
Male, age 35-44	-0.1740	0.0062	791.41	<.0001
Male, age 45-54	-0.1682	0.0056	885.41	<.0001
Male, age 55-59	-0.1523	0.0060	632.28	<.0001
Male, age 60-64	-0.1397	0.0059	559.16	<.0001
Male, age 65-69	-0.2302	0.0062	1348.77	<.0001
Male, age 70-74	-0.1561	0.0063	602.18	<.0001
Male, age 75-79	-0.0671	0.0063	105.80	<.0001
Male, age 80-84	0.0120	0.0064	5.44	0.0197
Male, age 85-89	0.0640	0.0066	103.26	<.0001
Male, age 90-94	0.0992	0.0074	191.62	<.0001
Male, age 95 and older	0.0520	0.0112	22.77	<.0001
African American	0.1120	0.0016	5113.69	<.0001
Other Race/Ethnicity	-0.2114	0.0034	3771.87	<.0001
Asian	-0.3568	0.0029	15567.27	<.0001
Hispanic	-0.1593	0.0026	3821.40	<.0001
Native American	0.1496	0.0059	652.78	<.0001
Disabled Medicare Entitled	0.0887	0.0036	640.28	<.0001
Medicaid Enrolled	0.0608	0.0012	2631.60	<.0001
HCC19:Diabetes without Complication (w/o ASC diagnoses)	0.0713	0.0012	3842.75	<.0001
HCC79:Cardio-Respiratory Failure and Shock (w/o ASC diagnoses)	-0.0620	0.0019	1114.99	<.0001
HCC80:Congestive Heart Failure (w/o ASC diagnoses)	0.2147	0.0013	28650.31	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease (w/o ASC diagnoses)	0.1821	0.0023	6217.97	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction (w/o ASC diagnoses)	0.1454	0.0017	7301.95	<.0001
HCC108:Chronic Obstructive Pulmonary (w/o ASC diagnoses)	0.2560	0.0012	49909.31	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess (w/o ASC diagnoses)	0.0773	0.0050	237.05	<.0001

Part 2 – Regression

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Intercept	14527.0000	223.6556	64.95	<.0001
HCC1:HIV/AIDS	4743.1329	227.5321	20.85	<.0001
HCC2:Septicemia/Shock	4055.0786	84.9746	47.72	<.0001
HCC5:Opportunistic Infections	3402.1351	196.4028	17.32	<.0001
HCC7:Metastatic Cancer and Acute Leukemia	1326.0317	103.0449	12.87	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	1533.7834	123.7533	12.39	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	1887.1015	104.4738	18.06	<.0001
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-401.2436	58.0478	-6.91	<.0001
HCC21:Protein-Calorie Malnutrition	1976.2916	95.9350	20.60	<.0001
HCC25:End-Stage Liver Disease	6194.5641	186.7481	33.17	<.0001
HCC26:Cirrhosis of Liver	1713.6009	188.2496	9.10	<.0001
HCC27:Chronic Hepatitis	2160.1190	194.5226	11.10	<.0001
HCC31:Intestinal Obstruction/Perforation	1803.6803	85.5096	21.09	<.0001
HCC32:Pancreatic Disease	1851.1371	101.9936	18.15	<.0001
HCC33:Inflammatory Bowel Disease:	543.2709	142.9495	3.80	0.0001
HCC37:Bone/Joint/Muscle Infections/Necrosis	3573.2610	114.3792	31.24	<.0001
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	292.2721	65.2352	4.48	<.0001
HCC44:Severe Hematological Disorders	3506.7502	110.0237	31.87	<.0001
HCC45:Disorders of Immunity	857.8045	130.9142	6.55	<.0001
HCC51:Drug/Alcohol Psychosis	889.3399	137.7605	6.46	<.0001
HCC52:Drug/Alcohol Dependence	1533.4654	131.6240	11.65	<.0001
HCC54:Schizophrenia	2178.1107	107.1120	20.33	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-528.7564	64.9343	-8.14	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	7120.0952	244.4681	29.12	<.0001
HCC68:Paraplegia	5656.1899	262.6493	21.54	<.0001
HCC69:Spinal Cord Disorders/Injuries	1364.4639	151.7583	8.99	<.0001
HCC70:Muscular Dystrophy	3088.8510	577.5103	5.35	<.0001
HCC71:Polyneuropathy:	685.3492	55.9840	12.24	<.0001
HCC72:Multiple Sclerosis	-550.8965	209.8037	-2.63	0.0086
HCC73:Parkinsons and Huntingtons Diseases	-200.0576	103.0901	-1.94	0.0523
HCC75:Coma, Brain Compression/Anoxic Damage	3981.9189	231.3386	17.21	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	18882.0000	207.5229	90.99	<.0001
HCC78:Respiratory Arrest	8072.1376	372.1231	21.69	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
HCC81:Acute Myocardial Infarction	1848.1466	103.6920	17.82	<.0001
HCC92:Specified Heart Arrhythmias:	432.3273	42.9676	10.06	<.0001
HCC95:Cerebral Hemorrhage	2029.0527	176.6943	11.48	<.0001
HCC96:Ischemic or Unspecified Stroke	323.6722	66.5069	4.87	<.0001
HCC100:Hemiplegia/Hemiparesis	545.4184	112.2515	4.86	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	186.3631	266.7521	0.70	0.4848
HCC104:Vascular Disease with Complications	3506.5657	78.5700	44.63	<.0001
HCC105:Vascular Disease	1008.5315	40.6279	24.82	<.0001
HCC107:Cystic Fibrosis	14420.0000	764.6967	18.86	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	2913.9125	110.3159	26.41	<.0001
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	2853.6457	127.5543	22.37	<.0001
HCC130:Dialysis Status	13501.0000	99.3256	135.93	<.0001
HCC131:Renal Failure	3912.3982	46.6796	83.81	<.0001
HCC132:Nephritis	1273.4012	296.9421	4.29	<.0001
HCC148:Decubitus Ulcer of Skin	2467.1297	98.1386	25.14	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	1967.3638	82.4718	23.85	<.0001
HCC150:Extensive Third-Degree Burns	9455.1778	0.7587	12463.00	<.0001
HCC154:Severe Head Injury	611.5391	886.3865	0.69	0.4902
HCC155:Major Head Injury	-22.8255	160.4513	-0.14	0.8869
HCC157:Vertebral Fractures without Spinal Cord Injury	560.6603	103.3565	5.42	<.0001
HCC158:Hip Fracture/Dislocation	-2.0527	102.1433	-0.02	0.9840
HCC161:Traumatic Amputation	2494.3096	278.0036	8.97	<.0001
HCC164:Major Complications of Medical Care and Trauma	1678.7267	65.2632	25.72	<.0001
HCC174:Major Organ Transplant Status	11556.0000	239.5353	48.24	<.0001
HCC176:Artificial Openings for Feeding or Elimination	1962.7712	125.0120	15.70	<.0001
HCC177:Amputation Status, Lower Limb/Amputation Complications	2836.7219	191.3264	14.83	<.0001
Female, age 35-44	-306.1429	159.7965	-1.92	0.0554
Female, age 45-54	639.3271	126.4963	5.05	<.0001
Female, age 55-59	1248.5359	142.7229	8.75	<.0001
Female, age 60-64	1713.8872	130.1153	13.17	<.0001
Female, age 65-69	967.8588	67.2091	14.40	<.0001
Female, age 70-74	515.6376	69.1378	7.46	<.0001
Female, age 75-79	-36.1722	68.8074	-0.53	0.5991
Female, age 80-84	-1172.5032	69.3097	-16.92	<.0001
Female, age 85-89	-2684.1058	76.9119	-34.90	<.0001

Variable	Parameter Estimate	Standard Error	t Value	Significance Level
Female, age 90-94	-4213.3451	104.3640	-40.37	<.0001
Female, age 95 and older	-5522.4632	184.2890	-29.97	<.0001
Male, Infant - age 34	3026.9807	209.7538	14.43	<.0001
Male, age 35-44	2566.7019	159.9379	16.05	<.0001
Male, age 45-54	3099.0953	125.0624	24.78	<.0001
Male, age 55-59	4328.0085	145.3994	29.77	<.0001
Male, age 60-64	4319.9703	134.0089	32.24	<.0001
Male, age 65-69	3657.7412	70.4303	51.93	<.0001
Male, age 70-74	3165.6265	72.9188	43.41	<.0001
Male, age 75-79	2567.8193	74.0390	34.68	<.0001
Male, age 80-84	1186.4405	78.6013	15.09	<.0001
Male, age 85-89	-742.5540	94.4751	-7.86	<.0001
Male, age 90-94	-2610.4756	148.9258	-17.53	<.0001
Male, age 95 and older	-3385.3332	329.1092	-10.29	<.0001
African American	3944.6643	58.4212	67.52	<.0001
Other Race/Ethnicity	3381.4588	151.2089	22.36	<.0001
Asian	4735.9668	126.2501	37.51	<.0001
Hispanic	2564.1174	104.7089	24.49	<.0001
Native American	1518.0447	217.4620	6.98	<.0001
Disabled Medicare Entitled	318.3647	115.1840	2.76	0.0057
Medicaid Enrolled	1121.4139	44.7768	25.04	<.0001
HCC19:Diabetes without Complication (w/o ASC diagnoses)	-111.7668	44.3300	-2.52	0.0117
HCC79:Cardio-Respiratory Failure and Shock (w/o ASC diagnoses)	3198.4845	62.8985	50.85	<.0001
HCC80:Congestive Heart Failure (w/o ASC diagnoses)	2895.2673	42.3407	68.38	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease (w/o ASC diagnoses)	1129.8033	78.1498	14.46	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction (w/o ASC diagnoses)	-334.6264	60.0652	-5.57	<.0001
HCC108:Chronic Obstructive Pulmonary (w/o ASC diagnoses)	202.2576	37.2156	5.43	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess (w/o ASC diagnoses)	1848.2328	168.6803	10.96	<.0001

Model Fit Summary

Number of Endogenous Variables	2
Number of Observations	10665376
Log Likelihood	-37562647
Maximum Absolute Gradient	110.08431
Number of Iterations	90
Optimization Method	Quasi-Newton

AIC 75125683

Schwarz Criterion 75128434

Appendix Table 5: Results from 2008 Colorado Data

Logit analysis to predict the probability of some inpatient Medicare expenditures

```
logit pos_inp mcaid hcc1-hcc10 acs_hcc19 hcc21-hcc73 hcc75-hcc78 acs_hcc79 acs_hcc80
hcc81 acs_hcc82 acs_hcc83  hcc92-hcc107 acs_hcc108 hcc111 acs_hcc112 hcc119-hcc177
f35_44-m95_gt orec_num

Iteration 0:   log likelihood = -129586.52
Iteration 1:   log likelihood = -85444.774
Iteration 2:   log likelihood = -83277.988
Iteration 3:   log likelihood = -83249.972
Iteration 4:   log likelihood = -83249.834
Iteration 5:   log likelihood = -83249.834

Logistic regression                                     Number of obs   =     250835
                                                        LR chi2(90)     =   92673.37
                                                        Prob > chi2     =     0.0000
Log likelihood = -83249.834                             Pseudo R2       =     0.3576

------------------------------------------------------------------------------
     pos_inp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       mcaid |   .0161168   .0203795     0.79   0.429    -.0238263    .0560599
        hcc1 |  -.2582127   .1427964    -1.81   0.071    -.5380885    .0216631
        hcc2 |   2.851666   .0853291    33.42   0.000     2.684424    3.018908
        hcc5 |   .7675759   .1033696     7.43   0.000     .5649753    .9701766
        hcc7 |   1.328965   .0391289    33.96   0.000     1.252274    1.405657
        hcc8 |   .7030719    .053125    13.23   0.000     .5989488     .807195
        hcc9 |   .3458032   .0418314     8.27   0.000      .263815    .4277913
       hcc10 |   .2652371   .0209479    12.66   0.000       .22418    .3062942
  acs_hcc19 |   1.017224   .0460421    22.09   0.000     .9269831    1.107465
       hcc21 |   1.466009   .0503538    29.11   0.000     1.367317      1.5647
       hcc25 |   1.180968    .091704    12.88   0.000     1.001232    1.360705
       hcc26 |   .2896624   .0923872     3.14   0.002     .1085868    .4707379
       hcc27 |   .3655631   .0904924     4.04   0.000     .1882013    .5429249
       hcc31 |   2.438212   .0449966    54.19   0.000      2.35002    2.526404
       hcc32 |   .9682867   .0396152    24.44   0.000     .8906424    1.045931
       hcc33 |   .6138066    .059773    10.27   0.000     .4966536    .7309596
       hcc37 |   .9473173   .0563915    16.80   0.000     .8367919    1.057843
       hcc38 |   .3793529   .0254195    14.92   0.000     .3295316    .4291742
       hcc44 |   .7398035   .0568038    13.02   0.000     .6284701    .8511369
       hcc45 |    .349559   .0553217     6.32   0.000     .2411304    .4579876
       hcc51 |   2.330619   .0661239    35.25   0.000     2.201018    2.460219
       hcc52 |   1.362284   .0560279    24.31   0.000     1.252472    1.472097
       hcc54 |   1.042386   .0534421    19.50   0.000     .9376412     1.14713
       hcc55 |   .6166826    .028083    21.96   0.000      .561641    .6717242
       hcc67 |   .2518934   .1038985     2.42   0.015     .0482561    .4555306
       hcc68 |   .6360259   .1201089     5.30   0.000     .4006168     .871435
       hcc69 |   .8925193   .0586343    15.22   0.000     .7775982     1.00744
       hcc70 |   .1699298   .2329622     0.73   0.466    -.2866677    .6265272
       hcc71 |   .2892956   .0233944    12.37   0.000     .2434434    .3351478
       hcc72 |   .4739971   .0648822     7.31   0.000     .3468303    .6011639
       hcc73 |   .4250148   .0424095    10.02   0.000     .3418937    .5081359
       hcc75 |   1.199315   .1022631    11.73   0.000     .9988826    1.399747
       hcc77 |   1.587254   .1353802    11.72   0.000     1.321913    1.852594
       hcc78 |   1.868282   .1700063    10.99   0.000     1.535076    2.201488
  acs_hcc79 |   1.483378   .0186465    79.55   0.000     1.446832    1.519925
  acs_hcc80 |   .7192151   .0231765    31.03   0.000     .6737899    .7646402
       hcc81 |   3.560243   .0779615    45.67   0.000     3.407441    3.713045
  acs_hcc82 |   .9988533   .0675251    14.79   0.000     .8665066      1.1312
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  acs_hcc83 |   1.030931   .0294845    34.97   0.000     .9731419    1.088719
      hcc92 |   .6761153   .0169594    39.87   0.000     .6428756     .709355
      hcc95 |   1.757915   .0752969    23.35   0.000     1.610336    1.905494
      hcc96 |   1.035474   .0292244    35.43   0.000     .9781955    1.092753
     hcc100 |   .6935877   .0519709    13.35   0.000     .5917267    .7954487
     hcc101 |   .5565499   .0938254     5.93   0.000     .3726555    .7404442
     hcc104 |   1.115258    .032104    34.74   0.000     1.052336    1.178181
     hcc105 |   .5382521   .0173289    31.06   0.000      .504288    .5722162
     hcc107 |  -.1751294   .3823933    -0.46   0.647    -.9246065    .5743478
  acs_hcc108 |   1.594133   .2279799     6.99   0.000     1.147301    2.040966
     hcc111 |   1.764472   .0612012    28.83   0.000      1.64452    1.884424
  acs_hcc112 |   .9576713   .1608863     5.95   0.000       .64234    1.273003
     hcc119 |  -.2275024   .0769152    -2.96   0.003    -.3782534   -.0767513
     hcc130 |   1.055026   .1596442     6.61   0.000     .7421288    1.367923
     hcc131 |   .9866119   .0200727    49.15   0.000     .9472701    1.025954
     hcc132 |   .5611391   .1100645     5.10   0.000     .3454165    .7768616
     hcc148 |   .4730979   .0518504     9.12   0.000      .371473    .5747228
     hcc149 |   .1536894    .039143     3.93   0.000     .0769705    .2304084
     hcc150 |   1.122699   .9930876     1.13   0.258    -.8237171    3.069115
     hcc154 |   1.162493   .3267916     3.56   0.000     .5219935    1.802993
     hcc155 |   .9038076   .0580906    15.56   0.000      .789952    1.017663
     hcc157 |    .967967   .0377984    25.61   0.000     .8938834     1.04205
     hcc158 |   2.065464   .0413438    49.96   0.000     1.984432    2.146497
     hcc161 |   .2787258   .1698979     1.64   0.101    -.0542679    .6117195
     hcc164 |   1.461284   .0292359    49.98   0.000     1.403983    1.518585
     hcc174 |  -.0940092   .1299708    -0.72   0.469    -.3487473    .1607288
     hcc176 |   .5249434   .0688232     7.63   0.000     .3900523    .6598344
     hcc177 |   .4730378   .1111538     4.26   0.000     .2551804    .6908953
      f35_44 |  -.2775239   .0851227    -3.26   0.001    -.4443613   -.1106864
      f45_54 |  -.4463541   .0783169    -5.70   0.000    -.5998525   -.2928558
      f55_59 |  -.2930037   .0843595    -3.47   0.001    -.4583454   -.1276621
      f60_64 |  -.4130739   .0883505    -4.68   0.000    -.5862377   -.2399102
      f65_69 |  -.3450384   .0909828    -3.79   0.000    -.5233615   -.1667153
      f70_74 |  -.2311924   .0911781    -2.54   0.011    -.4098982   -.0524866
      f75_79 |  -.1492732     .09127    -1.64   0.102    -.3281591    .0296128
      f80_84 |  -.0726981   .0917261    -0.79   0.428     -.252478    .1070818
      f85_89 |   .0194951   .0939882     0.21   0.836    -.1647184    .2037086
      f90_94 |   .0728427   .1018275     0.72   0.474    -.1267354    .2724209
      f95_gt |  -.1272899   .1466683    -0.87   0.385    -.4147545    .1601747
       m0_34 |  -.5553176   .1022493    -5.43   0.000    -.7557226   -.3549125
      m35_44 |  -.6429871   .0899485    -7.15   0.000    -.8192829   -.4666914
      m45_54 |  -.6474228   .0809482    -8.00   0.000    -.8060784   -.4887672
      m55_59 |  -.5202652   .0899435    -5.78   0.000    -.6965512   -.3439792
      m60_64 |  -.5164957     .08905    -5.80   0.000    -.6910304   -.3419609
      m65_69 |  -.4703772   .0914759    -5.14   0.000    -.6496668   -.2910877
      m70_74 |  -.3928205   .0920032    -4.27   0.000    -.5731434   -.2124976
      m75_79 |  -.3179772    .092671    -3.43   0.001    -.4996091   -.1363453
      m80_84 |  -.2514555   .0940845    -2.67   0.008    -.4358577   -.0670534
      m85_89 |  -.1127629   .0997598    -1.13   0.258    -.3082886    .0827627
      m90_94 |  -.0585686   .1275181    -0.46   0.646    -.3084995    .1913622
      m95_gt |   .4239215    .270696     1.57   0.117     -.106633    .9544759
   orec_num |  -.0222971   .0573164    -0.39   0.697    -.1346353    .0900411
       _cons |  -2.506757   .0889907   -28.17   0.000    -2.681175   -2.332338
------------------------------------------------------------------------------
```

OLS analysis of Medicare spending for beneficiaries with positive inpatient expenditures

```
. regress inp_amt mcaid hcc1-hcc10 acs_hcc19 hcc21-hcc73 hcc75-hcc78 acs_hcc79 acs_hcc80
hcc81 acs_hcc82 acs_hcc83  hcc92-hcc107 acs_hcc108 hcc111 acs_hcc112 hcc119-hcc177
f35_44-m95_gt orec_num if p
> os_i

      Source |       SS       df       MS              Number of obs =   53182
-------------+------------------------------           F( 90, 53091) =  347.42
       Model |  7.3754e+12    90  8.1949e+10           Prob > F      =  0.0000
    Residual |  1.2523e+13 53091   235881532           R-squared     =  0.3706
-------------+------------------------------           Adj R-squared =  0.3696
       Total |  1.9899e+13 53181   374167474           Root MSE      =   15358

------------------------------------------------------------------------------
     inp_amt |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       mcaid |  -2257.953   196.2738   -11.50   0.000    -2642.652   -1873.255
        hcc1 |   4098.642   1351.359     3.03   0.002     1449.967    6747.318
        hcc2 |   7904.365   272.3025    29.03   0.000      7370.65    8438.081
        hcc5 |   8559.378   663.8077    12.89   0.000     7258.309    9860.447
        hcc7 |   1288.684   299.1425     4.31   0.000     702.3624    1875.006
        hcc8 |   1081.268   442.1467     2.45   0.014     214.6562    1947.879
        hcc9 |    187.677   397.7846     0.47   0.637    -591.9843    967.3383
       hcc10 |   205.3804   219.2405     0.94   0.349    -224.3328    635.0937
   acs_hcc19 |   1397.221   345.4721     4.04   0.000     720.0925    2074.349
       hcc21 |   6423.518   264.5545    24.28   0.000     5904.989    6942.047
       hcc25 |   1733.889   594.6529     2.92   0.004      568.364    2899.413
       hcc26 |  -734.2276   739.2423    -0.99   0.321    -2183.149    714.6937
       hcc27 |   1082.375   859.8022     1.26   0.208     -602.845    2767.595
       hcc31 |   5785.674   249.9728    23.15   0.000     5295.725    6275.623
       hcc32 |   2044.317   307.6604     6.64   0.000       1441.3    2647.334
       hcc33 |   628.4368   523.2679     1.20   0.230    -397.1728    1654.046
       hcc37 |   6129.751   384.6981    15.93   0.000      5375.74    6883.763
       hcc38 |   901.9329   243.3232     3.71   0.000     425.0173    1378.849
       hcc44 |   4993.794   385.5438    12.95   0.000     4238.125    5749.463
       hcc45 |   1463.934   427.7168     3.42   0.001     625.6051    2302.262
       hcc51 |   3566.665    378.253     9.43   0.000     2825.286    4308.044
       hcc52 |   1213.959   452.3145     2.68   0.007     327.4185    2100.499
       hcc54 |   4694.903   521.3714     9.00   0.000      3673.01    5716.795
       hcc55 |   1379.727   257.0502     5.37   0.000     875.9061    1883.547
       hcc67 |    5943.96   785.8985     7.56   0.000     4403.592    7484.327
       hcc68 |   5456.323    930.371     5.86   0.000     3632.788    7279.858
       hcc69 |   5166.319   455.9208    11.33   0.000      4272.71    6059.928
       hcc70 |  -2486.676   2044.483    -1.22   0.224    -6493.881    1520.529
       hcc71 |   765.5151   213.4016     3.59   0.000     347.2462    1183.784
       hcc72 |   429.3548   613.8187     0.70   0.484    -773.7353    1632.445
       hcc73 |  -357.3178   376.5683    -0.95   0.343    -1095.395    380.7592
       hcc75 |   6740.113   514.0785    13.11   0.000     5732.515    7747.711
       hcc77 |   36736.57    591.554    62.10   0.000     35577.11    37896.02
       hcc78 |   5163.582    831.179     6.21   0.000     3534.464      6792.7
   acs_hcc79 |   3259.803   156.3122    20.85   0.000      2953.43    3566.176
   acs_hcc80 |    2833.42   188.3588    15.04   0.000     2464.235    3202.605
       hcc81 |   6296.571   303.9346    20.72   0.000     5700.857    6892.286
   acs_hcc82 |   2346.642   544.5947     4.31   0.000     1279.231    3414.052
   acs_hcc83 |   866.2578    254.193     3.41   0.001     368.0373    1364.478
       hcc92 |   2193.018   156.8622    13.98   0.000     1885.567     2500.47
       hcc95 |   6158.212   479.0974    12.85   0.000     5219.177    7097.247
       hcc96 |   855.1637   245.0823     3.49   0.000     374.8002    1335.527
```

hcc100	4346.897	371.652	11.70	0.000	3618.456	5075.338
hcc101	-978.9725	870.0367	-1.13	0.261	-2684.252	726.3071
hcc104	4927.783	244.4681	20.16	0.000	4448.624	5406.943
hcc105	1565.269	162.8512	9.61	0.000	1246.079	1884.459
hcc107	8186.594	3151.837	2.60	0.009	2008.966	14364.22
acs_hcc108	9953.558	1191.784	8.35	0.000	7617.652	12289.46
hcc111	5901.896	284.5454	20.74	0.000	5344.184	6459.607
acs_hcc112	6626.012	1049.976	6.31	0.000	4568.05	8683.974
hcc119	-2037.842	726.2861	-2.81	0.005	-3461.37	-614.3154
hcc130	13526.86	894.0011	15.13	0.000	11774.61	15279.11
hcc131	2108.573	166.9474	12.63	0.000	1781.355	2435.792
hcc132	-659.5372	1012.242	-0.65	0.515	-2643.54	1324.466
hcc148	3947.9	321.4784	12.28	0.000	3317.799	4578
hcc149	-691.4356	348.8079	-1.98	0.047	-1375.102	-7.769025
hcc150	44124.95	5440.3	8.11	0.000	33461.91	54787.98
hcc154	15636.85	1661.454	9.41	0.000	12380.39	18893.31
hcc155	1372.028	446.3322	3.07	0.002	497.2127	2246.843
hcc157	1866.37	295.2246	6.32	0.000	1287.727	2445.012
hcc158	4245.291	264.1681	16.07	0.000	3727.519	4763.062
hcc161	7712.885	990.4903	7.79	0.000	5771.515	9654.255
hcc164	7993.822	203.3428	39.31	0.000	7595.269	8392.376
hcc174	18686.41	988.7534	18.90	0.000	16748.44	20624.37
hcc176	8485.451	410.2482	20.68	0.000	7681.361	9289.541
hcc177	1871.343	774.8027	2.42	0.016	352.723	3389.963
f35_44	-1779.312	948.6013	-1.88	0.061	-3638.578	79.95508
f45_54	-1332.396	869.5319	-1.53	0.125	-3036.686	371.8937
f55_59	-1370.894	919.193	-1.49	0.136	-3172.521	430.7318
f60_64	1215.649	953.0749	1.28	0.202	-652.3859	3083.684
f65_69	-23.10758	986.9558	-0.02	0.981	-1957.549	1911.334
f70_74	-846.5355	987.2672	-0.86	0.391	-2781.588	1088.517
f75_79	-2691.756	985.7704	-2.73	0.006	-4623.875	-759.6375
f80_84	-3732.552	988.7559	-3.77	0.000	-5670.522	-1794.581
f85_89	-5139.015	1007.306	-5.10	0.000	-7113.344	-3164.685
f90_94	-6077.999	1068.473	-5.69	0.000	-8172.215	-3983.783
f95_gt	-5537.584	1471.232	-3.76	0.000	-8421.212	-2653.955
m0_34	498.9687	1146.604	0.44	0.663	-1748.386	2746.323
m35_44	-2050.512	993.9242	-2.06	0.039	-3998.612	-102.4121
m45_54	-533.967	882.0895	-0.61	0.545	-2262.87	1194.936
m55_59	-926.1889	954.4862	-0.97	0.332	-2796.99	944.6124
m60_64	797.2115	962.0248	0.83	0.407	-1088.365	2682.789
m65_69	1034.75	990.962	1.04	0.296	-907.544	2977.044
m70_74	-652.9383	993.1877	-0.66	0.511	-2599.595	1293.718
m75_79	-2008.138	997.2425	-2.01	0.044	-3962.742	-53.53393
m80_84	-4158.749	1006.783	-4.13	0.000	-6132.053	-2185.445
m85_89	-5967.456	1046.117	-5.70	0.000	-8017.854	-3917.058
m90_94	-6717.976	1247.185	-5.39	0.000	-9162.47	-4273.483
m95_gt	-8049.637	2341.164	-3.44	0.001	-12638.34	-3460.934
orec_num	1109.546	584.4881	1.90	0.058	-36.05605	2255.148
_cons	5956.758	963.706	6.18	0.000	4067.886	7845.63

GLM analysis of Medicare spending for beneficiaries with positive inpatient expenditures

```
glm inp_amt mcaid hcc1-hcc10 acs_hcc19 hcc21-hcc73 hcc75-hcc78 acs_hcc79 acs_hcc80 hcc81
acs_hcc82 acs_hcc83  hcc92-hcc107 acs_hcc108 hcc111 acs_hcc112 hcc119-hcc177 f35_44-
m95_gt orec_num if pos_i
> np, f(gamma) l(log)

Iteration 0:   log likelihood = -555242.86
Iteration 1:   log likelihood = -554688.19
Iteration 2:   log likelihood = -554687.32
Iteration 3:   log likelihood = -554687.32

Generalized linear models                         No. of obs      =     53182
Optimization     : ML                             Residual df     =     53091
                                                  Scale parameter =  .7646758
Deviance         =  29099.34621                   (1/df) Deviance =  .5481032
Pearson          =  40597.40359                   (1/df) Pearson  =  .7646758

Variance function: V(u) = u^2                     [Gamma]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  20.86339
Log likelihood   = -554687.3198                   BIC             = -548609.1

------------------------------------------------------------------------------
             |                 OIM
     inp_amt |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       mcaid |  -.0984576   .0112131    -8.78   0.000    -.1204349   -.0764802
        hcc1 |   .1251041    .077058     1.62   0.104    -.0259269     .276135
        hcc2 |   .2876101   .0154558    18.61   0.000     .2573174    .3179028
        hcc5 |   .2139842   .0379354     5.64   0.000     .1396322    .2883361
        hcc7 |   .1886637   .0170296    11.08   0.000     .1552864     .222041
        hcc8 |    .133025   .0252182     5.27   0.000     .0835983    .1824516
        hcc9 |   .0865657   .0226779     3.82   0.000     .0421178    .1310136
       hcc10 |   .0137228   .0124721     1.10   0.271    -.0107221    .0381676
   acs_hcc19 |   .0878731    .019768     4.45   0.000     .0491286    .1266176
       hcc21 |   .2408224    .015106    15.94   0.000     .2112151    .2704297
       hcc25 |   .1101477    .033955     3.24   0.001     .0435971    .1766982
       hcc26 |  -.0420496   .0420788    -1.00   0.318    -.1245226    .0404233
       hcc27 |   .0670367   .0492273     1.36   0.173     -.029447    .1635203
       hcc31 |   .2799061   .0143141    19.55   0.000     .2518509    .3079613
       hcc32 |   .1047669   .0175677     5.96   0.000     .0703348     .139199
       hcc33 |   .0232299   .0298208     0.78   0.436    -.0352178    .0816775
       hcc37 |   .2631951   .0218754    12.03   0.000       .22032    .3060701
       hcc38 |   .0614753   .0138617     4.43   0.000     .0343069    .0886437
       hcc44 |   .1836569   .0220098     8.34   0.000     .1405186    .2267953
       hcc45 |    .042446   .0244923     1.73   0.083     -.005558    .0904501
       hcc51 |   .1816629   .0215232     8.44   0.000     .1394782    .2238477
       hcc52 |   .1002722   .0258789     3.87   0.000     .0495505    .1509938
       hcc54 |   .3379861   .0298186    11.33   0.000     .2795427    .3964296
       hcc55 |   .0873293   .0145929     5.98   0.000     .0587277    .1159309
       hcc67 |    .282299   .0448559     6.29   0.000     .1943831     .370215
       hcc68 |   .2522516   .0530547     4.75   0.000     .1482663     .356237
       hcc69 |   .2817374   .0259486    10.86   0.000     .2308791    .3325957
       hcc70 |  -.0134004   .1166128    -0.11   0.909    -.2419573    .2151565
       hcc71 |   .0404098   .0121796     3.32   0.001     .0165382    .0642814
       hcc72 |   .0825356   .0350522     2.35   0.019     .0138346    .1512366
       hcc73 |    .016416   .0214475     0.77   0.444    -.0256203    .0584523
       hcc75 |   .2375732   .0293125     8.10   0.000     .1801218    .2950246
       hcc77 |    .817323   .0339151    24.10   0.000     .7508507    .8837953
       hcc78 |   .3218534   .0473442     6.80   0.000     .2290605    .4146463
   acs_hcc79 |   .2369418   .0089709    26.41   0.000     .2193593    .2545244
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  acs_hcc80 |   .1594371   .0108211    14.73   0.000      .138228    .1806461
      hcc81 |   .3943123   .0172949    22.80   0.000      .360415    .4282096
  acs_hcc82 |   .1616199   .0310193     5.21   0.000     .1008233    .2224166
  acs_hcc83 |   .0599196   .0145038     4.13   0.000     .0314928    .0883465
      hcc92 |   .1281351   .0089955    14.24   0.000     .1105042     .145766
      hcc95 |   .3090458   .0276732    11.17   0.000     .2548072    .3632843
      hcc96 |    .017856   .0141637     1.26   0.207    -.0099043    .0456164
     hcc100 |   .3024424   .0213983    14.13   0.000     .2605025    .3443823
     hcc101 |  -.0134276   .0496397    -0.27   0.787    -.1107196    .0838645
     hcc104 |   .2385945   .0139421    17.11   0.000     .2112685    .2659204
     hcc105 |   .0887396   .0092888     9.55   0.000     .0705339    .1069452
     hcc107 |   .2225141   .1792592     1.24   0.214    -.1288275    .5738557
  acs_hcc108 |    .286385   .0679425     4.22   0.000     .1532201    .4195498
     hcc111 |   .2237651   .0162087    13.81   0.000     .1919967    .2555335
  acs_hcc112 |   .2968733   .0598787     4.96   0.000     .1795131    .4142334
     hcc119 |  -.0729453   .0414686    -1.76   0.079    -.1542223    .0083317
     hcc130 |   .3537728    .050963     6.94   0.000     .2538872    .4536583
     hcc131 |   .1491501   .0095549    15.61   0.000     .1304228    .1678773
     hcc132 |  -.0317381   .0576693    -0.55   0.582    -.1447679    .0812917
     hcc148 |   .1438025   .0183395     7.84   0.000     .1078577    .1797473
     hcc149 |  -.0332946   .0198642    -1.68   0.094    -.0722277    .0056385
     hcc150 |   .3963062   .3094797     1.28   0.200    -.2102627    1.002875
     hcc154 |   .2453142   .0950777     2.58   0.010     .0589654     .431663
     hcc155 |   .0843469   .0257119     3.28   0.001     .0339524    .1347413
     hcc157 |   .1096226   .0167862     6.53   0.000     .0767223    .1425229
     hcc158 |    .338215   .0150559    22.46   0.000      .308706    .3677239
     hcc161 |   .2856181   .0562852     5.07   0.000     .1753011    .3959351
     hcc164 |   .4449036   .0114829    38.74   0.000     .4223976    .4674097
     hcc174 |   .4631468   .0565814     8.19   0.000     .3522493    .5740444
     hcc176 |   .1962608   .0234302     8.38   0.000     .1503385    .2421831
     hcc177 |   .1098274   .0442369     2.48   0.013     .0231247    .1965302
     f35_44 |  -.0267003   .0540943    -0.49   0.622    -.1327231    .0793226
     f45_54 |   .0033607   .0496166     0.07   0.946     -.093886    .1006075
     f55_59 |   .0314089   .0524896     0.60   0.550    -.0714689    .1342867
     f60_64 |   .0992595   .0542952     1.83   0.068    -.0071572    .2056761
     f65_69 |   .0637771   .0563527     1.13   0.258    -.0466722    .1742264
     f70_74 |   .0078992   .0563785     0.14   0.889    -.1026006    .1183991
     f75_79 |  -.1223877   .0562924    -2.17   0.030    -.2327187   -.0120566
     f80_84 |  -.2062247   .0564679    -3.65   0.000    -.3168997   -.0955497
     f85_89 |  -.3199794   .0575043    -5.56   0.000    -.4326857    -.207273
     f90_94 |   -.393549   .0610065    -6.45   0.000    -.5131195   -.2739784
     f95_gt |  -.3461934   .0839096    -4.13   0.000    -.5106531   -.1817337
      m0_34 |   .0605436   .0653439     0.93   0.354    -.0675282    .1886154
     m35_44 |   .0042494   .0566233     0.08   0.940    -.1067301     .115229
     m45_54 |   .0133989   .0503838     0.27   0.790    -.0853515    .1121493
     m55_59 |   .0344077   .0544891     0.63   0.528     -.072389    .1412044
     m60_64 |    .106251   .0550461     1.93   0.054    -.0016374    .2141394
     m65_69 |   .0965246   .0565866     1.71   0.088    -.0143831    .2074324
     m70_74 |   .0219766   .0567268     0.39   0.698    -.0892059    .1331591
     m75_79 |  -.0571179   .0569295    -1.00   0.316    -.1686976    .0544618
     m80_84 |  -.1806645   .0574827    -3.14   0.002    -.2933285   -.0680006
     m85_89 |  -.3084942   .0597561    -5.16   0.000     -.425614   -.1913743
     m90_94 |  -.3798211   .0711818    -5.34   0.000    -.5193349   -.2403072
     m95_gt |  -.4994468   .1334117    -3.74   0.000    -.7609289   -.2379648
   orec_num |   .0015849   .0333302     0.05   0.962    -.0637411    .0669109
      _cons |   8.936139   .0550684   162.27   0.000     8.828207    9.044071
------------------------------------------------------------------------------
```

OLS analysis of outpatient Medicare spending

```
.ols pmt_amt mcaid hcc1-hcc177 f35_44-m95_gt orec_num if pos_out
```

```
      Source |       SS       df       MS              Number of obs =  248034
-------------+------------------------------           F( 95,247938) = 1846.86
       Model |  9.3192e+12    95  9.8097e+10           Prob > F      =  0.0000
    Residual |  1.3169e+13247938  53115430.5           R-squared     =  0.4144
-------------+------------------------------           Adj R-squared =  0.4142
       Total |  2.2489e+13248033  90667505.5           Root MSE      =    7288

------------------------------------------------------------------------------
     pmt_amt |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       mcaid |   25.83325   49.72366     0.52   0.603     -71.6238    123.2903
        hcc1 |   1188.991   304.0852     3.91   0.000     592.9919     1784.99
        hcc2 |   2513.874   123.7653    20.31   0.000     2271.297     2756.45
        hcc5 |   2287.505   250.2366     9.14   0.000     1797.048    2777.962
        hcc7 |   11975.56    106.786   112.15   0.000     11766.26    12184.85
        hcc8 |   4054.254   143.0593    28.34   0.000     3773.862    4334.647
        hcc9 |   4136.669   105.6383    39.16   0.000     3929.621    4343.717
       hcc10 |   1726.014   50.15469    34.41   0.000     1627.712    1824.316
       hcc15 |   1371.591   96.74976    14.18   0.000     1181.964    1561.218
       hcc16 |   1049.898   88.66581    11.84   0.000     876.1149     1223.68
       hcc17 |   1227.238   303.5147     4.04   0.000     632.3571    1822.119
       hcc18 |   878.2599    132.519     6.63   0.000     618.5261    1137.994
       hcc19 |   431.9921   42.87111    10.08   0.000     347.9659    516.0184
       hcc21 |   4435.643   112.1452    39.55   0.000     4215.842    4655.445
       hcc25 |   1093.527   230.1628     4.75   0.000     642.4145     1544.64
       hcc26 |  -70.77034   231.0509    -0.31   0.759    -523.6241    382.0834
       hcc27 |   123.4623   231.6337     0.53   0.594    -330.5337    577.4582
       hcc31 |   2416.805   105.7631    22.85   0.000     2209.512    2624.098
       hcc32 |   1673.918   106.5567    15.71   0.000      1465.07    1882.767
       hcc33 |   1174.073   156.9493     7.48   0.000     866.4561    1481.689
       hcc37 |   4198.752   142.4155    29.48   0.000     3919.621    4477.882
       hcc38 |   2099.227   64.47485    32.56   0.000     1972.858    2225.596
       hcc44 |   4746.227    144.666    32.81   0.000     4462.686    5029.769
       hcc45 |    9202.79   141.7732    64.91   0.000     8924.918    9480.662
       hcc51 |   3866.102   158.7143    24.36   0.000     3555.026    4177.177
       hcc52 |   1241.125   157.4721     7.88   0.000     932.4842    1549.767
       hcc54 |   1092.391   142.7136     7.65   0.000     812.6763    1372.106
       hcc55 |   2058.159   72.86491    28.25   0.000     1915.345    2200.972
       hcc67 |   4303.743   248.4064    17.33   0.000     3816.873    4790.613
       hcc68 |   3264.109   304.0891    10.73   0.000     2668.102    3860.116
       hcc69 |   3664.647   158.3402    23.14   0.000     3354.304    3974.989
       hcc70 |   3140.219   581.5659     5.40   0.000     2000.366    4280.073
       hcc71 |   1712.086    62.2888    27.49   0.000     1590.002     1834.17
       hcc72 |   3557.441   162.8728    21.84   0.000     3238.215    3876.668
       hcc73 |   3353.106   111.9488    29.95   0.000      3133.69    3572.523
       hcc74 |   1154.221   85.12568    13.56   0.000     987.3767    1321.065
       hcc75 |   1272.426   218.8949     5.81   0.000     843.3981    1701.454
       hcc77 |    2935.71   257.6132    11.40   0.000     2430.795    3440.625
       hcc78 |   1034.892   361.1255     2.87   0.004     327.0959    1742.689
       hcc79 |   2029.954   55.35842    36.67   0.000     1921.453    2138.455
       hcc80 |    2193.55   49.43648    44.37   0.000     2096.656    2290.444
       hcc81 |   2153.963   136.9128    15.73   0.000     1885.618    2422.309
       hcc82 |   1850.939   119.7825    15.45   0.000     1616.169     2085.71
       hcc83 |   1195.911   74.64221    16.02   0.000     1049.615    1342.208
       hcc92 |   1281.844    46.4402    27.60   0.000     1190.822    1372.865
       hcc95 |   3973.547   189.4027    20.98   0.000     3602.322    4344.771
       hcc96 |   1897.996    82.4616    23.02   0.000     1736.373    2059.619
      hcc100 |   4068.585   137.6548    29.56   0.000     3798.785    4338.385
      hcc101 |   1583.493   244.9978     6.46   0.000     1103.303    2063.682
      hcc104 |   2668.234    87.2322    30.59   0.000     2497.261    2839.207
      hcc105 |   1618.977   46.38676    34.90   0.000     1528.061    1709.894
      hcc107 |   3134.333   905.6725     3.46   0.001     1359.239    4909.427
      hcc108 |    1659.29   43.12034    38.48   0.000     1574.775    1743.805
```

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      hcc111 |   3163.161   124.0283    25.50   0.000     2920.069    3406.254
      hcc112 |   1885.795    201.341     9.37   0.000     1491.172    2280.418
      hcc119 |    939.193   182.3458     5.15   0.000     581.8001    1296.586
      hcc130 |   12838.66   369.4192    34.75   0.000     12114.61    13562.71
      hcc131 |   1630.792   56.48553    28.87   0.000     1520.081    1741.502
      hcc132 |  -111.8505   299.9512    -0.37   0.709    -699.7469     476.046
      hcc148 |   5992.647   124.2493    48.23   0.000     5749.122    6236.172
      hcc149 |   1639.236   102.6203    15.97   0.000     1438.103    1840.369
      hcc150 |  -1396.859   2199.423    -0.64   0.525     -5707.67    2913.953
      hcc154 |   312.0812    694.155     0.45   0.653    -1048.444    1672.607
      hcc155 |   1945.946   154.8199    12.57   0.000     1642.503    2249.389
      hcc157 |   3857.488   103.2815    37.35   0.000     3655.059    4059.917
      hcc158 |   8988.393   107.1739    83.87   0.000     8778.335    9198.451
      hcc161 |   5665.548    376.067    15.07   0.000     4928.466    6402.629
      hcc164 |   5169.031   77.51425    66.68   0.000     5017.106    5320.957
      hcc174 |   2859.036   315.3797     9.07   0.000       2240.9    3477.171
      hcc176 |   5493.479   162.2366    33.86   0.000       5175.5    5811.459
      hcc177 |   3421.898    286.093    11.96   0.000     2861.163    3982.633
      f35_44 |   277.3519   209.2264     1.33   0.185    -132.7264    687.4301
      f45_54 |   142.5791   192.7953     0.74   0.460    -235.2946    520.4529
      f55_59 |   727.4195   208.3055     3.49   0.000     319.1463    1135.693
      f60_64 |     623.84   214.6787     2.91   0.004     203.0753    1044.605
      f65_69 |   608.4412    219.529     2.77   0.006     178.1702    1038.712
      f70_74 |   741.3083   220.5833     3.36   0.001      308.971    1173.646
      f75_79 |   862.5224   221.3508     3.90   0.000     428.6807    1296.364
      f80_84 |   1193.845   222.9659     5.35   0.000     756.8374    1630.852
      f85_89 |   1890.077   229.6816     8.23   0.000     1439.907    2340.247
      f90_94 |    2477.38   252.3582     9.82   0.000     1982.764    2971.995
      f95_gt |   2698.729   371.0475     7.27   0.000     1971.486    3425.972
       m0_34 |  -295.3641   238.1009    -1.24   0.215    -762.0355    171.3073
      m35_44 |  -741.2782   212.9865    -3.48   0.001    -1158.726   -323.8302
      m45_54 |  -565.7854   195.9551    -2.89   0.004    -949.8521   -181.7186
      m55_59 |  -219.4551   216.2248    -1.01   0.310      -643.25    204.3398
      m60_64 |   218.6524   215.9039     1.01   0.311    -204.5136    641.8184
      m65_69 |   237.9891   220.4297     1.08   0.280    -194.0473    670.0256
      m70_74 |   260.8677   222.1554     1.17   0.240     -174.551    696.2865
      m75_79 |   120.1154   224.4958     0.54   0.593    -319.8905    560.1213
      m80_84 |   557.5206    228.852     2.44   0.015     108.9767    1006.065
      m85_89 |   800.8773   245.2067     3.27   0.001     320.2788    1281.476
      m90_94 |   1235.162    322.335     3.83   0.000     603.3935     1866.93
      m95_gt |   1349.399   740.6645     1.82   0.068    -102.2839    2801.082
    orec_num |   16.25943   132.0669     0.12   0.902    -242.5882     275.107
       _cons |   729.5916   215.5652     3.38   0.001     307.0895    1152.094
------------------------------------------------------------------------------
```

GLM analysis of outpatient Medicare spending

```
. glm pmt_amt mcaid hcc1-hcc177 f35_44-m95_gt orec_num if pos_out, f(gamma) l(log)

Iteration 0:   log likelihood = -2298429.7
Iteration 1:   log likelihood = -2292921.5
Iteration 2:   log likelihood = -2292894.5
Iteration 3:   log likelihood = -2292894.5

Generalized linear models                         No. of obs      =    248047
Optimization     : ML                             Residual df     =    247951
                                                  Scale parameter =   1.99218
Deviance         =  304023.3437                   (1/df) Deviance =  1.226143
Pearson          =  493962.9332                   (1/df) Pearson  =   1.99218

Variance function: V(u) = u^2                     [Gamma]
```

```
Link function    : g(u) = ln(u)                    [Log]

                                                   AIC             =  18.48836
Log likelihood   =  -2292894.52                    BIC             =  -2775869

------------------------------------------------------------------------------
             |                 OIM
     pmt_amt |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       mcaid |   .1072196   .0095558    11.22   0.000     .0884905    .1259486
        hcc1 |   .3067753   .0593435     5.17   0.000     .1904642    .4230864
        hcc2 |    .049432   .0231464     2.14   0.033     .0040659    .0947981
        hcc5 |   .2583349    .048212     5.36   0.000     .1638411    .3528287
        hcc7 |   1.367153   .0204868    66.73   0.000        1.327    1.407307
        hcc8 |   .7228187   .0276843    26.11   0.000     .6685585    .7770788
        hcc9 |   .7887296   .0205623    38.36   0.000     .7484283    .8290309
       hcc10 |   .4793649   .0097271    49.28   0.000     .4603002    .4984296
       hcc15 |   .2097492   .0185783    11.29   0.000     .1733363    .2461621
       hcc16 |   .2468011   .0169958    14.52   0.000       .21349    .2801122
       hcc17 |   .2656939   .0588109     4.52   0.000     .1504267    .3809611
       hcc18 |   .2637007   .0256661    10.27   0.000      .213396    .3140054
       hcc19 |   .1245152    .008303    15.00   0.000     .1082416    .1407887
       hcc21 |   .3040333   .0209977    14.48   0.000     .2628785    .3451881
       hcc25 |    .354974   .0445366     7.97   0.000     .2676839    .4422642
       hcc26 |   .1283707   .0447047     2.87   0.004      .040751    .2159904
       hcc27 |   .2114266   .0450528     4.69   0.000     .1231247    .2997284
       hcc31 |   .3147122    .020063    15.69   0.000     .2753896    .3540349
       hcc32 |   .2620395   .0205387    12.76   0.000     .2217845    .3022946
       hcc33 |   .3248854   .0303664    10.70   0.000     .2653685    .3844024
       hcc37 |   .4059714   .0271455    14.96   0.000     .3527673    .4591755
       hcc38 |    .509487   .0124807    40.82   0.000     .4850253    .5339487
       hcc44 |   .4814355      .0276    17.44   0.000     .4273404    .5355306
       hcc45 |   .6603996   .0272261    24.26   0.000     .6070374    .7137618
       hcc51 |   .4450335   .0305211    14.58   0.000     .3852132    .5048539
       hcc52 |    .317043   .0303514    10.45   0.000     .2575553    .3765307
       hcc54 |   .1747722   .0275719     6.34   0.000     .1207322    .2288122
       hcc55 |   .3418127   .0139935    24.43   0.000      .314386    .3692395
       hcc67 |   .7457476    .047838    15.59   0.000     .6519868    .8395083
       hcc68 |   .5643783   .0588459     9.59   0.000     .4490425    .6797141
       hcc69 |   .4691662   .0305442    15.36   0.000     .4093005    .5290318
       hcc70 |   .6594223   .1133061     5.82   0.000     .4373464    .8814982
       hcc71 |   .2868453   .0118701    24.17   0.000     .2635804    .3101102
       hcc72 |   .7049351     .03155    22.34   0.000     .6430983    .7667719
       hcc73 |   .5653326   .0216571    26.10   0.000     .5228856    .6077796
       hcc74 |    .204306   .0163708    12.48   0.000     .1722198    .2363921
       hcc75 |   .1149804   .0421275     2.73   0.006     .0324119    .1975488
       hcc77 |   .2441916   .0493596     4.95   0.000     .1474486    .3409346
       hcc78 |   .1741064   .0697323     2.50   0.013     .0374336    .3107793
       hcc79 |   .3461815   .0102934    33.63   0.000     .3260068    .3663562
       hcc80 |   .3084631   .0092405    33.38   0.000     .2903521    .3265741
       hcc81 |   .3408831   .0262633    12.98   0.000      .289408    .3923583
       hcc82 |    .389905   .0231094    16.87   0.000     .3446115    .4351986
       hcc83 |   .2807224   .0143696    19.54   0.000     .2525585    .3088863
       hcc92 |   .2642333   .0088087    30.00   0.000     .2469685     .281498
       hcc95 |   .3442522    .036395     9.46   0.000     .2729193    .4155851
       hcc96 |   .2908702   .0159101    18.28   0.000      .259687    .3220535
      hcc100 |   .4311731   .0266325    16.19   0.000     .3789744    .4833719
      hcc101 |    .277289   .0474077     5.85   0.000     .1843716    .3702064
      hcc104 |   .3625731    .016642    21.79   0.000     .3299554    .3951907
      hcc105 |   .3154667   .0088385    35.69   0.000     .2981435    .3327899
      hcc107 |   .5750425   .1754611     3.28   0.001     .2311452    .9189399
      hcc108 |     .35567   .0081518    43.63   0.000     .3396928    .3716471
      hcc111 |   .1627248   .0234273     6.95   0.000     .1168082    .2086414
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      hcc112 |   .1530061   .0388791     3.94   0.000     .0768044    .2292077
      hcc119 |    .263768   .0353232     7.47   0.000     .1945357    .3330003
      hcc130 |   .9459155   .0712129    13.28   0.000     .8063407     1.08549
      hcc131 |   .2302875   .0107065    21.51   0.000     .2093032    .2512718
      hcc132 |    .123186   .0581089     2.12   0.034     .0092948    .2370773
      hcc148 |   .4388411   .0234601    18.71   0.000     .3928603     .484822
      hcc149 |    .260926   .0197479    13.21   0.000     .2222208    .2996313
      hcc150 |   .0911862    .425943     0.21   0.830    -.7436467    .9260192
      hcc154 |   .0498425   .1343843     0.37   0.711    -.2135459    .3132309
      hcc155 |   .3573927   .0296948    12.04   0.000      .299192    .4155933
      hcc157 |   .4455175   .0199086    22.38   0.000     .4064973    .4845377
      hcc158 |   .8354899   .0205427    40.67   0.000     .7952269    .8757528
      hcc161 |   .5213909   .0723677     7.20   0.000     .3795528    .6632291
      hcc164 |   .5959194   .0145726    40.89   0.000     .5673577    .6244811
      hcc174 |   .3854519   .0608628     6.33   0.000     .2661629    .5047408
      hcc176 |   .3540728   .0307385    11.52   0.000     .2938264    .4143192
      hcc177 |   .4574841   .0551013     8.30   0.000     .3494875    .5654807
      f35_44 |   .1351711   .0405446     3.33   0.001     .0557051    .2146371
      f45_54 |   .1043631   .0373658     2.79   0.005     .0311276    .1775987
      f55_59 |   .1826033   .0403909     4.52   0.000     .1034386    .2617679
      f60_64 |   .2100933   .0416273     5.05   0.000     .1285053    .2916814
      f65_69 |   .2679988   .0425862     6.29   0.000     .1845315    .3514661
      f70_74 |   .3310439   .0427948     7.74   0.000     .2471677    .4149202
      f75_79 |    .402701   .0429324     9.38   0.000     .3185551    .4868469
      f80_84 |    .489141   .0432549    11.31   0.000     .4043629    .5739192
      f85_89 |   .6388657   .0445538    14.34   0.000      .551542    .7261895
      f90_94 |   .7855625   .0489233    16.06   0.000     .6896747    .8814504
      f95_gt |   .9507411   .0719075    13.22   0.000     .8098049    1.091677
       m0_34 |  -.1342606    .046134    -2.91   0.004    -.2246817   -.0438396
      m35_44 |  -.1568638   .0412742    -3.80   0.000    -.2377597   -.0759678
      m45_54 |  -.0750687   .0379724    -1.98   0.048    -.1494932   -.0006442
      m55_59 |   .0003987   .0418567     0.01   0.992    -.0816388    .0824363
      m60_64 |    .113688   .0419097     2.71   0.007     .0315466    .1958294
      m65_69 |   .1718626   .0427617     4.02   0.000     .0880512     .255674
      m70_74 |   .2627763   .0430895     6.10   0.000     .1783225    .3472302
      m75_79 |   .2584636   .0435393     5.94   0.000     .1731281    .3437992
      m80_84 |   .3371884   .0443823     7.60   0.000     .2502007     .424176
      m85_89 |   .4597902   .0475515     9.67   0.000      .366591    .5529895
      m90_94 |   .5635503   .0624679     9.02   0.000     .4411154    .6859852
      m95_gt |    .837123   .1434275     5.84   0.000     .5560102    1.118236
    orec_num |    .160664   .0255542     6.29   0.000     .1105786    .2107494
       _cons |    7.28232   .0418551   173.99   0.000     7.200285    7.364354
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APPENDIX 19
REGRESSION RESULTS FROM
MS-DRG COST ANALYSES

Table 1 : MEDICAL AMI: Regression of 30-day Episode Costs for Medical AMI Episodes (N=34,194)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	8.9772	3.1371	2.86	0.0042
HCC1:HIV/AIDS	0.0983	0.1185	-0.83	0.4069
HCC2:Septicemia/Shock	0.0521	0.0278	-1.88	0.0606
HCC5:Opportunistic Infections	-0.0087	0.0808	0.11	0.9142
HCC7:Metastatic Cancer and Acute Leukemia	-0.041	0.0413	0.99	0.3212
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.0095	0.0414	0.23	0.8185
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.0392	0.0386	1.01	0.3105
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.0021	0.0212	0.1	0.9208
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.0921	0.0216	-4.27	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0598	0.0263	-2.27	0.0232
HCC17:Diabetes with Acute Complications	0.1004	0.0831	-1.21	0.2272
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.1349	0.0462	-2.92	0.0035
HCC19:Diabetes without Complication	0.0467	0.0162	-2.88	0.0039
HCC21:Protein-Calorie Malnutrition	-0.0016	0.0322	0.05	0.9593
HCC25:End-Stage Liver Disease	0.0446	0.076	-0.59	0.5577
HCC26:Cirrhosis of Liver	-0.158	0.0707	2.23	0.0255
HCC27:Chronic Hepatitis	-0.0641	0.0686	0.93	0.3506
HCC31:Intestinal Obstruction/Perforation	0.0123	0.0323	-0.38	0.7036
HCC32:Pancreatic Disease	-0.0026	0.0407	0.06	0.9487
HCC33:Inflammatory Bowel Disease:	0.1213	0.0677	-1.79	0.0732
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0111	0.0404	0.28	0.7826
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0105	0.0235	-0.45	0.6552
HCC44:Severe Hematological Disorders	0.0598	0.0447	-1.34	0.1809
HCC45:Disorders of Immunity	-0.0627	0.0602	1.04	0.2974
HCC51:Drug/Alcohol Psychosis	0.0264	0.0604	-0.44	0.6616
HCC52:Drug/Alcohol Dependence	-0.0074	0.0722	0.1	0.9186
HCC54:Schizophrenia	-0.0009	0.0527	0.02	0.9863
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.0121	0.0238	-0.51	0.6109
HCC67:Quadriplegia, Other Extensive Paralysis	-0.1954	0.0781	2.5	0.0123
HCC68:Paraplegia	-0.0447	0.1198	0.37	0.7089
HCC69:Spinal Cord Disorders/Injuries	0.0246	0.0492	-0.5	0.6169
HCC70:Muscular Dystrophy	0.2389	0.1954	-1.22	0.2213
HCC71:Polyneuropathy:	0.0292	0.0211	-1.38	0.1664
HCC72:Multiple Sclerosis	0.0259	0.1064	-0.24	0.8073

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	-0.0254	0.0325	0.78	0.4339
HCC74:Seizure Disorders and Convulsions	-0.0086	0.0283	0.3	0.7617
HCC75:Coma, Brain Compression/Anoxic Damage	0.1201	0.0648	-1.85	0.0637
HCC77:Respirator Dependence/Tracheostomy Status	0.1149	0.0799	-1.44	0.1506
HCC78:Respiratory Arrest	0.1485	0.0994	-1.49	0.1352
HCC79:Cardio-Respiratory Failure and Shock	0.005	0.0186	-0.27	0.7892
HCC80:Congestive Heart Failure	-0.0147	0.0153	0.96	0.3378
HCC81:Acute Myocardial Infarction	-0.1071	0.0188	5.69	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.1023	0.0218	4.7	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.0959	0.0212	4.53	<.0001
HCC92:Specified Heart Arrhythmias:	-0.0565	0.0142	3.97	<.0001
HCC95:Cerebral Hemorrhage	0.048	0.0556	-0.86	0.3882
HCC96:Ischemic or Unspecified Stroke	0.0295	0.0185	-1.6	0.1107
HCC100:Hemiplegia/Hemiparesis	0.0138	0.0301	-0.46	0.6459
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.0169	0.0888	-0.19	0.8487
HCC104:Vascular Disease with Complications	0.0501	0.0258	-1.94	0.0524
HCC105:Vascular Disease	0.0235	0.0145	-1.62	0.1043
HCC107:Cystic Fibrosis	-0.3098	0.1972	1.57	0.1162
HCC108:Chronic Obstructive Pulmonary Disease	0.0485	0.0146	-3.32	0.0009
HCC111:Aspiration and Specified Bacterial Pneumonias	0.0227	0.0356	-0.64	0.523
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.0424	0.0548	0.77	0.4387
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.0396	0.05	-0.79	0.4275
HCC130:Dialysis Status	0.1335	0.0521	-2.56	0.0104
HCC131:Renal Failure	-0.0144	0.0158	0.91	0.3631
HCC132:Nephritis	-0.0342	0.097	0.35	0.7243
HCC148:Decubitus Ulcer of Skin	0.0168	0.0279	-0.6	0.5482
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.0005	0.0241	-0.02	0.9828
HCC150:Extensive Third-Degree Burns	-0.3733	0.4104	0.91	0.363
HCC154:Severe Head Injury	0.0945	0.2146	-0.44	0.6597
HCC155:Major Head Injury	0.0388	0.0499	-0.78	0.4365
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.0303	0.0308	0.98	0.3249
HCC158:Hip Fracture/Dislocation	0.0353	0.0279	-1.27	0.2055
HCC161:Traumatic Amputation	0.0496	0.0826	-0.6	0.548
HCC164:Major Complications of Medical Care and Trauma	0.1288	0.0253	-5.08	<.0001
HCC174:Major Organ Transplant Status	0.3406	0.1461	-2.33	0.0197
HCC176:Artificial Openings for Feeding or Elimination	-0.0606	0.0581	1.04	0.2964
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.0325	0.0639	0.51	0.6112

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.3792	0.1137	-3.34	0.0008
Trauma in Episode HCC68:Paraplegia	0.3055	0.0987	-3.1	0.002
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.4205	0.0724	-5.81	<.0001
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.6032	0.0532	-11.34	<.0001
Trauma in Episode HCC154:Severe Head Injury	0.8021	0.4157	-1.93	0.0537
Trauma in Episode HCC155:Major Head Injury	0.2944	0.0617	-4.77	<.0001
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.1386	0.0498	-2.78	0.0054
Trauma in Episode HCC158:Hip Fracture/Dislocation	0.3805	0.0469	-8.11	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.6112	0.1419	-4.31	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.8817	0.0252	-35.04	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.2284	0.0923	-2.47	0.0134
Female, Infant - age 34	-2.16	0.3995	5.41	<.0001
Female, age 35-44	-0.7626	0.3415	2.23	0.0255
Female, age 45-54	-0.9986	0.3164	3.16	0.0016
Female, age 55-59	-1.0683	0.3145	3.4	0.0007
Female, age 60-64	-0.7679	0.3049	2.52	0.0118
Female, age 65-69	0.2362	0.0698	-3.39	0.0007
Female, age 70-74	0.2951	0.0654	-4.51	<.0001
Female, age 75-79	0.2703	0.0624	-4.33	<.0001
Female, age 80-84	0.1999	0.0608	-3.29	0.001
Female, age 85-89	0.1584	0.0602	-2.63	0.0085
Female, age 90-94	0.0754	0.0605	-1.25	0.2123
Female, age 95 and older	0.0202	0.0659	-0.31	0.7596
Male, Infant - age 34	-1.1251	0.4308	2.61	0.009
Male, age 35-44	-0.8631	0.3569	2.42	0.0156
Male, age 45-54	-0.9798	0.311	3.15	0.0016
Male, age 55-59	-0.7081	0.3189	2.22	0.0264
Male, age 60-64	-0.6282	0.3063	2.05	0.0403
Male, age 65-69	0.4193	0.0658	-6.37	<.0001
Male, age 70-74	0.3853	0.0644	-5.99	<.0001
Male, age 75-79	0.3859	0.0627	-6.15	<.0001
Male, age 80-84	0.2873	0.062	-4.64	<.0001
Male, age 85-89	0.1255	0.0616	-2.04	0.0415
Male, age 90-94	0.0571	0.0639	-0.89	0.3715
Male, age 95 and older	0	0	.	.
Disability	1.2912	0.323	-4	<.0001
Dual Eligible	-0.0064	0.0157	0.41	0.6847

Parameter	Estimate	Standard Error	Z Value	Significance Level
Medicare-Aged	-0.1822	0.08	-2.28	0.0228
Medicare-Disabled	0.1261	0.1313	0.96	0.3367
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	-0.0612	0.0189	3.24	0.0012
MS-DRG:Major Complications and Comorbidity	0.1046	0.0179	-5.84	<.0001
Number of IP visits in last 12 months for condition	0.0036	0.0037	0.98	0.3292
Number of ED visits in last 12 months for condition	-0.0612	0.0482	-1.27	0.2035

Table 2 : AMI with PTCA- Regression of 30-day Episode Costs for AMI with PTCA Episodes (N=13,679)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	11.716	6.3841	1.84	0.0665
HCC1:HIV/AIDS	-0.0165	0.1147	0.14	0.8854
HCC2:Septicemia/Shock	0.0148	0.0686	-0.22	0.8288
HCC5:Opportunistic Infections	0.0151	0.1203	-0.13	0.9003
HCC7:Metastatic Cancer and Acute Leukemia	0.2265	0.0775	-2.92	0.0035
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.0197	0.0718	-0.27	0.7836
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.0421	0.0587	0.72	0.473
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.0236	0.0372	0.64	0.5245
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.1389	0.045	-3.09	0.002
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.1027	0.0457	-2.25	0.0247
HCC17:Diabetes with Acute Complications	0.1849	0.2154	-0.86	0.3905
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.2776	0.0694	-4	<.0001
HCC19:Diabetes without Complication	0.051	0.0315	-1.62	0.1046
HCC21:Protein-Calorie Malnutrition	-0.0204	0.0743	0.27	0.7839
HCC25:End-Stage Liver Disease	-0.0178	0.1643	0.11	0.9138
HCC26:Cirrhosis of Liver	0.0426	0.1716	-0.25	0.8039
HCC27:Chronic Hepatitis	0.0476	0.1209	-0.39	0.694
HCC31:Intestinal Obstruction/Perforation	0.0284	0.0571	-0.5	0.6193
HCC32:Pancreatic Disease	-0.0409	0.0655	0.63	0.5318
HCC33:Inflammatory Bowel Disease:	0.0297	0.0909	-0.33	0.7437
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0641	0.0726	0.88	0.3776
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.075	0.0472	-1.59	0.1121
HCC44:Severe Hematological Disorders	0.0552	0.0831	-0.66	0.5071
HCC45:Disorders of Immunity	0.1185	0.0867	-1.37	0.1718
HCC51:Drug/Alcohol Psychosis	-0.0221	0.1067	0.21	0.8357
HCC52:Drug/Alcohol Dependence	0.2113	0.0956	-2.21	0.027
HCC54:Schizophrenia	0.0531	0.1267	-0.42	0.6749
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.0798	0.0537	-1.49	0.1374
HCC67:Quadriplegia, Other Extensive Paralysis	0.1724	0.2751	-0.63	0.5309
HCC68:Paraplegia	0.4646	0.2232	-2.08	0.0374
HCC69:Spinal Cord Disorders/Injuries	0.0246	0.0996	-0.25	0.8048
HCC70:Muscular Dystrophy	0.5949	0.5815	-1.02	0.3063
HCC71:Polyneuropathy:	0.0196	0.0384	-0.51	0.6101
HCC72:Multiple Sclerosis	0.0951	0.1692	-0.56	0.5743
HCC73:Parkinsons and Huntingtons Diseases	0.2837	0.0748	-3.8	0.0001
HCC74:Seizure Disorders and Convulsions	0.12	0.0545	-2.2	0.0275

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC75:Coma, Brain Compression/Anoxic Damage	0.1367	0.1529	-0.89	0.3715
HCC77:Respirator Dependence/Tracheostomy Status	0.2008	0.2171	-0.92	0.355
HCC78:Respiratory Arrest	0.0661	0.2503	-0.26	0.7918
HCC79:Cardio-Respiratory Failure and Shock	0.0978	0.045	-2.17	0.0298
HCC80:Congestive Heart Failure	0.0389	0.0296	-1.31	0.1897
HCC81:Acute Myocardial Infarction	-0.0802	0.0381	2.1	0.0354
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.1451	0.0407	3.56	0.0004
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.1391	0.0352	3.95	<.0001
HCC92:Specified Heart Arrhythmias:	0.0488	0.0315	-1.55	0.1208
HCC95:Cerebral Hemorrhage	-0.0098	0.1509	0.06	0.9483
HCC96:Ischemic or Unspecified Stroke	0.1543	0.042	-3.68	0.0002
HCC100:Hemiplegia/Hemiparesis	0.1356	0.066	-2.05	0.0399
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.0228	0.1561	-0.15	0.8841
HCC104:Vascular Disease with Complications	0.1075	0.0493	-2.18	0.0294
HCC105:Vascular Disease	0.1231	0.0309	-3.99	<.0001
HCC107:Cystic Fibrosis	0.9992	0.3769	-2.65	0.008
HCC108:Chronic Obstructive Pulmonary Disease	0.1018	0.0295	-3.46	0.0005
HCC111:Aspiration and Specified Bacterial Pneumonias	0.0681	0.0837	-0.81	0.4161
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.0546	0.1333	-0.41	0.6818
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.0349	0.0764	-0.46	0.6474
HCC130:Dialysis Status	0.1029	0.1154	-0.89	0.3727
HCC131:Renal Failure	0.0941	0.0355	-2.65	0.0081
HCC132:Nephritis	0.1059	0.1898	-0.56	0.577
HCC148:Decubitus Ulcer of Skin	0.1745	0.0816	-2.14	0.0326
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1665	0.0533	-3.12	0.0018
HCC154:Severe Head Injury	-1.9738	0.1937	10.19	<.0001
HCC155:Major Head Injury	0.1383	0.1263	-1.09	0.2736
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.1675	0.0595	2.81	0.0049
HCC158:Hip Fracture/Dislocation	0.2868	0.0919	-3.12	0.0018
HCC161:Traumatic Amputation	0.0528	0.2629	-0.2	0.8409
HCC164:Major Complications of Medical Care and Trauma	0.1369	0.0521	-2.63	0.0087
HCC174:Major Organ Transplant Status	0.1875	0.1674	-1.12	0.2628
HCC176:Artificial Openings for Feeding or Elimination	-0.2911	0.1192	2.44	0.0146
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.146	0.1203	1.21	0.225
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.7674	0.2135	-3.59	0.0003
Trauma in Episode HCC68:Paraplegia	0.8442	0.3452	-2.45	0.0145
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.2713	0.1347	-2.01	0.044
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.5756	0.1269	-4.53	<.0001
Trauma in Episode HCC154:Severe Head Injury	0.6927	0.3071	-2.26	0.0241
Trauma in Episode HCC155:Major Head Injury	0.8342	0.1694	-4.92	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.2868	0.1122	-2.56	0.0106
Trauma in Episode HCC158:Hip Fracture/Dislocation	0.8945	0.119	-7.52	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.7036	0.276	-2.55	0.0108
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.3708	0.0439	-8.45	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0765	0.1784	-0.43	0.668
Female, Infant - age 34	-0.9837	0.4419	2.23	0.026
Female, age 35-44	-0.5578	0.4529	1.23	0.2181
Female, age 45-54	-0.81	0.4055	2	0.0458
Female, age 55-59	-0.6689	0.4022	1.66	0.0963
Female, age 60-64	-0.3102	0.4108	0.76	0.4501
Female, age 65-69	-0.4085	0.2591	1.58	0.1149
Female, age 70-74	-0.4169	0.2578	1.62	0.1058
Female, age 75-79	-0.2321	0.2569	0.9	0.3663
Female, age 80-84	-0.1029	0.2568	0.4	0.6888
Female, age 85-89	-0.0731	0.2578	0.28	0.7768
Female, age 90-94	-0.0337	0.263	0.13	0.8981
Female, age 95 and older	-0.0757	0.297	0.25	0.7989
Male, Infant - age 34	0.4899	0.6446	-0.76	0.4472
Male, age 35-44	-1.0625	0.4091	2.6	0.0094
Male, age 45-54	-0.6531	0.4009	1.63	0.1033
Male, age 55-59	-0.8228	0.3981	2.07	0.0388
Male, age 60-64	-0.6204	0.3902	1.59	0.1119
Male, age 65-69	-0.3758	0.2589	1.45	0.1467
Male, age 70-74	-0.3582	0.2575	1.39	0.1643
Male, age 75-79	-0.2438	0.2591	0.94	0.3468
Male, age 80-84	-0.2447	0.2573	0.95	0.3417
Male, age 85-89	-0.2351	0.259	0.91	0.3639
Male, age 90-94	-0.0933	0.2699	0.35	0.7296
Male, age 95 and older	0	0	.	.
Disability	0.4971	0.2364	-2.1	0.0355
Dual Eligible	0.1251	0.0335	-3.74	0.0002
Medicare-Aged	-0.1935	0.1444	-1.34	0.1802
Medicare-Disabled	0.1553	0.1914	0.81	0.4173
Medicare-ESRD	0	0	.	.
MS-DRG: DRUG ELUTING STENT	-0.0888	0.038	2.34	0.0194
MS-DRG:Major Complications and Comorbidity	0.3967	0.0346	-11.47	<.0001
Number of IP visits in last 12 months for condition	0.0221	0.0076	2.92	0.0035
Number of ED visits in last 12 months for condition	0.0062	0.078	0.08	0.937

Table 3 : AMI with CABG- Regression of 30-day Episode Costs for AMI with CABG Episodes (N=2,559)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	34.6825	3.3307	10.41	<.0001
HCC1:HIV/AIDS	-0.0026	0.4578	0.01	0.9955
HCC2:Septicemia/Shock	-0.041	0.1042	0.39	0.6941
HCC5:Opportunistic Infections	-0.7674	0.1533	5.01	<.0001
HCC7:Metastatic Cancer and Acute Leukemia	0.1111	0.1705	-0.65	0.5146
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.1196	0.1596	0.75	0.4535
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0808	0.1051	-0.77	0.442
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.1071	0.0469	-2.28	0.0223
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.1218	0.0648	-1.88	0.0604
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0783	0.0736	-1.06	0.2873
HCC17:Diabetes with Acute Complications	0.2332	0.1631	-1.43	0.1527
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.1195	0.1057	-1.13	0.2582
HCC19:Diabetes without Complication	0.037	0.035	-1.06	0.2906
HCC21:Protein-Calorie Malnutrition	0.1129	0.1551	-0.73	0.4666
HCC25:End-Stage Liver Disease	0.009	0.2987	-0.03	0.9758
HCC26:Cirrhosis of Liver	-0.3462	0.2032	1.7	0.0884
HCC27:Chronic Hepatitis	-0.1521	0.2153	0.71	0.4799
HCC31:Intestinal Obstruction/Perforation	0.0229	0.1065	-0.21	0.8299
HCC32:Pancreatic Disease	0.0579	0.1119	-0.52	0.6051
HCC33:Inflammatory Bowel Disease:	-0.0394	0.1201	0.33	0.743
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.027	0.1375	-0.2	0.8443
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0674	0.0547	-1.23	0.218
HCC44:Severe Hematological Disorders	-0.0906	0.1018	0.89	0.3738
HCC45:Disorders of Immunity	-0.0062	0.108	0.06	0.9545
HCC51:Drug/Alcohol Psychosis	0.128	0.1943	-0.66	0.5101
HCC52:Drug/Alcohol Dependence	-0.1749	0.155	1.13	0.2591
HCC54:Schizophrenia	-0.0513	0.1368	0.38	0.7076
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.0366	0.089	-0.41	0.6811
HCC67:Quadriplegia, Other Extensive Paralysis	1.0256	0.2355	-4.36	<.0001
HCC68:Paraplegia	0.177	0.212	-0.83	0.404
HCC69:Spinal Cord Disorders/Injuries	0.1152	0.1918	-0.6	0.5482
HCC70:Muscular Dystrophy	0.3755	0.2089	-1.8	0.0723
HCC71:Polyneuropathy:	0.0115	0.0551	-0.21	0.8343
HCC72:Multiple Sclerosis	0.1543	0.2032	-0.76	0.4476
HCC73:Parkinsons and Huntingtons Diseases	0.247	0.1291	-1.91	0.0557
HCC74:Seizure Disorders and Convulsions	0.0641	0.1074	-0.6	0.5504

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC75:Coma, Brain Compression/Anoxic Damage	0.1148	0.3167	-0.36	0.7169
HCC77:Respirator Dependence/Tracheostomy Status	-0.2403	0.3163	0.76	0.4474
HCC78:Respiratory Arrest	0.1198	0.2826	-0.42	0.6715
HCC79:Cardio-Respiratory Failure and Shock	0.0928	0.0748	-1.24	0.2148
HCC80:Congestive Heart Failure	0.0754	0.0444	-1.7	0.0892
HCC81:Acute Myocardial Infarction	-0.004	0.0515	0.08	0.9388
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0102	0.0476	0.22	0.8297
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.0398	0.0471	0.85	0.3978
HCC92:Specified Heart Arrhythmias:	0.0393	0.0514	-0.77	0.4442
HCC95:Cerebral Hemorrhage	0.0128	0.2114	-0.06	0.9517
HCC96:Ischemic or Unspecified Stroke	0.1446	0.0685	-2.11	0.0346
HCC100:Hemiplegia/Hemiparesis	0.2879	0.1124	-2.56	0.0104
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.0959	0.2338	-0.41	0.6817
HCC104:Vascular Disease with Complications	0.0902	0.079	-1.14	0.2538
HCC105:Vascular Disease	0.0449	0.0386	-1.16	0.2442
HCC108:Chronic Obstructive Pulmonary Disease	0.0621	0.0415	-1.5	0.134
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1973	0.1602	1.23	0.2183
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.1029	0.1586	0.65	0.5165
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.1219	0.0908	-1.34	0.1793
HCC130:Dialysis Status	0.2062	0.1953	-1.06	0.2911
HCC131:Renal Failure	0.051	0.0491	-1.04	0.2995
HCC132:Nephritis	-0.338	0.1433	2.36	0.0183
HCC148:Decubitus Ulcer of Skin	0.3957	0.2412	-1.64	0.1009
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.3591	0.1043	-3.44	0.0006
HCC154:Severe Head Injury	-0.4227	0.3301	1.28	0.2004
HCC155:Major Head Injury	-0.0431	0.1632	0.26	0.7915
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0182	0.1384	-0.13	0.8953
HCC158:Hip Fracture/Dislocation	0.1221	0.1283	-0.95	0.3411
HCC161:Traumatic Amputation	0.5017	0.2589	-1.94	0.0527
HCC164:Major Complications of Medical Care and Trauma	-0.0602	0.0714	0.84	0.3992
HCC174:Major Organ Transplant Status	-0.0782	0.154	0.51	0.6115
HCC176:Artificial Openings for Feeding or Elimination	-0.164	0.2129	0.77	0.441
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.061	0.226	-0.27	0.7872
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.3581	0.1419	-2.52	0.0116
Trauma in Episode HCC68:Paraplegia	0.8864	0.1911	-4.64	<.0001
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.5489	0.2911	-1.89	0.0593
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.5564	0.1176	-4.73	<.0001
Trauma in Episode HCC155:Major Head Injury	0.7389	0.1841	-4.01	<.0001
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.4316	0.1581	-2.73	0.0063

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC158:Hip Fracture/Dislocation	-0.3259	0.2631	1.24	0.2155
Trauma in Episode HCC161:Traumatic Amputation	0.7733	0.3308	-2.34	0.0194
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.2217	0.0346	-6.41	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.5425	0.2849	1.9	0.0569
Female, Infant - age 34	0.1846	0.4716	-0.39	0.6954
Female, age 35-44	0.5613	0.2768	-2.03	0.0426
Female, age 45-54	1.1524	0.3123	-3.69	0.0002
Female, age 55-59	0.6528	0.242	-2.7	0.007
Female, age 60-64	0.6822	0.1637	-4.17	<.0001
Female, age 65-69	0.9526	0.129	-7.39	<.0001
Female, age 70-74	1.1025	0.1221	-9.03	<.0001
Female, age 75-79	1.1739	0.1238	-9.48	<.0001
Female, age 80-84	1.2852	0.1224	-10.5	<.0001
Female, age 85-89	1.4721	0.1322	-11.13	<.0001
Female, age 90-94	1.2308	0.309	-3.98	<.0001
Male, Infant - age 34	0.3421	0.2816	-1.21	0.2244
Male, age 35-44	0.3549	0.2743	-1.29	0.1958
Male, age 45-54	0.4919	0.2282	-2.16	0.0311
Male, age 55-59	0.5683	0.2221	-2.56	0.0105
Male, age 60-64	0.4596	0.2122	-2.17	0.0303
Male, age 65-69	0.968	0.1187	-8.16	<.0001
Male, age 70-74	1.101	0.122	-9.03	<.0001
Male, age 75-79	1.1601	0.1212	-9.57	<.0001
Male, age 80-84	1.2523	0.1214	-10.32	<.0001
Male, age 85-89	1.2867	0.1353	-9.51	<.0001
Male, age 90-94	1.4839	0.3437	-4.32	<.0001
Male, age 95 and older	0	0	.	.
Disability	0.0319	0.2784	-0.11	0.9088
Dual Eligible	0.0114	0.0399	-0.29	0.7748
Medicare-Aged	0.0973	0.1908	0.51	0.6098
Medicare-Disabled	-0.3431	0.2076	-1.65	0.0985
Medicare-ESRD	0	0	.	.
MS-DRG: PTCA	0.1861	0.0744	-2.5	0.0123
MS-DRG:Major Complications and Comorbidity	0.5714	0.0909	-6.28	<.0001
Number of IP visits in last 12 months for condition	0.015	0.0185	0.81	0.4187
Number of ED visits in last 12 months for condition	-0.0617	0.0895	-0.69	0.4911
Death in episode window	0.1861	0.0744	-2.5	0.0123

Table 4: CHF- Regression of 30-day Episode Costs for CHF Episodes (N=107,185)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	23.0513	1.9167	144.64	<.0001
HCC1:HIV/AIDS	-0.0931	0.0504	3.41	0.0647
HCC2:Septicemia/Shock	-0.0418	0.0122	11.72	0.0006
HCC5:Opportunistic Infections	-0.0313	0.0324	0.93	0.334
HCC7:Metastatic Cancer and Acute Leukemia	-0.0729	0.0207	12.42	0.0004
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.0127	0.022	0.33	0.5638
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.0175	0.0188	0.87	0.3514
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.0143	0.0108	1.73	0.1882
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	-0.0536	0.0106	25.79	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	-0.0452	0.0127	12.62	0.0004
HCC17:Diabetes with Acute Complications	-0.072	0.0464	2.41	0.1207
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.0434	0.0203	4.55	0.0329
HCC19:Diabetes without Complication	-0.0101	0.0083	1.49	0.2223
HCC21:Protein-Calorie Malnutrition	-0.0503	0.0137	13.5	0.0002
HCC25:End-Stage Liver Disease	-0.0494	0.0312	2.52	0.1128
HCC26:Cirrhosis of Liver	-0.0326	0.0292	1.24	0.2651
HCC27:Chronic Hepatitis	-0.0218	0.0327	0.44	0.505
HCC31:Intestinal Obstruction/Perforation	-0.0453	0.0143	9.97	0.0016
HCC32:Pancreatic Disease	0.0094	0.0174	0.29	0.5885
HCC33:Inflammatory Bowel Disease:	0.0337	0.0298	1.27	0.2594
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0274	0.0192	2.05	0.1526
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	-0.0365	0.0117	9.76	0.0018
HCC44:Severe Hematological Disorders	-0.0197	0.0154	1.63	0.2016
HCC45:Disorders of Immunity	-0.115	0.0231	24.73	<.0001
HCC51:Drug/Alcohol Psychosis	0.0386	0.0276	1.96	0.1611
HCC52:Drug/Alcohol Dependence	0.0372	0.0296	1.58	0.2094
HCC54:Schizophrenia	-0.2134	0.0297	51.46	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-0.1215	0.0131	85.7	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	-0.0306	0.0374	0.67	0.4138
HCC68:Paraplegia	-0.0502	0.0538	0.87	0.3507
HCC69:Spinal Cord Disorders/Injuries	-0.0238	0.0259	0.85	0.3569
HCC70:Muscular Dystrophy	0.0007	0.1042	0	0.9949
HCC71:Polyneuropathy:	-0.0348	0.01	12.12	0.0005
HCC72:Multiple Sclerosis	-0.1423	0.056	6.46	0.011
HCC73:Parkinsons and Huntingtons Diseases	-0.0924	0.0197	22.02	<.0001

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC74:Seizure Disorders and Convulsions	-0.0265	0.0151	3.06	0.0801
HCC75:Coma, Brain Compression/Anoxic Damage	-0.0501	0.031	2.61	0.1065
HCC77:Respirator Dependence/Tracheostomy Status	-0.2243	0.0348	41.58	<.0001
HCC78:Respiratory Arrest	-0.092	0.0373	6.09	0.0136
HCC79:Cardio-Respiratory Failure and Shock	-0.0274	0.008	11.64	0.0006
HCC80:Congestive Heart Failure	0.0138	0.0096	2.09	0.1487
HCC81:Acute Myocardial Infarction	-0.0464	0.0111	17.42	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0157	0.0106	2.2	0.1377
HCC83:Angina Pectoris/Old Myocardial Infarction	0.0462	0.0093	24.76	<.0001
HCC92:Specified Heart Arrhythmias:	-0.0022	0.0072	0.1	0.7576
HCC95:Cerebral Hemorrhage	-0.0924	0.0287	10.35	0.0013
HCC96:Ischemic or Unspecified Stroke	-0.0701	0.0101	48.17	<.0001
HCC100:Hemiplegia/Hemiparesis	-0.0516	0.0172	8.97	0.0027
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.0571	0.0484	1.39	0.2384
HCC104:Vascular Disease with Complications	-0.0724	0.0119	37.22	<.0001
HCC105:Vascular Disease	-0.06	0.0073	67.79	<.0001
HCC107:Cystic Fibrosis	-0.1405	0.1399	1.01	0.3152
HCC108:Chronic Obstructive Pulmonary Disease	-0.0371	0.0071	27.34	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	0.0077	0.0148	0.27	0.6014
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.0151	0.0224	0.45	0.5006
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.0182	0.0197	0.86	0.3549
HCC130:Dialysis Status	-0.0573	0.025	5.26	0.0218
HCC131:Renal Failure	-0.0439	0.0075	33.92	<.0001
HCC132:Nephritis	-0.0129	0.0475	0.07	0.7858
HCC148:Decubitus Ulcer of Skin	-0.0464	0.0136	11.7	0.0006
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.0829	0.0128	42.18	<.0001
HCC150:Extensive Third-Degree Burns	0.0486	0.4016	0.01	0.9037
HCC154:Severe Head Injury	-0.1733	0.1709	1.03	0.3107
HCC155:Major Head Injury	-0.0072	0.0259	0.08	0.7812
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.0327	0.0165	3.91	0.0479
HCC158:Hip Fracture/Dislocation	-0.0834	0.0158	27.77	<.0001
HCC161:Traumatic Amputation	-0.0992	0.0385	6.63	0.01
HCC164:Major Complications of Medical Care and Trauma	-0.1014	0.01	102.97	<.0001
HCC174:Major Organ Transplant Status	-0.2653	0.0482	30.27	<.0001
HCC176:Artificial Openings for Feeding or Elimination	0.0064	0.0243	0.07	0.7916
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.0482	0.0299	2.6	0.1065
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	-0.5897	0.0558	111.67	<.0001

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Trauma in Episode HCC68:Paraplegia	-0.6251	0.0776	64.92	<.0001
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	-0.4021	0.0656	37.61	<.0001
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	-0.7881	0.0384	421.52	<.0001
Trauma in Episode HCC154:Severe Head Injury	-0.6522	0.3205	4.14	0.0418
Trauma in Episode HCC155:Major Head Injury	-0.6524	0.0617	111.8	<.0001
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	-0.3705	0.0379	95.48	<.0001
Trauma in Episode HCC158:Hip Fracture/Dislocation	-0.763	0.047	263.73	<.0001
Trauma in Episode HCC161:Traumatic Amputation	-0.5004	0.1012	24.46	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	-1.0625	0.0208	2605.04	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.1718	0.0533	10.4	0.0013
Female, Infant - age 34	-0.359	0.2175	2.72	0.0988
Female, age 35-44	-0.3015	0.1942	2.41	0.1206
Female, age 45-54	-0.3359	0.1872	3.22	0.0728
Female, age 55-59	-0.2874	0.1873	2.35	0.1249
Female, age 60-64	-0.3686	0.1852	3.96	0.0466
Female, age 65-69	-0.062	0.0399	2.41	0.1205
Female, age 70-74	-0.0645	0.0385	2.8	0.094
Female, age 75-79	-0.0842	0.0377	4.98	0.0256
Female, age 80-84	-0.0861	0.0372	5.37	0.0204
Female, age 85-89	-0.0728	0.0371	3.85	0.0497
Female, age 90-94	-0.0807	0.0378	4.54	0.033
Female, age 95 and older	-0.0441	0.0413	1.14	0.2859
Male, Infant - age 34	-0.5106	0.2056	6.17	0.013
Male, age 35-44	-0.3583	0.191	3.52	0.0607
Male, age 45-54	-0.4746	0.1862	6.5	0.0108
Male, age 55-59	-0.4144	0.1865	4.94	0.0263
Male, age 60-64	-0.4006	0.1836	4.76	0.0291
Male, age 65-69	-0.0908	0.0393	5.34	0.0208
Male, age 70-74	-0.0225	0.0384	0.34	0.558
Male, age 75-79	-0.0453	0.0378	1.44	0.2308
Male, age 80-84	-0.0495	0.0374	1.75	0.1863
Male, age 85-89	-0.0585	0.0377	2.41	0.1205
Male, age 90-94	-0.0072	0.0398	0.03	0.8567
Male, age 95 and older	0	0	.	.
Disability	0.3818	0.1884	4.11	0.0427
Dual Eligible	-0.0258	0.0079	10.78	0.001

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Medicare-Aged	-0.1047	0.0357	8.59	0.0034
Medicare-Disabled	-0.0282	0.0567	0.25	0.6183
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	-0.1909	0.0086	492.16	<.0001
MS-DRG:Major Complications and Comorbidity	-0.3522	0.0089	1558.6	<.0001
Number of IP visits in last 12 months for condition	0.0133	0.0042	10.14	0.0015
Number of ED visits in last 12 months for condition	-0.0027	0.0038	0.51	0.4748
Death in episode window	0.5577	0.0125	1979.69	<.0001

Table 5: COPD- Regression of 30-day Episode Costs for COPD Episodes (N=78,760)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	19.5961	2.5559	7.67	<.0001
HCC1:HIV/AIDS	0.0653	0.0831	0.79	0.4322
HCC2:Septicemia/Shock	0.0777	0.0197	3.94	<.0001
HCC5:Opportunistic Infections	0.0089	0.0348	0.26	0.7979
HCC7:Metastatic Cancer and Acute Leukemia	0.2763	0.0263	10.5	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.0869	0.0231	3.77	0.0002
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.122	0.0331	3.68	0.0002
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.03	0.0178	1.68	0.0922
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.125	0.0214	5.83	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0721	0.0216	3.34	0.0008
HCC17:Diabetes with Acute Complications	0.0179	0.0801	0.22	0.8233
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.0748	0.0333	2.25	0.0248
HCC19:Diabetes without Complication	0.03	0.0126	2.38	0.0171
HCC21:Protein-Calorie Malnutrition	0.1522	0.022	6.93	<.0001
HCC25:End-Stage Liver Disease	0.071	0.0651	1.09	0.2756
HCC26:Cirrhosis of Liver	0.0436	0.0543	0.8	0.4224
HCC27:Chronic Hepatitis	0.0563	0.0579	0.97	0.3313
HCC31:Intestinal Obstruction/Perforation	0.0276	0.0219	1.26	0.2071
HCC32:Pancreatic Disease	0.0067	0.0211	0.32	0.7488
HCC33:Inflammatory Bowel Disease:	0.0061	0.0418	0.15	0.8835
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0032	0.035	-0.09	0.9271
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0558	0.0174	3.21	0.0013
HCC44:Severe Hematological Disorders	0.004	0.0268	0.15	0.8807
HCC45:Disorders of Immunity	0.0873	0.0352	2.48	0.0131
HCC51:Drug/Alcohol Psychosis	0.1163	0.0347	3.35	0.0008
HCC52:Drug/Alcohol Dependence	0.0417	0.0308	1.35	0.1766
HCC54:Schizophrenia	0.4066	0.0294	13.84	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.168	0.017	9.9	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	0.075	0.0597	1.26	0.209
HCC68:Paraplegia	0.1015	0.0708	1.43	0.1514
HCC69:Spinal Cord Disorders/Injuries	0.1003	0.0354	2.83	0.0046
HCC70:Muscular Dystrophy	0.125	0.1128	1.11	0.2677
HCC71:Polyneuropathy:	0.016	0.0159	1	0.3153
HCC72:Multiple Sclerosis	0.1162	0.0666	1.75	0.081
HCC73:Parkinsons and Huntingtons Diseases	0.1801	0.0275	6.56	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC74:Seizure Disorders and Convulsions	0.0504	0.0209	2.41	0.0158
HCC75:Coma, Brain Compression/Anoxic Damage	0.0472	0.0447	1.06	0.2908
HCC77:Respirator Dependence/Tracheostomy Status	0.2583	0.0535	4.83	<.0001
HCC78:Respiratory Arrest	0.2361	0.0565	4.18	<.0001
HCC79:Cardio-Respiratory Failure and Shock	0.1029	0.0123	8.35	<.0001
HCC80:Congestive Heart Failure	0.1134	0.0122	9.31	<.0001
HCC81:Acute Myocardial Infarction	0.0184	0.023	0.8	0.4225
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0353	0.0183	1.93	0.0539
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.0311	0.017	-1.83	0.0677
HCC92:Specified Heart Arrhythmias:	0.0348	0.0117	2.99	0.0028
HCC95:Cerebral Hemorrhage	0.023	0.0441	0.52	0.6016
HCC96:Ischemic or Unspecified Stroke	0.112	0.017	6.6	<.0001
HCC100:Hemiplegia/Hemiparesis	0.1043	0.0293	3.56	0.0004
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.0656	0.0594	1.1	0.2699
HCC104:Vascular Disease with Complications	0.1373	0.0225	6.11	<.0001
HCC105:Vascular Disease	0.0938	0.0116	8.11	<.0001
HCC107:Cystic Fibrosis	0.1285	0.1046	1.23	0.2192
HCC108:Chronic Obstructive Pulmonary Disease	0.0691	0.0175	3.96	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	0.0942	0.0199	4.73	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.0427	0.0294	-1.45	0.1464
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	-0.0108	0.049	-0.22	0.8259
HCC130:Dialysis Status	0.2026	0.0764	2.65	0.008
HCC131:Renal Failure	0.0819	0.0143	5.72	<.0001
HCC132:Nephritis	0.0252	0.0632	0.4	0.6897
HCC148:Decubitus Ulcer of Skin	0.1136	0.0242	4.69	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.0934	0.0254	3.68	0.0002
HCC150:Extensive Third-Degree Burns	0.6678	0.6816	0.98	0.3272
HCC154:Severe Head Injury	0.0243	0.2047	0.12	0.9057
HCC155:Major Head Injury	0.0205	0.0477	0.43	0.668
HCC157:Vertebral Fractures without Spinal Cord Injury	0.1413	0.022	6.41	<.0001
HCC158:Hip Fracture/Dislocation	0.13	0.0231	5.62	<.0001
HCC161:Traumatic Amputation	0.1245	0.0242	5.14	<.0001
HCC164:Major Complications of Medical Care and Trauma	0.0472	0.0186	2.54	0.011
HCC174:Major Organ Transplant Status	-0.1726	0.1	-1.73	0.0843
HCC176:Artificial Openings for Feeding or Elimination	0.0971	0.0398	2.44	0.0146
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0714	0.0684	1.04	0.2962
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.768	0.0829	9.26	<.0001
Trauma in Episode HCC68:Paraplegia	0.5758	0.1021	5.64	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.5295	0.0783	6.76	<.0001
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.9769	0.0748	13.06	<.0001
Trauma in Episode HCC154:Severe Head Injury	0.7758	0.0497	15.6	<.0001
Trauma in Episode HCC155:Major Head Injury	0.6995	0.0847	8.26	<.0001
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.5239	0.0411	12.74	<.0001
Trauma in Episode HCC158:Hip Fracture/Dislocation	1.0286	0.0548	18.76	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.4913	0.0321	15.32	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.9689	0.0333	29.12	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0978	0.1117	0.88	0.3814
Female, Infant - age 34	-0.1521	0.2312	-0.66	0.5106
Female, age 35-44	-0.2348	0.2185	-1.07	0.2824
Female, age 45-54	-0.0651	0.2097	-0.31	0.7561
Female, age 55-59	0.0524	0.2096	0.25	0.8027
Female, age 60-64	0.0692	0.2055	0.34	0.7362
Female, age 65-69	-0.4186	0.0775	-5.4	<.0001
Female, age 70-74	-0.3814	0.0767	-4.98	<.0001
Female, age 75-79	-0.2593	0.0761	-3.41	0.0007
Female, age 80-84	-0.1795	0.0759	-2.37	0.018
Female, age 85-89	-0.0514	0.0762	-0.68	0.4996
Female, age 90-94	-0.028	0.0781	-0.36	0.7205
Female, age 95 and older	0.0534	0.0843	0.63	0.5268
Male, Infant - age 34	0.258	0.4469	0.58	0.5638
Male, age 35-44	-0.1612	0.2249	-0.72	0.4737
Male, age 45-54	-0.0143	0.2109	-0.07	0.9461
Male, age 55-59	0.0835	0.2128	0.39	0.6947
Male, age 60-64	0.1132	0.207	0.55	0.5844
Male, age 65-69	-0.4177	0.08	-5.22	<.0001
Male, age 70-74	-0.3767	0.0777	-4.85	<.0001
Male, age 75-79	-0.3042	0.0771	-3.94	<.0001
Male, age 80-84	-0.217	0.0767	-2.83	0.0046
Male, age 85-89	-0.1392	0.0778	-1.79	0.0736
Male, age 90-94	-0.1075	0.0823	-1.31	0.1917
Male, age 95 and older	0	0	-	.
Disability	-0.506	0.2366	-2.14	0.0325
Dual Eligible	0.1166	0.0119	9.79	<.0001
Medicare-Aged	-0.3204	0.0937	-3.42	0.0006
Medicare-Disabled	-0.2181	0.1444	-1.51	0.131

Parameter	Estimate	Standard Error	Z Value	Significance Level
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.2483	0.0134	18.52	<.0001
MS-DRG:Major Complications and Comorbidity	0.3189	0.0136	23.52	<.0001
Number of IP visits in last 12 months for condition	0.0381	0.0072	5.27	<.0001
Number of ED visits in last 12 months for condition	0.022	0.0038	5.76	<.0001
Death in episode window	0.1673	0.0237	7.07	<.0001

Table 6 : Pneumonia- Regression of 30-day Episode Costs for Pneumonia Episodes (N=86,869)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	17.8243	2.3673	7.53	<.0001
HCC1:HIV/AIDS	0.0492	0.0833	0.59	0.5544
HCC2:Septicemia/Shock	0.0759	0.0164	4.62	<.0001
HCC5:Opportunistic Infections	0.0665	0.0396	1.68	0.093
HCC7:Metastatic Cancer and Acute Leukemia	0.091	0.022	4.14	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.0139	0.025	0.56	0.577
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0795	0.029	2.74	0.0062
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0271	0.016	1.69	0.0907
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.1097	0.0176	6.25	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0863	0.0189	4.57	<.0001
HCC17:Diabetes with Acute Complications	0.119	0.1211	0.98	0.3258
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.0688	0.0325	2.12	0.0343
HCC19:Diabetes without Complication	0.0217	0.0124	1.75	0.0801
HCC21:Protein-Calorie Malnutrition	0.0746	0.0175	4.26	<.0001
HCC25:End-Stage Liver Disease	0.0439	0.0602	0.73	0.4655
HCC26:Cirrhosis of Liver	0.0264	0.0508	0.52	0.6036
HCC27:Chronic Hepatitis	0.0228	0.0494	0.46	0.6444
HCC31:Intestinal Obstruction/Perforation	0.0555	0.0187	2.98	0.0029
HCC32:Pancreatic Disease	0.0424	0.0214	1.98	0.0475
HCC33:Inflammatory Bowel Disease:	0.0585	0.0449	1.3	0.1928
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0585	0.0276	2.12	0.0341
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0295	0.0166	1.77	0.0763
HCC44:Severe Hematological Disorders	0.0081	0.0226	0.36	0.7207
HCC45:Disorders of Immunity	0.0965	0.0258	3.75	0.0002
HCC51:Drug/Alcohol Psychosis	0.0549	0.0334	1.64	0.1006
HCC52:Drug/Alcohol Dependence	0.1655	0.0459	3.61	0.0003
HCC54:Schizophrenia	0.3429	0.0294	11.68	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.1421	0.0159	8.93	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	0.071	0.0401	1.77	0.0768
HCC68:Paraplegia	0.1653	0.0586	2.82	0.0048
HCC69:Spinal Cord Disorders/Injuries	0.0774	0.029	2.67	0.0076
HCC70:Muscular Dystrophy	0.2197	0.1443	1.52	0.128
HCC71:Polyneuropathy:	0.0415	0.0141	2.95	0.0032
HCC72:Multiple Sclerosis	0.2228	0.0676	3.29	0.001
HCC73:Parkinsons and Huntingtons Diseases	0.1789	0.0189	9.46	<.0001
HCC74:Seizure Disorders and Convulsions	0.0594	0.0174	3.41	0.0007
HCC75:Coma, Brain Compression/Anoxic Damage	0.0719	0.0403	1.78	0.0746

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC77:Respirator Dependence/Tracheostomy Status	0.2962	0.0502	5.9	<.0001
HCC78:Respiratory Arrest	0.1234	0.0727	1.7	0.0896
HCC79:Cardio-Respiratory Failure and Shock	0.0634	0.0126	5.05	<.0001
HCC80:Congestive Heart Failure	0.0499	0.0115	4.35	<.0001
HCC81:Acute Myocardial Infarction	0.0204	0.0245	0.83	0.4049
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0313	0.0197	1.59	0.1122
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.0066	0.0162	-0.41	0.6836
HCC92:Specified Heart Arrhythmias:	0.0278	0.0118	2.36	0.0185
HCC95:Cerebral Hemorrhage	0.0768	0.0377	2.04	0.0413
HCC96:Ischemic or Unspecified Stroke	0.0833	0.0136	6.11	<.0001
HCC100:Hemiplegia/Hemiparesis	0.1303	0.0217	6	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.1542	0.0725	2.13	0.0335
HCC104:Vascular Disease with Complications	0.0678	0.0194	3.5	0.0005
HCC105:Vascular Disease	0.0988	0.0106	9.35	<.0001
HCC107:Cystic Fibrosis	0.1858	0.1489	1.25	0.2121
HCC108:Chronic Obstructive Pulmonary Disease	0.0335	0.0107	3.12	0.0018
HCC111:Aspiration and Specified Bacterial Pneumonias	0.021	0.0192	1.09	0.2746
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.0509	0.027	-1.88	0.0596
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	-0.0159	0.0377	-0.42	0.6723
HCC130:Dialysis Status	0.1024	0.044	2.33	0.02
HCC131:Renal Failure	0.0472	0.0126	3.75	0.0002
HCC132:Nephritis	0.0347	0.0694	0.5	0.6173
HCC148:Decubitus Ulcer of Skin	0.011	0.0178	0.61	0.5387
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.0953	0.0205	4.64	<.0001
HCC150:Extensive Third-Degree Burns	0.1093	0.2708	0.4	0.6865
HCC154:Severe Head Injury	0.0281	0.1674	0.17	0.8669
HCC155:Major Head Injury	0.0639	0.0367	1.74	0.0817
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0679	0.0195	3.48	0.0005
HCC158:Hip Fracture/Dislocation	0.1407	0.0186	7.56	<.0001
HCC161:Traumatic Amputation	0.0385	0.0219	1.76	0.0793
HCC164:Major Complications of Medical Care and Trauma	0.0586	0.0163	3.59	0.0003
HCC174:Major Organ Transplant Status	0.0256	0.0785	0.33	0.7446
HCC176:Artificial Openings for Feeding or Elimination	-0.011	0.0286	-0.39	0.7002
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.049	0.0477	1.03	0.304
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.4651	0.0571	8.15	<.0001
Trauma in Episode HCC68:Paraplegia	0.5467	0.0963	5.68	<.0001
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.5791	0.0691	8.38	<.0001
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.7273	0.0539	13.49	<.0001
Trauma in Episode HCC154:Severe Head Injury	1.1107	0.4588	2.42	0.0155
Trauma in Episode HCC155:Major Head Injury	0.5821	0.0731	7.96	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.3366	0.0368	9.14	<.0001
Trauma in Episode HCC158:Hip Fracture/Dislocation	0.8152	0.047	17.35	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.4557	0.0375	12.16	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.7339	0.0237	31.01	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.2219	0.0644	3.44	0.0006
Female, Infant - age 34	-0.4	0.2627	-1.52	0.1278
Female, age 35-44	-0.2813	0.2517	-1.12	0.2638
Female, age 45-54	-0.2113	0.2417	-0.87	0.3821
Female, age 55-59	-0.1605	0.241	-0.67	0.5054
Female, age 60-64	-0.0803	0.2379	-0.34	0.7358
Female, age 65-69	-0.3253	0.0482	-6.75	<.0001
Female, age 70-74	-0.2678	0.0462	-5.8	<.0001
Female, age 75-79	-0.1518	0.0439	-3.46	0.0005
Female, age 80-84	-0.0496	0.0429	-1.15	0.2482
Female, age 85-89	0.0748	0.0423	1.77	0.077
Female, age 90-94	0.0572	0.0429	1.33	0.1829
Female, age 95 and older	0.0204	0.0466	0.44	0.6607
Male, Infant - age 34	-0.1097	0.2562	-0.43	0.6687
Male, age 35-44	-0.2555	0.2454	-1.04	0.2979
Male, age 45-54	-0.187	0.2404	-0.78	0.4366
Male, age 55-59	-0.0891	0.2411	-0.37	0.7116
Male, age 60-64	-0.0222	0.2363	-0.09	0.9252
Male, age 65-69	-0.2661	0.0498	-5.34	<.0001
Male, age 70-74	-0.2453	0.0463	-5.29	<.0001
Male, age 75-79	-0.1651	0.0444	-3.72	0.0002
Male, age 80-84	-0.1154	0.0435	-2.65	0.008
Male, age 85-89	-0.0632	0.0431	-1.47	0.1421
Male, age 90-94	0.0249	0.0456	0.55	0.5852
Male, age 95 and older	0	0	-	.
Disability	-0.0336	0.2452	-0.14	0.891
Dual Eligible	0.1098	0.0118	9.27	<.0001
Medicare-Aged	-0.2408	0.0599	-4.02	<.0001
Medicare-Disabled	-0.0281	0.0853	-0.33	0.7419
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.4041	0.0149	27.19	<.0001
MS-DRG:Major Complications and Comorbidity	0.218	0.0128	17.05	<.0001
Number of IP visits in last 12 months for condition	-0.0096	0.0122	-0.78	0.433
Number of ED visits in last 12 months for condition	0.0271	0.0097	2.8	0.0051

Parameter	Estimate	Standard Error	Z Value	Significance Level
Death in episode window	-0.5221	0.0118	-44.28	<.0001

Table 7 : Bronchitis- Regression of 30-day Episode Costs for Bronchitis Episodes (N=13,780)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	12.6431	5.141	2.46	0.0139
HCC1:HIV/AIDS	0.0868	0.1427	0.61	0.5431
HCC2:Septicemia/Shock	0.1124	0.0517	2.17	0.0297
HCC5:Opportunistic Infections	0.1514	0.0888	1.7	0.0884
HCC7:Metastatic Cancer and Acute Leukemia	0.2609	0.0735	3.55	0.0004
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.2978	0.1061	2.81	0.005
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0365	0.06	0.61	0.5436
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0247	0.0425	0.58	0.5614
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.1676	0.0479	3.5	0.0005
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.1354	0.0473	2.86	0.0042
HCC17:Diabetes with Acute Complications	0.0736	0.2304	0.32	0.7492
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.0502	0.0785	0.64	0.5224
HCC19:Diabetes without Complication	0.019	0.0305	0.62	0.5335
HCC21:Protein-Calorie Malnutrition	0.1315	0.0699	1.88	0.0599
HCC25:End-Stage Liver Disease	-0.3012	0.103	-2.92	0.0035
HCC26:Cirrhosis of Liver	-0.3035	0.1235	-2.46	0.014
HCC27:Chronic Hepatitis	0.1764	0.1137	1.55	0.1207
HCC31:Intestinal Obstruction/Perforation	0.0927	0.0558	1.66	0.0965
HCC32:Pancreatic Disease	0.1032	0.0594	1.74	0.0825
HCC33:Inflammatory Bowel Disease:	-0.0927	0.0954	-0.97	0.3313
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0726	0.0831	0.87	0.3825
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0814	0.0418	1.95	0.0512
HCC44:Severe Hematological Disorders	0.0099	0.0696	0.14	0.8873
HCC45:Disorders of Immunity	0.2825	0.0706	4	<.0001
HCC51:Drug/Alcohol Psychosis	0.3068	0.1286	2.39	0.0171
HCC52:Drug/Alcohol Dependence	0.311	0.091	3.42	0.0006
HCC54:Schizophrenia	0.4474	0.0687	6.52	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.2519	0.0403	6.25	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	0.1374	0.1415	0.97	0.3314
HCC68:Paraplegia	0.4474	0.1691	2.65	0.0081
HCC69:Spinal Cord Disorders/Injuries	0.278	0.1099	2.53	0.0114
HCC70:Muscular Dystrophy	-0.3156	0.2493	-1.27	0.2056
HCC71:Polyneuropathy:	0.0389	0.0373	1.04	0.2973
HCC72:Multiple Sclerosis	0.3033	0.118	2.57	0.0101
HCC73:Parkinsons and Huntingtons Diseases	0.2452	0.0541	4.53	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC74:Seizure Disorders and Convulsions	0.1849	0.0543	3.4	0.0007
HCC75:Coma, Brain Compression/Anoxic Damage	0.2347	0.1288	1.82	0.0683
HCC77:Respirator Dependence/Tracheostomy Status	0.1545	0.1078	1.43	0.152
HCC78:Respiratory Arrest	0.4157	0.334	1.24	0.2133
HCC79:Cardio-Respiratory Failure and Shock	0.0899	0.0342	2.63	0.0086
HCC80:Congestive Heart Failure	0.1391	0.0302	4.6	<.0001
HCC81:Acute Myocardial Infarction	0.0438	0.0791	0.55	0.58
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0623	0.0462	-1.35	0.1771
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.0463	0.0426	-1.09	0.2769
HCC92:Specified Heart Arrhythmias:	0.0492	0.031	1.59	0.1125
HCC95:Cerebral Hemorrhage	0.0347	0.0926	0.38	0.7075
HCC96:Ischemic or Unspecified Stroke	0.0849	0.0412	2.06	0.0394
HCC100:Hemiplegia/Hemiparesis	0.1909	0.0667	2.86	0.0042
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.2282	0.1609	1.42	0.156
HCC104:Vascular Disease with Complications	0.0769	0.0529	1.45	0.1461
HCC105:Vascular Disease	0.0914	0.0288	3.17	0.0015
HCC107:Cystic Fibrosis	-0.2486	0.2371	-1.05	0.2945
HCC108:Chronic Obstructive Pulmonary Disease	-0.028	0.0272	-1.03	0.3037
HCC111:Aspiration and Specified Bacterial Pneumonias	0.1484	0.0596	2.49	0.0128
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.0712	0.0834	-0.85	0.3936
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.1885	0.1305	1.44	0.1486
HCC130:Dialysis Status	0.3432	0.1193	2.88	0.004
HCC131:Renal Failure	0.082	0.0344	2.38	0.0173
HCC132:Nephritis	0.1266	0.1248	1.01	0.3106
HCC148:Decubitus Ulcer of Skin	0.1165	0.0555	2.1	0.036
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.2141	0.0505	4.24	<.0001
HCC150:Extensive Third-Degree Burns	0.6616	0.1536	4.31	<.0001
HCC154:Severe Head Injury	-0.0154	0.4226	-0.04	0.9709
HCC155:Major Head Injury	0.1114	0.0846	1.32	0.1877
HCC157:Vertebral Fractures without Spinal Cord Injury	0.1575	0.0606	2.6	0.0094
HCC158:Hip Fracture/Dislocation	0.1922	0.0638	3.01	0.0026
HCC161:Traumatic Amputation	0.1974	0.0829	2.38	0.0172
HCC164:Major Complications of Medical Care and Trauma	0.0512	0.0433	1.18	0.2374
HCC174:Major Organ Transplant Status	0.0368	0.1466	0.25	0.8018
HCC176:Artificial Openings for Feeding or Elimination	-0.0298	0.0781	-0.38	0.7027
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0596	0.1733	0.34	0.7307
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.6508	0.1748	3.72	0.0002
Trauma in Episode HCC68:Paraplegia	0.7051	0.2985	2.36	0.0182

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.5401	0.1552	3.48	0.0005
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.7564	0.1576	4.8	<.0001
Trauma in Episode HCC155:Major Head Injury	0.4514	0.1431	3.15	0.0016
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.6767	0.1062	6.37	<.0001
Trauma in Episode HCC158:Hip Fracture/Dislocation	1.1999	0.1503	7.98	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.4443	0.0881	5.05	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	1.2661	0.0886	14.29	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.5966	0.3774	1.58	0.1139
Female, Infant - age 34	-0.9949	0.4847	-2.05	0.0401
Female, age 35-44	-0.9422	0.4794	-1.97	0.0494
Female, age 45-54	-0.9226	0.4745	-1.94	0.0519
Female, age 55-59	-0.7277	0.4783	-1.52	0.1282
Female, age 60-64	-0.795	0.4726	-1.68	0.0925
Female, age 65-69	-0.6161	0.1443	-4.27	<.0001
Female, age 70-74	-0.4788	0.1412	-3.39	0.0007
Female, age 75-79	-0.3625	0.1392	-2.6	0.0092
Female, age 80-84	-0.2371	0.1372	-1.73	0.0838
Female, age 85-89	-0.0485	0.1369	-0.35	0.7232
Female, age 90-94	0.0937	0.1385	0.68	0.4985
Female, age 95 and older	-0.0336	0.1529	-0.22	0.8262
Male, Infant - age 34	-1.3094	0.4939	-2.65	0.008
Male, age 35-44	-1.003	0.4865	-2.06	0.0392
Male, age 45-54	-0.8857	0.4782	-1.85	0.064
Male, age 55-59	-0.6295	0.4872	-1.29	0.1963
Male, age 60-64	-0.7248	0.4737	-1.53	0.126
Male, age 65-69	-0.541	0.1535	-3.53	0.0004
Male, age 70-74	-0.5064	0.151	-3.35	0.0008
Male, age 75-79	-0.3967	0.1449	-2.74	0.0062
Male, age 80-84	-0.2078	0.1459	-1.42	0.1545
Male, age 85-89	-0.1458	0.1469	-0.99	0.3207
Male, age 90-94	0.0398	0.1507	0.26	0.7917
Male, age 95 and older	0	0	-	.
Disability	0.1713	0.5043	0.34	0.7341
Dual Eligible	0.1714	0.0295	5.8	<.0001
Medicare-Aged	-0.3044	0.1457	-2.09	0.0367
Medicare-Disabled	-0.1503	0.2292	-0.66	0.512

Parameter	Estimate	Standard Error	Z Value	Significance Level
Medicare-ESRD	0	0	.	.
MS-DRG:Major Complications and Comorbidity	0.2899	0.0265	10.96	<.0001
Number of IP visits in last 12 months for condition	-0.0427	0.0244	-1.75	0.08
Number of ED visits in last 12 months for condition	0.0346	0.0134	2.58	0.0099
Death in episode window	-0.2943	0.0437	-6.73	<.0001

Table 8 : Acute Ischemic Stroke- Regression of 30-day Episode Costs for Acute Ischemic Stroke Episodes (N=1,458)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	-10.3672	5.7843	-1.79	0.0731
HCC1:HIV/AIDS	0.2857	0.3079	0.93	0.3536
HCC2:Septicemia/Shock	-0.0519	0.1464	-0.35	0.7229
HCC5:Opportunistic Infections	-0.0662	0.2244	-0.3	0.7678
HCC7:Metastatic Cancer and Acute Leukemia	0.1723	0.1698	1.01	0.3102
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.1571	0.2034	0.77	0.4399
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0623	0.1493	0.42	0.6766
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.0757	0.0913	-0.83	0.4068
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.1577	0.1053	1.5	0.1343
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0436	0.1182	0.37	0.712
HCC17:Diabetes with Acute Complications	-0.5674	0.2966	-1.91	0.0557
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.0784	0.1802	0.44	0.6633
HCC19:Diabetes without Complication	0.1028	0.0734	1.4	0.1614
HCC21:Protein-Calorie Malnutrition	0.0791	0.1769	0.45	0.6549
HCC25:End-Stage Liver Disease	0.7028	0.5347	1.31	0.1887
HCC26:Cirrhosis of Liver	0.0411	0.4028	0.1	0.9187
HCC27:Chronic Hepatitis	-0.2309	0.2755	-0.84	0.402
HCC31:Intestinal Obstruction/Perforation	0.0226	0.1264	0.18	0.8581
HCC32:Pancreatic Disease	-0.0233	0.1537	-0.15	0.8793
HCC33:Inflammatory Bowel Disease:	-0.0775	0.188	-0.41	0.6801
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0267	0.1612	-0.17	0.8684
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0364	0.088	0.41	0.6792
HCC44:Severe Hematological Disorders	0.1659	0.2173	0.76	0.445
HCC45:Disorders of Immunity	0.0938	0.181	0.52	0.6045
HCC51:Drug/Alcohol Psychosis	0.1466	0.1669	0.88	0.3798
HCC52:Drug/Alcohol Dependence	0.0947	0.2438	0.39	0.6977
HCC54:Schizophrenia	0.3979	0.187	2.13	0.0334
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.1308	0.1289	1.01	0.3104
HCC67:Quadriplegia, Other Extensive Paralysis	0.7053	0.6914	1.02	0.3077
HCC68:Paraplegia	-2.6796	0.0838	-31.97	<.0001
HCC69:Spinal Cord Disorders/Injuries	0.0684	0.2246	0.3	0.7608
HCC70:Muscular Dystrophy	-0.2982	0.494	-0.6	0.5461
HCC71:Polyneuropathy:	-0.0453	0.0895	-0.51	0.613
HCC72:Multiple Sclerosis	-0.3334	0.3282	-1.02	0.3097

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	-0.0037	0.2493	-0.01	0.988
HCC74:Seizure Disorders and Convulsions	-0.2164	0.1421	-1.52	0.1278
HCC75:Coma, Brain Compression/Anoxic Damage	-0.3533	0.2691	-1.31	0.1893
HCC77:Respirator Dependence/Tracheostomy Status	0.2453	0.2421	1.01	0.311
HCC78:Respiratory Arrest	0.1919	0.2862	0.67	0.5026
HCC79:Cardio-Respiratory Failure and Shock	-0.1815	0.0996	-1.82	0.0683
HCC80:Congestive Heart Failure	0.048	0.0666	0.72	0.4708
HCC81:Acute Myocardial Infarction	-0.0639	0.1391	-0.46	0.6459
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0036	0.1019	0.04	0.9717
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.148	0.0846	-1.75	0.0802
HCC92:Specified Heart Arrhythmias:	0.0111	0.0587	0.19	0.8496
HCC95:Cerebral Hemorrhage	0.0283	0.1596	0.18	0.859
HCC96:Ischemic or Unspecified Stroke	-0.1195	0.0612	-1.95	0.051
HCC100:Hemiplegia/Hemiparesis	0.0908	0.0969	0.94	0.3487
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-1.5706	0.2106	-7.46	<.0001
HCC104:Vascular Disease with Complications	-0.0402	0.0996	-0.4	0.6862
HCC105:Vascular Disease	0.064	0.0615	1.04	0.2983
HCC107:Cystic Fibrosis	0.3746	0.2913	1.29	0.1984
HCC108:Chronic Obstructive Pulmonary Disease	0.04	0.0679	0.59	0.5551
HCC111:Aspiration and Specified Bacterial Pneumonias	0.2343	0.2151	1.09	0.2761
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.4537	0.193	2.35	0.0187
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.1564	0.2463	0.63	0.5255
HCC130:Dialysis Status	0.388	0.2189	1.77	0.0763
HCC131:Renal Failure	-0.1031	0.0716	-1.44	0.1496
HCC132:Nephritis	1.0148	0.2627	3.86	0.0001
HCC148:Decubitus Ulcer of Skin	-0.1463	0.1549	-0.94	0.345
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.0879	0.1046	0.84	0.4007
HCC155:Major Head Injury	0.0751	0.2315	0.32	0.7458
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0517	0.159	0.33	0.7451
HCC158:Hip Fracture/Dislocation	-0.0978	0.1342	-0.73	0.466
HCC161:Traumatic Amputation	-0.1721	0.242	-0.71	0.477
HCC164:Major Complications of Medical Care and Trauma	-0.0899	0.1007	-0.89	0.3719
HCC174:Major Organ Transplant Status	0.4954	0.6349	0.78	0.4353
HCC176:Artificial Openings for Feeding or Elimination	0.2495	0.266	0.94	0.3484
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.6231	0.5338	1.17	0.2431
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.779	0.2486	3.13	0.0017
Trauma in Episode HCC68:Paraplegia	-0.0202	0.2438	-0.08	0.9339

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	-0.2123	0.2932	-0.72	0.4691
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.1879	0.1239	1.52	0.1293
Trauma in Episode HCC155:Major Head Injury	0.4678	0.1766	2.65	0.0081
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.0706	0.3105	0.23	0.82
Trauma in Episode HCC158:Hip Fracture/Dislocation	0.6525	0.2235	2.92	0.0035
Trauma in Episode HCC161:Traumatic Amputation	-0.2754	0.1594	-1.73	0.084
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.3284	0.116	2.83	0.0046
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.6879	0.3605	1.91	0.0564
Female, age 35-44	-3.0299	0.8224	-3.68	0.0002
Female, age 45-54	-3.293	0.4364	-7.55	<.0001
Female, age 55-59	-3.2255	0.4402	-7.33	<.0001
Female, age 60-64	-2.5788	0.4195	-6.15	<.0001
Female, age 65-69	-0.5139	0.2961	-1.74	0.0827
Female, age 70-74	-0.1276	0.2748	-0.46	0.6424
Female, age 75-79	-0.1081	0.268	-0.4	0.6867
Female, age 80-84	-0.0197	0.2669	-0.07	0.9411
Female, age 85-89	-0.0759	0.2632	-0.29	0.773
Female, age 90-94	-0.0583	0.2714	-0.21	0.83
Female, age 95 and older	-0.4435	0.3138	-1.41	0.1575
Male, age 35-44	-3.0393	0.8383	-3.63	0.0003
Male, age 45-54	-3.4746	0.5902	-5.89	<.0001
Male, age 55-59	-2.7341	0.465	-5.88	<.0001
Male, age 60-64	-2.8343	0.3021	-9.38	<.0001
Male, age 65-69	-0.0358	0.2801	-0.13	0.8983
Male, age 70-74	-0.1796	0.2776	-0.65	0.5176
Male, age 75-79	-0.0579	0.2672	-0.22	0.8285
Male, age 80-84	0.0737	0.275	0.27	0.7886
Male, age 85-89	0.0349	0.2921	0.12	0.9049
Male, age 90-94	-0.3539	0.2872	-1.23	0.218
Male, age 95 and older	0	0	-	.
Disability	3.1817	0.741	4.29	<.0001
Dual Eligible	0.1252	0.0746	1.68	0.0934
Medicare-Aged	0.3961	0.4914	0.81	0.4203
Medicare-Disabled	0.5019	0.8577	0.59	0.5584
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.7831	0.0931	8.41	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
MS-DRG:Major Complications and Comorbidity	0.6693	0.0773	8.66	<.0001
Number of IP visits in last 12 months for condition	-0.0801	0.1159	-0.69	0.4896
Number of ED visits in last 12 months for condition	0.0502	0.3217	0.16	0.876
Death in episode window	-1.6449	0.1208	-13.61	<.0001

Table 9. Stroke with Cerebral Infarct- Regression of 30-day Episode Costs for Acute Ischemic Stroke Episodes (N=43,246)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	17.0389	2.7066	6.3	<.0001
HCC1:HIV/AIDS	0.0393	0.0969	0.41	0.6849
HCC2:Septicemia/Shock	-0.0227	0.0253	-0.9	0.3689
HCC5:Opportunistic Infections	0.0226	0.0609	0.37	0.7113
HCC7:Metastatic Cancer and Acute Leukemia	0.0077	0.0338	0.23	0.8202
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.1182	0.0388	-3.04	0.0023
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.0283	0.0382	-0.74	0.4591
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0012	0.0172	0.07	0.9458
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.0942	0.0209	4.51	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0413	0.0215	1.92	0.0545
HCC17:Diabetes with Acute Complications	0.0369	0.0815	0.45	0.6508
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.0449	0.0323	1.39	0.1645
HCC19:Diabetes without Complication	0.0544	0.0131	4.14	<.0001
HCC21:Protein-Calorie Malnutrition	-0.0089	0.0286	-0.31	0.7553
HCC25:End-Stage Liver Disease	-0.009	0.0733	-0.12	0.9026
HCC26:Cirrhosis of Liver	0.0664	0.067	0.99	0.3215
HCC27:Chronic Hepatitis	-0.0045	0.0631	-0.07	0.9435
HCC31:Intestinal Obstruction/Perforation	0.0219	0.0281	0.78	0.4349
HCC32:Pancreatic Disease	0.0592	0.0315	1.88	0.0605
HCC33:Inflammatory Bowel Disease:	-0.0506	0.0491	-1.03	0.3027
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0769	0.0448	1.72	0.086
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0238	0.0199	1.19	0.2336
HCC44:Severe Hematological Disorders	0.0114	0.0348	0.33	0.7431
HCC45:Disorders of Immunity	0.0259	0.0437	0.59	0.5541
HCC51:Drug/Alcohol Psychosis	-0.0018	0.05	-0.04	0.9719
HCC52:Drug/Alcohol Dependence	-0.0296	0.0533	-0.56	0.5786
HCC54:Schizophrenia	0.1442	0.0528	2.73	0.0063
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.0408	0.0226	1.81	0.0711
HCC67:Quadriplegia, Other Extensive Paralysis	0.0371	0.0724	0.51	0.6083
HCC68:Paraplegia	0.0407	0.0849	0.48	0.6318
HCC69:Spinal Cord Disorders/Injuries	0.0589	0.0372	1.59	0.1129
HCC70:Muscular Dystrophy	0.3541	0.213	1.66	0.0965
HCC71:Polyneuropathy:	0.0342	0.0177	1.93	0.0534
HCC72:Multiple Sclerosis	-0.0612	0.0585	-1.05	0.2952

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	0.08	0.0266	3	0.0027
HCC74:Seizure Disorders and Convulsions	0.0023	0.0207	0.11	0.9119
HCC75:Coma, Brain Compression/Anoxic Damage	0.0057	0.0437	0.13	0.8965
HCC77:Respirator Dependence/Tracheostomy Status	0.1144	0.091	1.26	0.2084
HCC78:Respiratory Arrest	-0.0438	0.1192	-0.37	0.7132
HCC79:Cardio-Respiratory Failure and Shock	0.0028	0.019	0.15	0.8817
HCC80:Congestive Heart Failure	-0.0091	0.0128	-0.71	0.4747
HCC81:Acute Myocardial Infarction	-0.0101	0.0286	-0.35	0.7236
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0123	0.0232	-0.53	0.596
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.0283	0.0182	-1.56	0.1189
HCC92:Specified Heart Arrhythmias:	-0.0452	0.0117	-3.88	0.0001
HCC95:Cerebral Hemorrhage	-0.0247	0.0333	-0.74	0.4583
HCC96:Ischemic or Unspecified Stroke	0.0117	0.0121	0.97	0.3329
HCC100:Hemiplegia/Hemiparesis	0.0648	0.0189	3.43	0.0006
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.0805	0.061	1.32	0.1874
HCC104:Vascular Disease with Complications	-0.0117	0.0245	-0.48	0.6323
HCC105:Vascular Disease	0.0086	0.0119	0.72	0.4711
HCC107:Cystic Fibrosis	0.4863	0.3314	1.47	0.1423
HCC108:Chronic Obstructive Pulmonary Disease	0.0085	0.0132	0.64	0.5198
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.0269	0.032	-0.84	0.4001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.0353	0.0635	0.56	0.5788
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.078	0.0348	2.24	0.0248
HCC130:Dialysis Status	0.1431	0.0643	2.23	0.026
HCC131:Renal Failure	0.0203	0.0149	1.36	0.1724
HCC132:Nephritis	0.0894	0.0854	1.05	0.2952
HCC148:Decubitus Ulcer of Skin	-0.0427	0.029	-1.47	0.1408
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.0495	0.0238	2.08	0.0372
HCC150:Extensive Third-Degree Burns	1.3078	0.0384	34.1	<.0001
HCC154:Severe Head Injury	-0.1089	0.1471	-0.74	0.4593
HCC155:Major Head Injury	0.014	0.0355	0.4	0.6924
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0005	0.0314	0.02	0.9874
HCC158:Hip Fracture/Dislocation	-0.0056	0.0254	-0.22	0.8257
HCC161:Traumatic Amputation	-0.0247	0.0941	-0.26	0.7927
HCC164:Major Complications of Medical Care and Trauma	0.0295	0.0212	1.39	0.1653
HCC174:Major Organ Transplant Status	-0.1692	0.0907	-1.86	0.0623
HCC176:Artificial Openings for Feeding or Elimination	0.0022	0.0471	0.05	0.9621
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.0716	0.0642	-1.11	0.2649

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.4226	0.049	8.62	<.0001
Trauma in Episode HCC68:Paraplegia	0.3194	0.0602	5.3	<.0001
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.1665	0.0415	4.02	<.0001
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.1832	0.0313	5.85	<.0001
Trauma in Episode HCC154:Severe Head Injury	0.3132	0.2343	1.34	0.1814
Trauma in Episode HCC155:Major Head Injury	0.4317	0.0464	9.31	<.0001
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.2033	0.0505	4.03	<.0001
Trauma in Episode HCC158:Hip Fracture/Dislocation	0.4649	0.0455	10.22	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.5889	0.1208	4.87	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.6298	0.0331	19.03	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0819	0.0699	1.17	0.2414
Female, Infant - age 34	-0.2491	0.3296	-0.76	0.4497
Female, age 35-44	0.1127	0.2481	0.45	0.6497
Female, age 45-54	0.2054	0.2236	0.92	0.3582
Female, age 55-59	0.2674	0.2212	1.21	0.2266
Female, age 60-64	0.2151	0.2117	1.02	0.3096
Female, age 65-69	-0.0812	0.0905	-0.9	0.3695
Female, age 70-74	0.0002	0.0887	0	0.998
Female, age 75-79	0.0402	0.0879	0.46	0.6473
Female, age 80-84	0.0831	0.0875	0.95	0.3419
Female, age 85-89	0.063	0.0875	0.72	0.4713
Female, age 90-94	0.0393	0.0881	0.45	0.656
Female, age 95 and older	-0.0661	0.0916	-0.72	0.4706
Male, Infant - age 34	0.0337	0.4302	0.08	0.9376
Male, age 35-44	0.1822	0.2505	0.73	0.4669
Male, age 45-54	0.1421	0.2249	0.63	0.5275
Male, age 55-59	0.15	0.2202	0.68	0.4956
Male, age 60-64	0.2361	0.2151	1.1	0.2723
Male, age 65-69	-0.068	0.0911	-0.75	0.4552
Male, age 70-74	-0.0459	0.0894	-0.51	0.6075
Male, age 75-79	-0.0227	0.0887	-0.26	0.7976
Male, age 80-84	0.0621	0.0884	0.7	0.4822
Male, age 85-89	0.1029	0.0886	1.16	0.2455
Male, age 90-94	0.0288	0.0915	0.31	0.753
Male, age 95 and older	0	0	-	.
Disability	-0.2467	0.2414	-1.02	0.3067

Parameter	Estimate	Standard Error	Z Value	Significance Level
Dual Eligible	0.042	0.0127	3.3	0.001
Medicare-Aged	0.0051	0.0852	0.06	0.9523
Medicare-Disabled	0.0632	0.1475	0.43	0.6681
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.4656	0.0171	27.18	<.0001
MS-DRG: Major Complications and Comorbidity	0.4354	0.0131	33.25	<.0001
Number of IP visits in last 12 months for condition	-0.0153	0.0212	-0.72	0.469
Number of ED visits in last 12 months for condition	0.0174	0.0547	0.32	0.7506
Death in episode window	-1.2213	0.0251	-48.61	<.0001

Table 10. Hip Replacement- Regression of 30-day Episode Costs for Hip Replacement Episodes (N=24,603)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	10.9212	8.7153	1.25	0.2102
HCC1:HIV/AIDS	-0.1007	0.0743	-1.36	0.1753
HCC2:Septicemia/Shock	0.0713	0.035	2.04	0.0418
HCC5:Opportunistic Infections	-0.0902	0.0363	-2.48	0.013
HCC7:Metastatic Cancer and Acute Leukemia	0.1249	0.0407	3.07	0.0021
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.0898	0.0426	2.11	0.0351
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.0034	0.0273	-0.12	0.9012
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0265	0.0139	1.91	0.0567
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.2276	0.0254	8.95	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.2087	0.0252	8.28	<.0001
HCC17:Diabetes with Acute Complications	-0.0338	0.101	-0.33	0.7379
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.1627	0.0334	4.87	<.0001
HCC19:Diabetes without Complication	0.118	0.0116	10.18	<.0001
HCC21:Protein-Calorie Malnutrition	-0.0231	0.0424	-0.55	0.5856
HCC25:End-Stage Liver Disease	0.0045	0.0573	0.08	0.9376
HCC26:Cirrhosis of Liver	0.1446	0.0785	1.84	0.0657
HCC27:Chronic Hepatitis	0.1136	0.0568	2	0.0456
HCC31:Intestinal Obstruction/Perforation	0.018	0.0301	0.6	0.5492
HCC32:Pancreatic Disease	0.0412	0.0416	0.99	0.3218
HCC33:Inflammatory Bowel Disease:	0.0019	0.0377	0.05	0.9598
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0316	0.0157	2.02	0.0437
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0637	0.0135	4.72	<.0001
HCC44:Severe Hematological Disorders	0.0683	0.0336	2.03	0.0423
HCC45:Disorders of Immunity	0.0359	0.0393	0.91	0.3612
HCC51:Drug/Alcohol Psychosis	0.0889	0.0488	1.82	0.0688
HCC52:Drug/Alcohol Dependence	0.0621	0.0452	1.37	0.1695
HCC54:Schizophrenia	0.2138	0.0585	3.66	0.0003
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.1337	0.022	6.08	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	0.2317	0.1679	1.38	0.1674
HCC68:Paraplegia	0.0977	0.127	0.77	0.4418
HCC69:Spinal Cord Disorders/Injuries	0.1224	0.0497	2.47	0.0137
HCC70:Muscular Dystrophy	0.1994	0.2557	0.78	0.4354
HCC71:Polyneuropathy:	0.0575	0.0179	3.22	0.0013
HCC72:Multiple Sclerosis	0.2419	0.1059	2.28	0.0223
HCC73:Parkinsons and Huntingtons Diseases	0.2304	0.0377	6.11	<.0001
HCC74:Seizure Disorders and Convulsions	0.1099	0.034	3.23	0.0012

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC75:Coma, Brain Compression/Anoxic Damage	-0.0401	0.083	-0.48	0.629
HCC77:Respirator Dependence/Tracheostomy Status	0.0148	0.148	0.1	0.9205
HCC78:Respiratory Arrest	-0.0195	0.1405	-0.14	0.8895
HCC79:Cardio-Respiratory Failure and Shock	0.0552	0.0245	2.25	0.0242
HCC80:Congestive Heart Failure	0.0651	0.0138	4.72	<.0001
HCC81:Acute Myocardial Infarction	0.0326	0.0493	0.66	0.5091
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0209	0.0227	0.92	0.3558
HCC83:Angina Pectoris/Old Myocardial Infarction	0.1044	0.0166	6.29	<.0001
HCC92:Specified Heart Arrhythmias:	0.056	0.0118	4.74	<.0001
HCC95:Cerebral Hemorrhage	-0.0357	0.0669	-0.53	0.5934
HCC96:Ischemic or Unspecified Stroke	0.0763	0.0209	3.65	0.0003
HCC100:Hemiplegia/Hemiparesis	0.164	0.0554	2.96	0.0031
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.2286	0.0927	2.47	0.0137
HCC104:Vascular Disease with Complications	0.0329	0.0258	1.28	0.2021
HCC105:Vascular Disease	0.0827	0.0113	7.3	<.0001
HCC107:Cystic Fibrosis	0.2325	0.173	1.34	0.1791
HCC108:Chronic Obstructive Pulmonary Disease	0.0897	0.0115	7.81	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	0.0205	0.0495	0.41	0.6786
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.0161	0.0544	0.3	0.7676
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.0324	0.0587	0.55	0.5808
HCC130:Dialysis Status	0.1321	0.0939	1.41	0.1596
HCC131:Renal Failure	0.0465	0.017	2.73	0.0063
HCC132:Nephritis	0.0463	0.0856	0.54	0.5889
HCC148:Decubitus Ulcer of Skin	0.1375	0.0383	3.59	0.0003
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1289	0.0266	4.84	<.0001
HCC154:Severe Head Injury	-0.0857	0.1803	-0.48	0.6344
HCC155:Major Head Injury	-1.0827	0.311	-3.48	0.0005
HCC157:Vertebral Fractures without Spinal Cord Injury	0.042	0.0524	0.8	0.4233
HCC158:Hip Fracture/Dislocation	0.0258	0.0246	1.05	0.293
HCC161:Traumatic Amputation	0.1723	0.0171	10.1	<.0001
HCC164:Major Complications of Medical Care and Trauma	-0.026	0.0382	-0.68	0.4953
HCC174:Major Organ Transplant Status	0.0519	0.0186	2.79	0.0052
HCC176:Artificial Openings for Feeding or Elimination	-0.1939	0.0977	-1.99	0.0471
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.0326	0.0644	-0.51	0.612
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	-0.0009	0.1132	-0.01	0.9935
Trauma in Episode HCC68:Paraplegia	0.3699	0.1962	1.89	0.0594
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.5534	0.1694	3.27	0.0011
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.2851	0.0597	4.78	<.0001
Trauma in Episode HCC154:Severe Head Injury	0.4902	0.1419	3.45	0.0006
Trauma in Episode HCC155:Major Head Injury	0.4364	0.0877	4.98	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.2895	0.0604	4.79	<.0001
Trauma in Episode HCC158:Hip Fracture/Dislocation	0.3869	0.0125	30.92	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.2926	0.0462	6.34	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.4164	0.0171	24.42	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.2367	0.0799	2.96	0.0031
Female, Infant - age 34	-0.6487	0.4503	-1.44	0.1497
Female, age 35-44	-0.5	0.4318	-1.16	0.2468
Female, age 45-54	-0.2576	0.4258	-0.61	0.5451
Female, age 55-59	-0.2165	0.4256	-0.51	0.6109
Female, age 60-64	-0.2394	0.4231	-0.57	0.5715
Female, age 65-69	-0.4222	0.388	-1.09	0.2765
Female, age 70-74	-0.3575	0.3879	-0.92	0.3567
Female, age 75-79	-0.2114	0.3878	-0.55	0.5857
Female, age 80-84	-0.0971	0.3878	-0.25	0.8023
Female, age 85-89	-0.0001	0.3879	0	0.9998
Female, age 90-94	0.037	0.3891	0.1	0.9243
Female, age 95 and older	-0.0699	0.3952	-0.18	0.8597
Male, Infant - age 34	-0.6717	0.4501	-1.49	0.1356
Male, age 35-44	-0.419	0.4323	-0.97	0.3324
Male, age 45-54	-0.4677	0.4256	-1.1	0.2718
Male, age 55-59	-0.2769	0.4273	-0.65	0.5169
Male, age 60-64	-0.3996	0.4229	-0.94	0.3447
Male, age 65-69	-0.6343	0.3881	-1.63	0.1022
Male, age 70-74	-0.5315	0.3881	-1.37	0.1708
Male, age 75-79	-0.3996	0.3879	-1.03	0.303
Male, age 80-84	-0.2247	0.3881	-0.58	0.5626
Male, age 85-89	-0.0737	0.3886	-0.19	0.8496
Male, age 90-94	-0.0137	0.3917	-0.04	0.972
Male, age 95 and older	0	0	-	.
Disability	0.0532	0.2675	0.2	0.8423
Dual Eligible	0.1311	0.0161	8.13	<.0001
Medicare-Aged	-0.288	0.1271	-2.27	0.0235
Medicare-Disabled	0.104	0.2288	0.45	0.6495
Medicare-ESRD	-0.104	0.2288	-0.45	0.6495
MS-DRG: Complications and Comorbidity	0.5927	0.2208	2.68	0.0073
MS-DRG:Muti Joint Procedure	0.7376	0.2155	3.42	0.0006
Number of IP visits in last 12 months for condition	-0.0814	0.0205	-3.97	<.0001
Number of ED visits in last 12 months for condition	0	0	.	.

Parameter	Estimate	Standard Error	Z Value	Significance Level
Death in episode window	-0.5668	0.1106	-5.12	<.0001

Table 11. Knee Replacement- Regression of 30-day Episode Costs for Knee Replacement Episodes (N=53,647)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	11.7091	4.7697	2.45	0.0141
HCC1:HIV/AIDS	0.177	0.1143	1.55	0.1215
HCC2:Septicemia/Shock	-0.036	0.031	-1.16	0.2453
HCC5:Opportunistic Infections	0.0486	0.0357	1.36	0.1735
HCC7:Metastatic Cancer and Acute Leukemia	0.0543	0.0318	1.71	0.0875
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.0204	0.0298	0.68	0.4934
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0265	0.0214	1.24	0.2154
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0172	0.0093	1.86	0.0628
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.2118	0.0156	13.59	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.1677	0.0151	11.1	<.0001
HCC17:Diabetes with Acute Complications	0.1527	0.0652	2.34	0.0191
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.1543	0.021	7.33	<.0001
HCC19:Diabetes without Complication	0.1114	0.0072	15.37	<.0001
HCC21:Protein-Calorie Malnutrition	0.0839	0.0408	2.06	0.0398
HCC25:End-Stage Liver Disease	0.0852	0.0535	1.59	0.1114
HCC26:Cirrhosis of Liver	-0.0171	0.0437	-0.39	0.6952
HCC27:Chronic Hepatitis	0.0947	0.0414	2.29	0.0222
HCC31:Intestinal Obstruction/Perforation	0.0689	0.0325	2.12	0.0337
HCC32:Pancreatic Disease	0.0137	0.0286	0.48	0.6322
HCC33:Inflammatory Bowel Disease:	0.0447	0.0288	1.55	0.121
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0016	0.019	0.09	0.9322
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0562	0.0091	6.15	<.0001
HCC44:Severe Hematological Disorders	0.1458	0.0449	3.25	0.0012
HCC45:Disorders of Immunity	0.0296	0.0277	1.07	0.2863
HCC51:Drug/Alcohol Psychosis	-0.0111	0.0378	-0.29	0.7695
HCC52:Drug/Alcohol Dependence	-0.0256	0.0365	-0.7	0.4833
HCC54:Schizophrenia	0.2996	0.0405	7.4	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.1163	0.0137	8.52	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	0.2053	0.1	2.05	0.0401
HCC68:Paraplegia	0.2618	0.1471	1.78	0.0752
HCC69:Spinal Cord Disorders/Injuries	0.1456	0.0319	4.56	<.0001
HCC70:Muscular Dystrophy	-0.0771	0.1325	-0.58	0.5605
HCC71:Polyneuropathy:	0.0657	0.011	5.98	<.0001
HCC72:Multiple Sclerosis	0.0992	0.0556	1.78	0.0746
HCC73:Parkinsons and Huntingtons Diseases	0.2414	0.0257	9.4	<.0001
HCC74:Seizure Disorders and Convulsions	0.0764	0.0233	3.28	0.001

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC75:Coma, Brain Compression/Anoxic Damage	0.0311	0.0811	0.38	0.7014
HCC77:Respirator Dependence/Tracheostomy Status	-0.0585	0.1198	-0.49	0.6253
HCC78:Respiratory Arrest	-0.1177	0.1036	-1.14	0.2556
HCC79:Cardio-Respiratory Failure and Shock	0.0553	0.0196	2.82	0.0048
HCC80:Congestive Heart Failure	0.0787	0.0093	8.43	<.0001
HCC81:Acute Myocardial Infarction	-0.0147	0.0372	-0.4	0.6928
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0409	0.0157	2.59	0.0095
HCC83:Angina Pectoris/Old Myocardial Infarction	0.0778	0.0108	7.17	<.0001
HCC92:Specified Heart Arrhythmias:	0.0605	0.0082	7.36	<.0001
HCC95:Cerebral Hemorrhage	0.204	0.0865	2.36	0.0184
HCC96:Ischemic or Unspecified Stroke	0.0982	0.0166	5.92	<.0001
HCC100:Hemiplegia/Hemiparesis	0.2932	0.0451	6.5	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.1331	0.0635	2.1	0.0359
HCC104:Vascular Disease with Complications	0.084	0.0208	4.04	<.0001
HCC105:Vascular Disease	0.0874	0.0075	11.58	<.0001
HCC107:Cystic Fibrosis	0.1066	0.1521	0.7	0.4834
HCC108:Chronic Obstructive Pulmonary Disease	0.09	0.0086	10.49	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.0225	0.0476	-0.47	0.6363
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.0062	0.0423	-0.15	0.884
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	-0.0279	0.0381	-0.73	0.4633
HCC130:Dialysis Status	0.217	0.0655	3.31	0.0009
HCC131:Renal Failure	0.0727	0.0114	6.36	<.0001
HCC132:Nephritis	0.0118	0.0499	0.24	0.8122
HCC148:Decubitus Ulcer of Skin	0.1316	0.0333	3.96	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1096	0.0167	6.56	<.0001
HCC154:Severe Head Injury	0.1717	0.1563	1.1	0.272
HCC155:Major Head Injury	-0.0013	0.0369	-0.03	0.9723
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0805	0.0239	3.37	0.0008
HCC158:Hip Fracture/Dislocation	0.1165	0.0226	5.14	<.0001
HCC161:Traumatic Amputation	0.0151	0.0342	0.44	0.6601
HCC164:Major Complications of Medical Care and Trauma	0.028	0.0147	1.91	0.0561
HCC174:Major Organ Transplant Status	0.018	0.0838	0.21	0.8301
HCC176:Artificial Openings for Feeding or Elimination	0.0415	0.0538	0.77	0.44
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0493	0.0759	0.65	0.5163
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.6146	0.2372	2.59	0.0096
Trauma in Episode HCC68:Paraplegia	0.59	0.1128	5.23	<.0001
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.3389	0.0365	9.29	<.0001
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.7459	0.1219	6.12	<.0001
Trauma in Episode HCC154:Severe Head Injury	1.0488	0.3039	3.45	0.0006
Trauma in Episode HCC155:Major Head Injury	-0.2153	0.0331	-6.5	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.4325	0.0862	5.02	<.0001
Trauma in Episode HCC158:Hip Fracture/Dislocation	0.4123	0.0331	12.45	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.3967	0.0276	14.39	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.3852	0.0143	26.85	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.4142	0.0514	8.05	<.0001
Female, Infant - age 34	-1.1225	0.2942	-3.82	0.0001
Female, age 35-44	-0.8158	0.2715	-3	0.0027
Female, age 45-54	-0.8532	0.2631	-3.24	0.0012
Female, age 55-59	-0.7956	0.2626	-3.03	0.0025
Female, age 60-64	-0.6966	0.2615	-2.66	0.0077
Female, age 65-69	-0.2476	0.204	-1.21	0.2249
Female, age 70-74	-0.1665	0.204	-0.82	0.4143
Female, age 75-79	-0.0501	0.204	-0.25	0.8058
Female, age 80-84	0.0722	0.204	0.35	0.7234
Female, age 85-89	0.2067	0.2044	1.01	0.3119
Female, age 90-94	0.3012	0.2079	1.45	0.1473
Female, age 95 and older	0.2649	0.2443	1.08	0.2783
Male, Infant - age 34	-0.9913	0.3618	-2.74	0.0061
Male, age 35-44	-0.9708	0.2724	-3.56	0.0004
Male, age 45-54	-0.9677	0.2646	-3.66	0.0003
Male, age 55-59	-0.8078	0.2689	-3	0.0027
Male, age 60-64	-0.8545	0.2616	-3.27	0.0011
Male, age 65-69	-0.4255	0.2042	-2.08	0.0372
Male, age 70-74	-0.3415	0.2041	-1.67	0.0943
Male, age 75-79	-0.2314	0.2041	-1.13	0.2569
Male, age 80-84	-0.0963	0.2043	-0.47	0.6376
Male, age 85-89	0.0352	0.2049	0.17	0.8635
Male, age 90-94	0.2001	0.2125	0.94	0.3462
Male, age 95 and older	0	0	-	.
Disability	0.148	0.2292	0.65	0.5184
Dual Eligible	0.1433	0.0098	14.59	<.0001
Medicare-Aged	-0.2216	0.1083	-2.05	0.0408
Medicare-Disabled	-0.4019	0.1753	-2.29	0.0219
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.0266	0.0471	0.56	0.5723
MS-DRG:Muti Joint Procedure	0.3251	0.0486	6.69	<.0001
Number of IP visits in last 12 months for condition	-0.0987	0.0118	-8.35	<.0001
Number of ED visits in last 12 months for condition	0	0	.	.

Parameter	Estimate	Standard Error	Z Value	Significance Level
Death in episode window	-0.1775	0.1258	-1.41	0.1581

Table 12. Hip Fracture- Regression of 30-day Episode Costs for Hip Fracture Episodes (N=3,098)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	2.3795	8.2833	0.08	0.7739
HCC1:HIV/AIDS	-0.0516	0.4725	0.01	0.913
HCC2:Septicemia/Shock	0.1234	0.0732	2.84	0.0921
HCC5:Opportunistic Infections	-0.125	0.1186	1.11	0.2921
HCC7:Metastatic Cancer and Acute Leukemia	0.2615	0.0964	7.35	0.0067
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.2117	0.1243	2.9	0.0884
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.1917	0.1082	3.14	0.0766
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.1244	0.0564	4.87	0.0273
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.1516	0.0736	4.24	0.0395
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0382	0.0758	0.25	0.6144
HCC17:Diabetes with Acute Complications	-0.1264	0.2337	0.29	0.5885
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.3167	0.1142	7.7	0.0055
HCC19:Diabetes without Complication	0.1238	0.044	7.93	0.0049
HCC21:Protein-Calorie Malnutrition	-0.0413	0.0696	0.35	0.5525
HCC25:End-Stage Liver Disease	0.2028	0.1757	1.33	0.2485
HCC26:Cirrhosis of Liver	-0.2433	0.2098	1.34	0.2462
HCC27:Chronic Hepatitis	-0.3229	0.2242	2.07	0.1498
HCC31:Intestinal Obstruction/Perforation	0.1171	0.0816	2.06	0.151
HCC32:Pancreatic Disease	0.0997	0.0908	1.21	0.2722
HCC33:Inflammatory Bowel Disease:	0.0378	0.1472	0.07	0.7974
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0043	0.1074	0	0.9681
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.1792	0.0606	8.74	0.0031
HCC44:Severe Hematological Disorders	0.2216	0.1025	4.67	0.0307
HCC45:Disorders of Immunity	-0.0381	0.1345	0.08	0.777
HCC51:Drug/Alcohol Psychosis	0.0692	0.1229	0.32	0.5734
HCC52:Drug/Alcohol Dependence	-0.0402	0.1669	0.06	0.8095
HCC54:Schizophrenia	0.1372	0.1533	0.8	0.3708
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-0.0303	0.0597	0.26	0.612
HCC67:Quadriplegia, Other Extensive Paralysis	-0.2378	0.1949	1.49	0.2224
HCC68:Paraplegia	-0.0135	0.2809	0	0.9617
HCC69:Spinal Cord Disorders/Injuries	-0.1636	0.1368	1.43	0.2316
HCC70:Muscular Dystrophy	-0.1677	0.6565	0.07	0.7983
HCC71:Polyneuropathy:	0.1246	0.0605	4.24	0.0395
HCC72:Multiple Sclerosis	-0.8412	0.2479	11.51	0.0007

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	-0.0134	0.0751	0.03	0.8587
HCC74:Seizure Disorders and Convulsions	-0.0316	0.0706	0.2	0.6541
HCC75:Coma, Brain Compression/Anoxic Damage	-0.1753	0.1675	1.1	0.2952
HCC77:Respirator Dependence/Tracheostomy Status	0.6973	0.2021	11.9	0.0006
HCC78:Respiratory Arrest	-0.3123	0.3499	0.8	0.372
HCC79:Cardio-Respiratory Failure and Shock	0.0841	0.0527	2.55	0.1103
HCC80:Congestive Heart Failure	0.0927	0.0388	5.71	0.0168
HCC81:Acute Myocardial Infarction	-0.0051	0.0846	0	0.9523
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0744	0.0782	0.91	0.3414
HCC83:Angina Pectoris/Old Myocardial Infarction	0.0329	0.0572	0.33	0.5647
HCC92:Specified Heart Arrhythmias:	0.1282	0.0383	11.19	0.0008
HCC95:Cerebral Hemorrhage	0.0326	0.143	0.05	0.8198
HCC96:Ischemic or Unspecified Stroke	0.056	0.0536	1.09	0.296
HCC100:Hemiplegia/Hemiparesis	-0.0811	0.0905	0.8	0.3703
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.3901	0.2262	2.97	0.0846
HCC104:Vascular Disease with Complications	-0.1797	0.0729	6.07	0.0138
HCC105:Vascular Disease	-0.0721	0.0369	3.81	0.0509
HCC107:Cystic Fibrosis	-0.9649	0.8931	1.17	0.28
HCC108:Chronic Obstructive Pulmonary Disease	-0.0734	0.0392	3.51	0.0612
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1572	0.0905	3.02	0.0824
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.2792	0.1357	4.23	0.0397
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	-0.1436	0.1728	0.69	0.4058
HCC130:Dialysis Status	0.3744	0.2971	1.59	0.2076
HCC131:Renal Failure	0.0126	0.0454	0.08	0.782
HCC132:Nephritis	-0.1553	0.2354	0.44	0.5094
HCC148:Decubitus Ulcer of Skin	-0.0005	0.0708	0	0.994
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.0429	0.0683	0.39	0.5299
HCC155:Major Head Injury	-0.0036	0.1144	0	0.9749
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0271	0.0643	0.18	0.6731
HCC158:Hip Fracture/Dislocation	-0.3041	0.035	75.56	<.0001
HCC161:Traumatic Amputation	-0.2402	0.0878	7.49	0.0062
HCC164:Major Complications of Medical Care and Trauma	0.1019	0.0572	3.18	0.0746
HCC174:Major Organ Transplant Status	-0.0571	0.376	0.02	0.8792
HCC176:Artificial Openings for Feeding or Elimination	0.0833	0.1254	0.44	0.5064
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.8167	0.2025	16.27	<.0001
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.2323	0.1988	1.36	0.2428
Trauma in Episode HCC68:Paraplegia	-0.3494	0.3073	1.29	0.2554

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.4895	0.1556	9.89	0.0017
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.4681	0.1412	10.99	0.0009
Trauma in Episode HCC155:Major Head Injury	0.0502	0.1614	0.1	0.7556
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.1233	0.1058	1.36	0.244
Trauma in Episode HCC161:Traumatic Amputation	0.3367	0.0981	11.78	0.0006
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.6025	0.0691	75.93	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0245	0.1824	0.02	0.8932
Female, age 35-44	-2.1999	1.1661	3.56	0.0592
Female, age 45-54	0.3463	0.965	0.13	0.7197
Female, age 55-59	0.2338	0.969	0.06	0.8093
Female, age 60-64	-0.2687	0.9106	0.09	0.7679
Female, age 65-69	-0.4468	0.1892	5.58	0.0182
Female, age 70-74	-0.5026	0.1704	8.7	0.0032
Female, age 75-79	-0.3799	0.1635	5.4	0.0201
Female, age 80-84	-0.3303	0.1597	4.28	0.0386
Female, age 85-89	-0.2984	0.1587	3.54	0.06
Female, age 90-94	-0.414	0.1606	6.64	0.0099
Female, age 95 and older	-0.4751	0.1704	7.78	0.0053
Male, Infant - age 34	0.2083	1.1341	0.03	0.8543
Male, age 35-44	-0.4499	0.992	0.21	0.6502
Male, age 45-54	0.1472	0.9673	0.02	0.8791
Male, age 55-59	0.2818	0.9657	0.09	0.7704
Male, age 60-64	-0.1066	0.9525	0.01	0.9109
Male, age 65-69	-0.5406	0.1983	7.43	0.0064
Male, age 70-74	-0.3999	0.1829	4.78	0.0288
Male, age 75-79	-0.3602	0.1726	4.36	0.0369
Male, age 80-84	-0.1314	0.1665	0.62	0.4299
Male, age 85-89	-0.4047	0.1665	5.91	0.0151
Male, age 90-94	-0.4684	0.1731	7.32	0.0068
Male, age 95 and older	0	0	.	.
Disability	0.6478	1.3107	0.24	0.6212
Dual Eligible	0.0353	0.0418	0.71	0.398
Medicare-Aged	0.3663	0.4433	0.68	0.4087
Medicare-Disabled	1.4113	0.9948	2.01	0.156
Medicare-ESRD	0	0	.	.

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Number of IP visits in last 12 months for condition	-0.0099	0.1298	0.01	0.9395
Number of ED visits in last 12 months for condition	0.0337	0.1016	0.11	0.7402
Death in episode window	-1.1707	0.0424	763.07	<.0001

Table 13. Laparoscopic Cholecystectomy- Regression of 30-day Episode Costs for Laparoscopic Cholecystectomy Episodes (N=15,851)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	5.9808	5.9805	1	0.3173
HCC1:HIV/AIDS	-0.1894	0.1668	-1.14	0.256
HCC2:Septicemia/Shock	0.1128	0.0566	1.99	0.0462
HCC5:Opportunistic Infections	-0.065	0.1124	-0.58	0.5632
HCC7:Metastatic Cancer and Acute Leukemia	0.1989	0.0657	3.03	0.0025
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.2488	0.075	3.32	0.0009
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0525	0.0704	0.74	0.4564
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0536	0.0357	1.5	0.1331
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.1872	0.0466	4.02	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.142	0.0474	3	0.0027
HCC17:Diabetes with Acute Complications	0.2027	0.2003	1.01	0.3116
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.1473	0.073	2.02	0.0436
HCC19:Diabetes without Complication	0.0251	0.0265	0.95	0.3426
HCC21:Protein-Calorie Malnutrition	0.3045	0.0765	3.98	<.0001
HCC25:End-Stage Liver Disease	-0.0253	0.1154	-0.22	0.8267
HCC26:Cirrhosis of Liver	0.0425	0.0909	0.47	0.6405
HCC27:Chronic Hepatitis	0.0704	0.0973	0.72	0.4695
HCC31:Intestinal Obstruction/Perforation	-0.0173	0.0463	-0.37	0.7081
HCC32:Pancreatic Disease	-0.0347	0.0393	-0.88	0.3774
HCC33:Inflammatory Bowel Disease:	0.0454	0.0773	0.59	0.5569
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0977	0.0764	1.28	0.2007
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0457	0.0359	1.27	0.2035
HCC44:Severe Hematological Disorders	0.1084	0.0747	1.45	0.1468
HCC45:Disorders of Immunity	0.07	0.0798	0.88	0.3806
HCC51:Drug/Alcohol Psychosis	0.2452	0.0979	2.5	0.0123
HCC52:Drug/Alcohol Dependence	0.003	0.078	0.04	0.9691
HCC54:Schizophrenia	0.3388	0.0822	4.12	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.177	0.0465	3.8	0.0001
HCC67:Quadriplegia, Other Extensive Paralysis	-0.2081	0.113	-1.84	0.0654
HCC68:Paraplegia	-0.0038	0.1554	-0.02	0.9806
HCC69:Spinal Cord Disorders/Injuries	0.2007	0.0761	2.64	0.0083
HCC70:Muscular Dystrophy	-0.1514	0.2198	-0.69	0.4908
HCC71:Polyneuropathy:	0.0162	0.037	0.44	0.6611
HCC72:Multiple Sclerosis	0.3126	0.1051	2.97	0.0029

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	0.323	0.0685	4.72	<.0001
HCC74:Seizure Disorders and Convulsions	0.1021	0.0479	2.13	0.033
HCC75:Coma, Brain Compression/Anoxic Damage	0.0697	0.1123	0.62	0.5348
HCC77:Respirator Dependence/Tracheostomy Status	0.2098	0.1683	1.25	0.2126
HCC78:Respiratory Arrest	0.0679	0.2158	0.31	0.7529
HCC79:Cardio-Respiratory Failure and Shock	0.0204	0.0423	0.48	0.6292
HCC80:Congestive Heart Failure	0.1161	0.0311	3.73	0.0002
HCC81:Acute Myocardial Infarction	-0.0033	0.0706	-0.05	0.9624
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0189	0.0514	-0.37	0.7134
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.0083	0.0369	-0.23	0.822
HCC92:Specified Heart Arrhythmias:	0.096	0.0278	3.45	0.0006
HCC95:Cerebral Hemorrhage	0.12	0.1298	0.92	0.3551
HCC96:Ischemic or Unspecified Stroke	0.206	0.0428	4.81	<.0001
HCC100:Hemiplegia/Hemiparesis	0.2246	0.0659	3.41	0.0007
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.3274	0.1618	2.02	0.043
HCC104:Vascular Disease with Complications	0.0275	0.0547	0.5	0.6156
HCC105:Vascular Disease	0.0893	0.0273	3.27	0.0011
HCC107:Cystic Fibrosis	-0.2013	0.4434	-0.45	0.6498
HCC108:Chronic Obstructive Pulmonary Disease	0.1022	0.0281	3.63	0.0003
HCC111:Aspiration and Specified Bacterial Pneumonias	0.0952	0.0819	1.16	0.2448
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.0447	0.1019	0.44	0.6611
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.0096	0.0887	0.11	0.9137
HCC130:Dialysis Status	0.2562	0.1101	2.33	0.02
HCC131:Renal Failure	0.1011	0.0342	2.96	0.0031
HCC132:Nephritis	0.2555	0.2033	1.26	0.2089
HCC148:Decubitus Ulcer of Skin	0.1	0.0593	1.69	0.0919
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1275	0.0567	2.25	0.0246
HCC150:Extensive Third-Degree Burns	-0.1576	0.1696	-0.93	0.3527
HCC154:Severe Head Injury	-0.6028	0.4354	-1.38	0.1662
HCC155:Major Head Injury	0.0087	0.144	0.06	0.9519
HCC157:Vertebral Fractures without Spinal Cord Injury	0.1296	0.0613	2.12	0.0343
HCC158:Hip Fracture/Dislocation	0.1529	0.059	2.59	0.0095
HCC161:Traumatic Amputation	0.0213	0.0735	0.29	0.7722
HCC164:Major Complications of Medical Care and Trauma	0.1649	0.0504	3.27	0.0011
HCC174:Major Organ Transplant Status	0.422	0.283	1.49	0.1358
HCC176:Artificial Openings for Feeding or Elimination	0.071	0.0902	0.79	0.4313
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.169	0.1165	1.45	0.1466
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.4175	0.1592	2.62	0.0087

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC68:Paraplegia	0.464	0.2276	2.04	0.0415
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.8731	0.3399	2.57	0.0102
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.9759	0.2085	4.68	<.0001
Trauma in Episode HCC155:Major Head Injury	0.8636	0.1529	5.65	<.0001
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.7109	0.1654	4.3	<.0001
Trauma in Episode HCC158:Hip Fracture/Dislocation	0.9506	0.1703	5.58	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.3075	0.067	4.59	<.0001
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.772	0.0488	15.81	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.2627	0.2413	1.09	0.2762
Female, Infant - age 34	-1.1407	0.3498	-3.26	0.0011
Female, age 35-44	-1.1189	0.3433	-3.26	0.0011
Female, age 45-54	-1.0861	0.3455	-3.14	0.0017
Female, age 55-59	-1.0706	0.3389	-3.16	0.0016
Female, age 60-64	-0.9008	0.3292	-2.74	0.0062
Female, age 65-69	-0.8451	0.2555	-3.31	0.0009
Female, age 70-74	-0.7218	0.2549	-2.83	0.0046
Female, age 75-79	-0.733	0.2538	-2.89	0.0039
Female, age 80-84	-0.4253	0.2545	-1.67	0.0947
Female, age 85-89	-0.2418	0.256	-0.94	0.3449
Female, age 90-94	-0.1215	0.2597	-0.47	0.6398
Female, age 95 and older	0.0802	0.2852	0.28	0.7785
Male, Infant - age 34	-1.2177	0.3573	-3.41	0.0007
Male, age 35-44	-1.1253	0.3473	-3.24	0.0012
Male, age 45-54	-1.0822	0.3439	-3.15	0.0016
Male, age 55-59	-1.1099	0.3531	-3.14	0.0017
Male, age 60-64	-1.0343	0.3366	-3.07	0.0021
Male, age 65-69	-0.8161	0.257	-3.18	0.0015
Male, age 70-74	-0.7959	0.2543	-3.13	0.0018
Male, age 75-79	-0.5838	0.2556	-2.28	0.0224
Male, age 80-84	-0.5262	0.2543	-2.07	0.0385
Male, age 85-89	-0.3199	0.2556	-1.25	0.2108
Male, age 90-94	-0.2207	0.2692	-0.82	0.4123
Male, age 95 and older	0	0	-	.
Disability	0.3827	0.2505	1.53	0.1265
Dual Eligible	0.1428	0.0292	4.89	<.0001
Medicare-Aged	-0.0547	0.1195	-0.46	0.6471
Medicare-Disabled	0.0222	0.1278	0.17	0.8619

Parameter	Estimate	Standard Error	Z Value	Significance Level
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.7909	0.0326	24.28	<.0001
MS-DRG:Major Complications and Comorbidity	0.4004	0.0269	14.91	<.0001
Number of IP visits in last 12 months for condition	0.6023	0.3464	1.74	0.0821
Number of ED visits in last 12 months for condition	-1.4386	0.1328	-10.83	<.0001
Death in episode window	0.317	0.1086	2.92	0.0035

Table 14.Non- Laparoscopic Cholecystectomy- Regression of 30-day Episode Costs for Non-Laparoscopic Cholecystectomy Episodes (N=3,701)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	12.4739	8.1347	1.53	0.1252
HCC1:HIV/AIDS	-0.1614	0.2255	-0.72	0.4741
HCC2:Septicemia/Shock	0.0444	0.0802	0.55	0.5802
HCC5:Opportunistic Infections	-0.3143	0.2207	-1.42	0.1543
HCC7:Metastatic Cancer and Acute Leukemia	0.0093	0.1052	0.09	0.9298
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.157	0.1051	1.49	0.1354
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0427	0.1668	0.26	0.7979
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0052	0.0623	0.08	0.9335
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.2904	0.0862	3.37	0.0008
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.1339	0.0756	1.77	0.0764
HCC17:Diabetes with Acute Complications	0.2959	0.2742	1.08	0.2806
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.1501	0.1303	1.15	0.2493
HCC19:Diabetes without Complication	0.0901	0.0525	1.72	0.0861
HCC21:Protein-Calorie Malnutrition	0.1178	0.0994	1.19	0.2357
HCC25:End-Stage Liver Disease	0.5442	0.1897	2.87	0.0041
HCC26:Cirrhosis of Liver	0.0692	0.1672	0.41	0.6789
HCC27:Chronic Hepatitis	-0.0872	0.145	-0.6	0.5473
HCC31:Intestinal Obstruction/Perforation	-0.0459	0.0714	-0.64	0.5202
HCC32:Pancreatic Disease	0.0686	0.0733	0.94	0.3494
HCC33:Inflammatory Bowel Disease:	-0.246	0.0958	-2.57	0.0102
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0412	0.1313	0.31	0.754
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0395	0.0722	0.55	0.5841
HCC44:Severe Hematological Disorders	0.0769	0.1095	0.7	0.4826
HCC45:Disorders of Immunity	-0.034	0.1486	-0.23	0.8193
HCC51:Drug/Alcohol Psychosis	0.0413	0.1795	0.23	0.8178
HCC52:Drug/Alcohol Dependence	0.2174	0.1757	1.24	0.2161
HCC54:Schizophrenia	0.108	0.1332	0.81	0.4171
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.194	0.0747	2.6	0.0094
HCC67:Quadriplegia, Other Extensive Paralysis	0.1734	0.1701	1.02	0.308
HCC68:Paraplegia	0.0373	0.1923	0.19	0.8463
HCC69:Spinal Cord Disorders/Injuries	0.2692	0.1434	1.88	0.0605
HCC70:Muscular Dystrophy	0.8588	0.5281	1.63	0.1039
HCC71:Polyneuropathy:	-0.0943	0.0682	-1.38	0.1669
HCC72:Multiple Sclerosis	0.3957	0.2166	1.83	0.0678

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	0.2696	0.112	2.41	0.0161
HCC74:Seizure Disorders and Convulsions	0.2399	0.0858	2.8	0.0052
HCC75:Coma, Brain Compression/Anoxic Damage	0.3145	0.3252	0.97	0.3335
HCC77:Respirator Dependence/Tracheostomy Status	0.3163	0.1818	1.74	0.0819
HCC78:Respiratory Arrest	0.3335	0.1917	1.74	0.082
HCC79:Cardio-Respiratory Failure and Shock	0.0456	0.063	0.72	0.4694
HCC80:Congestive Heart Failure	0.1428	0.0471	3.03	0.0024
HCC81:Acute Myocardial Infarction	-0.1052	0.0955	-1.1	0.2708
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0542	0.081	-0.67	0.5034
HCC83:Angina Pectoris/Old Myocardial Infarction	0.0184	0.0542	0.34	0.7334
HCC92:Specified Heart Arrhythmias:	0.1193	0.0428	2.79	0.0053
HCC95:Cerebral Hemorrhage	0.1795	0.1741	1.03	0.3024
HCC96:Ischemic or Unspecified Stroke	0.204	0.0642	3.17	0.0015
HCC100:Hemiplegia/Hemiparesis	0.33	0.114	2.9	0.0038
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.5615	0.1713	-3.28	0.001
HCC104:Vascular Disease with Complications	0.1587	0.0681	2.33	0.0197
HCC105:Vascular Disease	0.1325	0.0466	2.84	0.0044
HCC107:Cystic Fibrosis	-2.1774	0.1125	-19.35	<.0001
HCC108:Chronic Obstructive Pulmonary Disease	0.0672	0.0514	1.31	0.1911
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.0926	0.1201	-0.77	0.4407
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.1641	0.1736	0.95	0.3446
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	-0.1201	0.1148	-1.05	0.2954
HCC130:Dialysis Status	-0.3917	0.1566	-2.5	0.0124
HCC131:Renal Failure	-0.0185	0.0536	-0.34	0.7303
HCC132:Nephritis	0.231	0.3274	0.71	0.4805
HCC148:Decubitus Ulcer of Skin	0.0014	0.0919	0.02	0.9876
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.0577	0.0903	0.64	0.5229
HCC150:Extensive Third-Degree Burns	-0.3819	0.4093	-0.93	0.3508
HCC155:Major Head Injury	0.1287	0.1681	0.77	0.4442
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0487	0.0878	0.56	0.5788
HCC158:Hip Fracture/Dislocation	0.1632	0.0961	1.7	0.0893
HCC161:Traumatic Amputation	-0.257	0.083	-3.1	0.002
HCC164:Major Complications of Medical Care and Trauma	0.2139	0.0733	2.92	0.0035
HCC174:Major Organ Transplant Status	0.3286	0.2786	1.18	0.2382
HCC176:Artificial Openings for Feeding or Elimination	0.1161	0.1188	0.98	0.3285
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.2474	0.199	1.24	0.2138
Trauma in Episode HCC67:Quadriplegia, Other Extensive Paralysis	0.045	0.1981	0.23	0.8204
Trauma in Episode HCC68:Paraplegia	0.8252	0.2371	3.48	0.0005

Parameter	Estimate	Standard Error	Z Value	Significance Level
Trauma in Episode HCC69:Spinal Cord Disorders/Injuries	0.5188	0.4882	1.06	0.2879
Trauma in Episode HCC75:Coma, Brain Compression/Anoxic Damage	0.6395	0.333	1.92	0.0548
Trauma in Episode HCC155:Major Head Injury	0.214	0.5313	0.4	0.6871
Trauma in Episode HCC157:Vertebral Fractures without Spinal Cord Injury	0.5044	0.3085	1.63	0.1021
Trauma in Episode HCC158:Hip Fracture/Dislocation	1.149	0.2233	5.15	<.0001
Trauma in Episode HCC161:Traumatic Amputation	0.2902	0.1181	2.46	0.014
Trauma in Episode HCC164:Major Complications of Medical Care and Trauma	0.6035	0.0568	10.63	<.0001
Trauma in Episode HCC177:Amputation Status, Lower Limb/Amputation Complications	0.3286	0.1905	1.73	0.0845
Female, Infant - age 34	-0.7625	0.6539	-1.17	0.2436
Female, age 35-44	-0.7019	0.5356	-1.31	0.19
Female, age 45-54	-0.459	0.5305	-0.87	0.387
Female, age 55-59	-0.4895	0.5197	-0.94	0.3463
Female, age 60-64	-0.1866	0.5456	-0.34	0.7324
Female, age 65-69	-0.2977	0.3272	-0.91	0.3629
Female, age 70-74	-0.3958	0.3241	-1.22	0.222
Female, age 75-79	-0.2637	0.3216	-0.82	0.4122
Female, age 80-84	-0.0373	0.3214	-0.12	0.9076
Female, age 85-89	0.0021	0.3206	0.01	0.9948
Female, age 90-94	0.0584	0.3262	0.18	0.858
Female, age 95 and older	-0.0872	0.3474	-0.25	0.8018
Male, Infant - age 34	-0.7985	0.5391	-1.48	0.1386
Male, age 35-44	-0.5756	0.5342	-1.08	0.2812
Male, age 45-54	-0.1983	0.5184	-0.38	0.7021
Male, age 55-59	-0.0499	0.5257	-0.09	0.9243
Male, age 60-64	0.0577	0.5938	0.1	0.9225
Male, age 65-69	-0.6172	0.3237	-1.91	0.0566
Male, age 70-74	-0.4934	0.3205	-1.54	0.1237
Male, age 75-79	-0.3347	0.3206	-1.04	0.2966
Male, age 80-84	-0.2441	0.3187	-0.77	0.4438
Male, age 85-89	0.038	0.3236	0.12	0.9065
Male, age 90-94	0.0214	0.3309	0.06	0.9485
Male, age 95 and older	0	0	-	.
Disability	0.2233	0.4491	0.5	0.6191
Dual Eligible	0.1079	0.0542	1.99	0.0466
Medicare-Aged	-0.4049	0.2022	-2	0.0453
Medicare-Disabled	0.0216	0.4063	0.05	0.9575

Parameter	Estimate	Standard Error	Z Value	Significance Level
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.598	0.13	4.6	<.0001
MS-DRG:Major Complications and Comorbidity	0.2256	0.1162	1.94	0.0522
MS-DRG: Common Duct Exploration	-0.1295	0.1563	-0.83	0.4073
Number of IP visits in last 12 months for condition	0.2588	0.2533	1.02	0.3069
Number of ED visits in last 12 months for condition	0	0	.	.

Table 15.Medical Back Pain- Regression of 30-day Episode Costs for Medical Back Pain (N=9,904)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	14.0068	3.6117	3.88	0.0001
HCC1:HIV/AIDS	-0.0269	0.3035	-0.09	0.9295
HCC2:Septicemia/Shock	-0.0987	0.057	-1.73	0.0832
HCC5:Opportunistic Infections	-0.1477	0.1451	-1.02	0.3088
HCC7:Metastatic Cancer and Acute Leukemia	-0.1527	0.0626	-2.44	0.0147
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.0145	0.0875	0.17	0.8687
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.1292	0.0624	-2.07	0.0386
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.0521	0.0364	-1.43	0.153
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	-0.1025	0.0469	-2.18	0.029
HCC16:Diabetes with Neurologic or Other Specified Manifestation	-0.0513	0.0499	-1.03	0.3033
HCC17:Diabetes with Acute Complications	-0.2819	0.277	-1.02	0.3088
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	-0.2295	0.1025	-2.24	0.0252
HCC19:Diabetes without Complication	-0.031	0.0307	-1.01	0.3124
HCC21:Protein-Calorie Malnutrition	0.0559	0.0568	0.98	0.3247
HCC25:End-Stage Liver Disease	-0.1936	0.1257	-1.54	0.1234
HCC26:Cirrhosis of Liver	-0.0738	0.1192	-0.62	0.5357
HCC27:Chronic Hepatitis	-0.0128	0.1378	-0.09	0.9257
HCC31:Intestinal Obstruction/Perforation	0.0105	0.0547	0.19	0.8472
HCC32:Pancreatic Disease	0.0415	0.0523	0.79	0.4279
HCC33:Inflammatory Bowel Disease:	-0.0952	0.0935	-1.02	0.3086
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.1227	0.0822	-1.49	0.1352
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	-0.0595	0.0339	-1.76	0.079
HCC44:Severe Hematological Disorders	0.0076	0.0673	0.11	0.9098
HCC45:Disorders of Immunity	-0.0563	0.0785	-0.72	0.473
HCC51:Drug/Alcohol Psychosis	0.0354	0.0827	0.43	0.6687
HCC52:Drug/Alcohol Dependence	0.0888	0.083	1.07	0.2843
HCC54:Schizophrenia	-0.1875	0.0916	-2.05	0.0406
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-0.0651	0.0428	-1.52	0.1279
HCC67:Quadriplegia, Other Extensive Paralysis	-0.1288	0.1606	-0.8	0.4228
HCC68:Paraplegia	-0.2953	0.151	-1.96	0.0504
HCC69:Spinal Cord Disorders/Injuries	-0.1402	0.0598	-2.35	0.019
HCC70:Muscular Dystrophy	0.0721	0.3761	0.19	0.8481
HCC71:Polyneuropathy:	-0.0715	0.0348	-2.06	0.0396
HCC72:Multiple Sclerosis	0.0172	0.1301	0.13	0.8947
HCC73:Parkinsons and Huntingtons Diseases	-0.1026	0.0512	-2	0.045

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC74:Seizure Disorders and Convulsions	-0.1683	0.0554	-3.04	0.0024
HCC75:Coma, Brain Compression/Anoxic Damage	0.0161	0.1169	0.14	0.8908
HCC77:Respirator Dependence/Tracheostomy Status	0.1798	0.2416	0.74	0.4567
HCC78:Respiratory Arrest	-0.1338	0.1987	-0.67	0.5008
HCC79:Cardio-Respiratory Failure and Shock	-0.0706	0.0377	-1.87	0.0614
HCC80:Congestive Heart Failure	-0.0783	0.0278	-2.82	0.0048
HCC81:Acute Myocardial Infarction	0.1357	0.0597	2.27	0.0231
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0757	0.0519	1.46	0.1447
HCC83:Angina Pectoris/Old Myocardial Infarction	0.0966	0.0394	2.45	0.0142
HCC92:Specified Heart Arrhythmias:	-0.0313	0.026	-1.2	0.2286
HCC95:Cerebral Hemorrhage	0.0756	0.0862	0.88	0.3801
HCC96:Ischemic or Unspecified Stroke	-0.0545	0.0367	-1.49	0.1374
HCC100:Hemiplegia/Hemiparesis	-0.094	0.0672	-1.4	0.1618
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.0297	0.1446	-0.21	0.8374
HCC104:Vascular Disease with Complications	-0.0854	0.0521	-1.64	0.1013
HCC105:Vascular Disease	-0.026	0.0259	-1	0.3163
HCC107:Cystic Fibrosis	-0.9302	0.1013	-9.18	<.0001
HCC108:Chronic Obstructive Pulmonary Disease	-0.026	0.0279	-0.93	0.3515
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1967	0.0867	-2.27	0.0233
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.0243	0.0826	0.29	0.7687
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	-0.0006	0.1047	-0.01	0.9957
HCC130:Dialysis Status	-0.2514	0.1339	-1.88	0.0605
HCC131:Renal Failure	-0.0385	0.0322	-1.19	0.2324
HCC132:Nephritis	-0.184	0.1342	-1.37	0.1704
HCC148:Decubitus Ulcer of Skin	-0.0428	0.0679	-0.63	0.529
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.1964	0.046	-4.27	<.0001
HCC154:Severe Head Injury	-0.0726	0.3229	-0.22	0.822
HCC155:Major Head Injury	-0.0359	0.084	-0.43	0.6696
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.165	0.0315	-5.24	<.0001
HCC158:Hip Fracture/Dislocation	-0.0666	0.044	-1.51	0.1298
HCC161:Traumatic Amputation	0.0865	0.0636	1.36	0.1735
HCC164:Major Complications of Medical Care and Trauma	-0.0193	0.041	-0.47	0.638
HCC174:Major Organ Transplant Status	0.3226	0.2006	1.61	0.1077
HCC176:Artificial Openings for Feeding or Elimination	0.0155	0.0965	0.16	0.8726
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.3033	0.1442	2.1	0.0354
Female, Infant - age 34	0.1783	0.3646	0.49	0.6248
Female, age 35-44	-0.2772	0.3598	-0.77	0.4411
Female, age 45-54	-0.2427	0.3374	-0.72	0.4719

Parameter	Estimate	Standard Error	Z Value	Significance Level
Female, age 55-59	-0.5683	0.3302	-1.72	0.0852
Female, age 60-64	-0.4967	0.3038	-1.63	0.1021
Female, age 65-69	0.5027	0.1184	4.24	<.0001
Female, age 70-74	0.2701	0.112	2.41	0.0159
Female, age 75-79	0.2004	0.1084	1.85	0.0646
Female, age 80-84	0.1195	0.1053	1.13	0.2567
Female, age 85-89	0.099	0.105	0.94	0.3459
Female, age 90-94	0.0892	0.1065	0.84	0.4025
Female, age 95 and older	0.0001	0.1165	0	0.9995
Male, Infant - age 34	-0.2492	0.4395	-0.57	0.5707
Male, age 35-44	0.0379	0.3691	0.1	0.9182
Male, age 45-54	-0.3754	0.3354	-1.12	0.263
Male, age 55-59	-0.3486	0.3432	-1.02	0.3098
Male, age 60-64	-0.5088	0.3241	-1.57	0.1164
Male, age 65-69	0.4041	0.1399	2.89	0.0039
Male, age 70-74	0.1782	0.1229	1.45	0.1472
Male, age 75-79	0.1907	0.1179	1.62	0.1058
Male, age 80-84	0.1801	0.1113	1.62	0.1055
Male, age 85-89	0.0621	0.111	0.56	0.5762
Male, age 90-94	0.1694	0.1145	1.48	0.139
Male, age 95 and older	0	0	-	.
Disability	0.8438	0.402	2.1	0.0358
Dual Eligible	0.0388	0.0315	1.23	0.2174
Medicare-Aged	-0.4637	0.1995	-2.32	0.0201
Medicare-Disabled	-0.3389	0.2975	-1.14	0.2546
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	-0.2511	0.0343	-7.32	<.0001
Number of IP visits in last 12 months for condition	-0.0254	0.0375	-0.68	0.4984
Number of ED visits in last 12 months for condition	0.0246	0.0144	1.71	0.0877

Table 16. Back Pain with Spinal Fusion- Regression of 30-day Episode Costs for Back Pain with Spinal Fusion (N=6,332)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	6.2867	4.6857	1.34	0.1797
HCC1:HIV/AIDS	0.315	0.2964	1.06	0.2878
HCC2:Septicemia/Shock	0.0307	0.0826	0.37	0.7105
HCC5:Opportunistic Infections	-0.1662	0.1205	-1.38	0.1679
HCC7:Metastatic Cancer and Acute Leukemia	-0.2497	0.0967	-2.58	0.0098
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.0989	0.08	-1.24	0.2165
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.0844	0.0656	-1.29	0.1982
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0122	0.0356	0.34	0.7319
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.102	0.0513	1.99	0.0468
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.1483	0.0803	1.85	0.0646
HCC17:Diabetes with Acute Complications	-0.1399	0.226	-0.62	0.5359
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.096	0.0768	1.25	0.211
HCC19:Diabetes without Complication	0.0542	0.0261	2.08	0.0377
HCC21:Protein-Calorie Malnutrition	0.0869	0.1011	0.86	0.3904
HCC25:End-Stage Liver Disease	-0.1077	0.1717	-0.63	0.5304
HCC26:Cirrhosis of Liver	-0.1533	0.1594	-0.96	0.3363
HCC27:Chronic Hepatitis	-0.0145	0.0969	-0.15	0.881
HCC31:Intestinal Obstruction/Perforation	0.0347	0.0652	0.53	0.5945
HCC32:Pancreatic Disease	-0.0749	0.0704	-1.06	0.2873
HCC33:Inflammatory Bowel Disease:	-0.0489	0.0877	-0.56	0.577
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.1126	0.0766	-1.47	0.1415
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0821	0.0276	2.97	0.003
HCC44:Severe Hematological Disorders	0.0016	0.0692	0.02	0.9812
HCC45:Disorders of Immunity	0.071	0.1136	0.62	0.5321
HCC51:Drug/Alcohol Psychosis	0.074	0.071	1.04	0.2977
HCC52:Drug/Alcohol Dependence	-0.0095	0.0752	-0.13	0.8992
HCC54:Schizophrenia	0.259	0.1138	2.28	0.0229
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.0842	0.0365	2.31	0.0209
HCC67:Quadriplegia, Other Extensive Paralysis	0.5481	0.3902	1.4	0.1602
HCC68:Paraplegia	0.5637	0.1994	2.83	0.0047
HCC69:Spinal Cord Disorders/Injuries	0.1652	0.0598	2.76	0.0057
HCC70:Muscular Dystrophy	0.395	0.1699	2.32	0.0201
HCC71:Polyneuropathy:	0.1118	0.0445	2.51	0.0119
HCC72:Multiple Sclerosis	0.0262	0.1401	0.19	0.8515

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	0.2647	0.0756	3.5	0.0005
HCC74:Seizure Disorders and Convulsions	0.1377	0.0593	2.32	0.0201
HCC75:Coma, Brain Compression/Anoxic Damage	0.1248	0.1544	0.81	0.4191
HCC77:Respirator Dependence/Tracheostomy Status	-0.8771	0.1561	-5.62	<.0001
HCC78:Respiratory Arrest	0.3416	0.1333	2.56	0.0104
HCC79:Cardio-Respiratory Failure and Shock	-0.0212	0.0571	-0.37	0.7104
HCC80:Congestive Heart Failure	0.0784	0.0302	2.6	0.0095
HCC81:Acute Myocardial Infarction	-0.2792	0.127	-2.2	0.028
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0379	0.0502	-0.75	0.4506
HCC83:Angina Pectoris/Old Myocardial Infarction	0.0555	0.0354	1.57	0.1174
HCC92:Specified Heart Arrhythmias:	0.0492	0.0313	1.57	0.1157
HCC95:Cerebral Hemorrhage	-0.0168	0.1467	-0.11	0.9091
HCC96:Ischemic or Unspecified Stroke	0.0711	0.0449	1.58	0.1136
HCC100:Hemiplegia/Hemiparesis	0.1561	0.0885	1.76	0.0778
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.4133	0.1504	2.75	0.006
HCC104:Vascular Disease with Complications	0.1154	0.0593	1.94	0.0518
HCC105:Vascular Disease	0.0119	0.0258	0.46	0.6433
HCC107:Cystic Fibrosis	-0.3463	0.3639	-0.95	0.3412
HCC108:Chronic Obstructive Pulmonary Disease	0.083	0.0281	2.96	0.0031
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.021	0.1008	-0.21	0.835
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.0022	0.0908	0.02	0.9807
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.0101	0.136	0.07	0.9405
HCC130:Dialysis Status	-0.0701	0.2	-0.35	0.7261
HCC131:Renal Failure	0.0464	0.0398	1.17	0.2436
HCC132:Nephritis	-0.2023	0.1689	-1.2	0.231
HCC148:Decubitus Ulcer of Skin	0.3197	0.1004	3.19	0.0014
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1594	0.0658	2.42	0.0154
HCC150:Extensive Third-Degree Burns	-0.8435	0.1974	-4.27	<.0001
HCC154:Severe Head Injury	0.054	0.1984	0.27	0.7856
HCC155:Major Head Injury	0.0633	0.1372	0.46	0.6448
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0893	0.0431	2.07	0.0383
HCC158:Hip Fracture/Dislocation	0.1084	0.0756	1.43	0.1515
HCC161:Traumatic Amputation	-0.0304	0.0839	-0.36	0.7168
HCC164:Major Complications of Medical Care and Trauma	0.0611	0.0409	1.5	0.1349
HCC174:Major Organ Transplant Status	-0.2853	0.2747	-1.04	0.2989
HCC176:Artificial Openings for Feeding or Elimination	0.0873	0.1598	0.55	0.5848
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.1161	0.2312	0.5	0.6155
Female, Infant - age 34	-1.2427	0.3812	-3.26	0.0011

Parameter	Estimate	Standard Error	Z Value	Significance Level
Female, age 35-44	-0.6549	0.3659	-1.79	0.0735
Female, age 45-54	-0.6034	0.3495	-1.73	0.0843
Female, age 55-59	-0.4588	0.3519	-1.3	0.1923
Female, age 60-64	-0.2314	0.3454	-0.67	0.5028
Female, age 65-69	0.0333	0.1864	0.18	0.8582
Female, age 70-74	0.1016	0.1863	0.55	0.5856
Female, age 75-79	0.2159	0.1858	1.16	0.2452
Female, age 80-84	0.3161	0.1871	1.69	0.0912
Female, age 85-89	0.3693	0.1954	1.89	0.0589
Female, age 90-94	0.116	0.2239	0.52	0.6045
Male, Infant - age 34	-1.3923	0.3948	-3.53	0.0004
Male, age 35-44	-1.0656	0.3661	-2.91	0.0036
Male, age 45-54	-0.6568	0.3552	-1.85	0.0644
Male, age 55-59	-0.5249	0.3579	-1.47	0.1425
Male, age 60-64	-0.3709	0.3417	-1.09	0.2777
Male, age 65-69	-0.1207	0.1899	-0.64	0.5248
Male, age 70-74	0.0162	0.1894	0.09	0.9318
Male, age 75-79	0.0065	0.1881	0.03	0.9722
Male, age 80-84	0.1916	0.191	1	0.3157
Male, age 85-89	0.3034	0.2009	1.51	0.1309
Male, age 90-94	0	0	-	.
Disability	-0.1165	0.5162	-0.23	0.8214
Dual Eligible	0.1116	0.0334	3.34	0.0008
Medicare-Aged	-0.1906	0.346	-0.55	0.5817
Medicare-Disabled	0	0	.	.
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.4468	0.0456	9.8	<.0001
Number of IP visits in last 12 months for condition	0.0055	0.0326	0.17	0.8655
Number of ED visits in last 12 months for condition	0.0278	0.0132	2.11	0.0352

Table 17. Back Pain with Other Procedures- Regression of 30-day Episode Costs for Back Pain with Other Procedures (N=9,025)

Parameter	Estimate	Standard Error	Z Value	Significance Level
Intercept	-11.4267	6.6705	-1.71	0.0867
HCC1:HIV/AIDS	0.3515	0.33	1.07	0.2869
HCC2:Septicemia/Shock	0.1999	0.123	1.62	0.1043
HCC5:Opportunistic Infections	-0.0158	0.1768	-0.09	0.9287
HCC7:Metastatic Cancer and Acute Leukemia	0.1519	0.1072	1.42	0.1566
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.1315	0.1291	-1.02	0.3082
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0844	0.086	0.98	0.3268
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.0045	0.0411	-0.11	0.9124
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.3387	0.0631	5.37	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.2501	0.0555	4.51	<.0001
HCC17:Diabetes with Acute Complications	-0.2938	0.2067	-1.42	0.1553
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.1568	0.0861	1.82	0.0687
HCC19:Diabetes without Complication	0.0569	0.0332	1.72	0.0861
HCC21:Protein-Calorie Malnutrition	0.0307	0.1261	0.24	0.8077
HCC25:End-Stage Liver Disease	0.0738	0.2543	0.29	0.7717
HCC26:Cirrhosis of Liver	0.2216	0.2452	0.9	0.3662
HCC27:Chronic Hepatitis	0.1055	0.1745	0.6	0.5453
HCC31:Intestinal Obstruction/Perforation	0.102	0.0885	1.15	0.2492
HCC32:Pancreatic Disease	-0.0583	0.0894	-0.65	0.5145
HCC33:Inflammatory Bowel Disease:	-0.0767	0.1198	-0.64	0.522
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.134	0.0927	1.45	0.1484
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0548	0.0395	1.39	0.1653
HCC44:Severe Hematological Disorders	0.2807	0.098	2.86	0.0042
HCC45:Disorders of Immunity	-0.1174	0.1119	-1.05	0.294
HCC51:Drug/Alcohol Psychosis	0.1277	0.1336	0.96	0.3391
HCC52:Drug/Alcohol Dependence	0.1602	0.1722	0.93	0.3521
HCC54:Schizophrenia	0.4263	0.1751	2.43	0.0149
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.2357	0.0597	3.95	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	0.8143	0.1626	5.01	<.0001
HCC68:Paraplegia	0.2429	0.1732	1.4	0.1608
HCC69:Spinal Cord Disorders/Injuries	0.2342	0.0744	3.15	0.0017
HCC70:Muscular Dystrophy	-2.1879	0.3278	-6.68	<.0001
HCC71:Polyneuropathy:	0.0843	0.0365	2.31	0.021
HCC72:Multiple Sclerosis	-0.1967	0.1256	-1.57	0.1172

Parameter	Estimate	Standard Error	Z Value	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	0.4341	0.0866	5.01	<.0001
HCC74:Seizure Disorders and Convulsions	0.091	0.0938	0.97	0.3323
HCC75:Coma, Brain Compression/Anoxic Damage	-0.0658	0.2634	-0.25	0.8029
HCC77:Respirator Dependence/Tracheostomy Status	-0.0062	0.4234	-0.01	0.9883
HCC78:Respiratory Arrest	-0.3684	0.2957	-1.25	0.2128
HCC79:Cardio-Respiratory Failure and Shock	-0.0827	0.0645	-1.28	0.1999
HCC80:Congestive Heart Failure	0.0969	0.0382	2.53	0.0113
HCC81:Acute Myocardial Infarction	0.2837	0.172	1.65	0.099
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0079	0.0638	0.12	0.901
HCC83:Angina Pectoris/Old Myocardial Infarction	0.0853	0.0438	1.95	0.0516
HCC92:Specified Heart Arrhythmias:	0.0583	0.0359	1.63	0.104
HCC95:Cerebral Hemorrhage	0.1301	0.1791	0.73	0.4674
HCC96:Ischemic or Unspecified Stroke	0.1263	0.0636	1.98	0.0473
HCC100:Hemiplegia/Hemiparesis	0.0945	0.1339	0.71	0.4806
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.2197	0.1913	1.15	0.2506
HCC104:Vascular Disease with Complications	0.0525	0.0733	0.72	0.4735
HCC105:Vascular Disease	0.0663	0.034	1.95	0.0509
HCC107:Cystic Fibrosis	0.4025	0.4094	0.98	0.3255
HCC108:Chronic Obstructive Pulmonary Disease	0.0846	0.0369	2.29	0.0218
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.3138	0.21	-1.49	0.1352
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.0186	0.1376	-0.13	0.8927
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.1324	0.1291	1.03	0.305
HCC130:Dialysis Status	-0.1473	0.3158	-0.47	0.6409
HCC131:Renal Failure	0.0331	0.0472	0.7	0.4834
HCC132:Nephritis	-0.0382	0.2318	-0.17	0.8689
HCC148:Decubitus Ulcer of Skin	-0.0015	0.1131	-0.01	0.9892
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1085	0.0722	1.5	0.1326
HCC154:Severe Head Injury	-0.6805	0.0877	-7.76	<.0001
HCC155:Major Head Injury	-0.1308	0.1188	-1.1	0.2708
HCC157:Vertebral Fractures without Spinal Cord Injury	0.1805	0.0519	3.48	0.0005
HCC158:Hip Fracture/Dislocation	0.0841	0.0998	0.84	0.3991
HCC161:Traumatic Amputation	0.0149	0.1389	0.11	0.9147
HCC164:Major Complications of Medical Care and Trauma	-0.0642	0.0535	-1.2	0.2301
HCC174:Major Organ Transplant Status	-0.1292	0.2872	-0.45	0.6529
HCC176:Artificial Openings for Feeding or Elimination	-0.0708	0.1523	-0.47	0.6419
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.5277	0.2756	1.91	0.0555
Female, Infant - age 34	-2.3944	0.553	-4.33	<.0001

Parameter	Estimate	Standard Error	Z Value	Significance Level
Female, age 35-44	-1.8214	0.3922	-4.64	<.0001
Female, age 45-54	-1.9869	0.3737	-5.32	<.0001
Female, age 55-59	-1.7922	0.393	-4.56	<.0001
Female, age 60-64	-2.0024	0.3293	-6.08	<.0001
Female, age 65-69	-0.6778	0.2898	-2.34	0.0194
Female, age 70-74	-0.5504	0.2874	-1.91	0.0555
Female, age 75-79	-0.2906	0.2885	-1.01	0.3139
Female, age 80-84	-0.2587	0.2874	-0.9	0.3681
Female, age 85-89	-0.0262	0.2906	-0.09	0.9281
Female, age 90-94	0.2494	0.3155	0.79	0.4292
Female, age 95 and older	0.0844	0.5593	0.15	0.88
Male, Infant - age 34	-3.2826	0.409	-8.03	<.0001
Male, age 35-44	-1.7202	0.4946	-3.48	0.0005
Male, age 45-54	-2.2322	0.3707	-6.02	<.0001
Male, age 55-59	-2.1916	0.3777	-5.8	<.0001
Male, age 60-64	-2.1673	0.3579	-6.06	<.0001
Male, age 65-69	-0.818	0.2886	-2.83	0.0046
Male, age 70-74	-0.6682	0.2882	-2.32	0.0204
Male, age 75-79	-0.5406	0.2871	-1.88	0.0597
Male, age 80-84	-0.314	0.2876	-1.09	0.2749
Male, age 85-89	-0.3488	0.2889	-1.21	0.2274
Male, age 90-94	-0.1745	0.3297	-0.53	0.5965
Male, age 95 and older	0	0	-	.
Disability	0.7613	0.577	1.32	0.1871
Original Disability	-0.3658	0.5965	-0.61	0.5397
Dual Eligible	0.2009	0.052	3.86	0.0001
Medicare-Aged	-0.5563	0.4399	-1.26	0.206
Medicare-Disabled	-0.0304	0.5894	-0.05	0.9588
Medicare-ESRD	0	0	.	.
MS-DRG: Complications and Comorbidity	0.4612	0.0294	15.67	<.0001
Number of IP visits in last 12 months for condition	0.0324	0.0491	0.66	0.5086
Number of ED visits in last 12 months for condition	0.0645	0.0189	3.42	0.0006
Death in episode window	-0.3042	0.2482	-1.23	0.2204

APPENDIX 20
REGRESSION RESULTS FROMMS-DRG QUALITY ANALYSES

Table 1 (a): CHF: Regression of 30-day Survival Likelihood for 30-day episodes of CHF (N=107,185)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	10.8659	153.3	0.005	0.9435
HCC1:HIV/AIDS	0.3065	0.1493	4.2167	0.04
HCC2:Septicemia/Shock	-0.3902	0.0194	406.1227	<.0001
HCC5:Opportunistic Infections	0.1225	0.0746	2.6968	0.1006
HCC7:Metastatic Cancer and Acute Leukemia	-0.4614	0.0317	211.928	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.2383	0.037	41.4449	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.1351	0.0342	15.634	<.0001
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.1922	0.0322	35.7215	<.0001
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.3609	0.0255	199.7011	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.2162	0.0301	51.636	<.0001
HCC17:Diabetes with Acute Complications	0.2712	0.1147	5.5914	0.018
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.3596	0.0583	38.0208	<.0001
HCC19:Diabetes without Complication	0.1404	0.0131	114.0301	<.0001
HCC21:Protein-Calorie Malnutrition	-0.2313	0.019	148.7094	<.0001
HCC25:End-Stage Liver Disease	-0.367	0.0491	55.8107	<.0001
HCC26:Cirrhosis of Liver	-0.1676	0.0558	9.0159	0.0027
HCC27:Chronic Hepatitis	0.2298	0.1134	4.1054	0.0427
HCC31:Intestinal Obstruction/Perforation	-0.1368	0.032	18.3178	<.0001
HCC32:Pancreatic Disease	0.1103	0.0518	4.5269	0.0334
HCC33:Inflammatory Bowel Disease:	0.1576	0.0797	3.9163	0.0478
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0876	0.0614	2.0347	0.1537
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.2419	0.0383	39.9211	<.0001
HCC44:Severe Hematological Disorders	0.0932	0.0321	8.4457	0.0037
HCC45:Disorders of Immunity	0.1861	0.0681	7.4669	0.0063
HCC51:Drug/Alcohol Psychosis	0.0231	0.0719	0.1035	0.7477
HCC52:Drug/Alcohol Dependence	0.2503	0.096	6.8032	0.0091
HCC54:Schizophrenia	0.2019	0.0859	5.5165	0.0188
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.2255	0.0365	38.159	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	-0.2141	0.0543	15.5685	<.0001
HCC68:Paraplegia	0.0246	0.0991	0.0615	0.8042
HCC69:Spinal Cord Disorders/Injuries	0.0629	0.0932	0.4551	0.4999
HCC70:Muscular Dystrophy	-0.509	0.1998	6.4873	0.0109
HCC71:Polyneuropathy:	0.1744	0.0333	27.353	<.0001
HCC72:Multiple Sclerosis	-0.1446	0.1251	1.3363	0.2477

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	0.0576	0.0405	2.0168	0.1556
HCC74:Seizure Disorders and Convulsions	0.00799	0.0332	0.0577	0.8101
HCC75:Coma, Brain Compression/Anoxic Damage	-0.7151	0.0394	328.7315	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	-0.6416	0.0531	146.2076	<.0001
HCC78:Respiratory Arrest	-1.07	0.0434	607.446	<.0001
HCC79:Cardio-Respiratory Failure and Shock	-0.4573	0.0115	1574.83	<.0001
HCC80:Congestive Heart Failure	0.8158	0.1446	31.8353	<.0001
HCC81:Acute Myocardial Infarction	-0.1751	0.0258	46.2302	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.0636	0.0205	9.6554	0.0019
HCC83:Angina Pectoris/Old Myocardial Infarction	0.2054	0.0204	101.6927	<.0001
HCC92:Specified Heart Arrhythmias:	0.036	0.0113	10.2198	0.0014
HCC95:Cerebral Hemorrhage	-0.299	0.0658	20.6416	<.0001
HCC96:Ischemic or Unspecified Stroke	-0.0264	0.0231	1.2996	0.2543
HCC100:Hemiplegia/Hemiparesis	-0.038	0.0316	1.4416	0.2299
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.00624	0.1339	0.0022	0.9628
HCC104:Vascular Disease with Complications	0.0215	0.0257	0.6966	0.4039
HCC105:Vascular Disease	0.1657	0.0149	123.1925	<.0001
HCC107:Cystic Fibrosis	4.4396	29.8935	0.0221	0.8819
HCC108:Chronic Obstructive Pulmonary Disease	0.1136	0.0114	98.8065	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1599	0.0219	53.2118	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.064	0.0406	2.4817	0.1152
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.6851	0.2537	7.2912	0.0069
HCC130:Dialysis Status	0.2143	0.0415	26.7381	<.0001
HCC131:Renal Failure	-0.1473	0.0118	154.8434	<.0001
HCC132:Nephritis	-0.0136	0.1347	0.0102	0.9195
HCC148:Decubitus Ulcer of Skin	-0.2046	0.0201	103.4502	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.077	0.0309	6.2228	0.0126
HCC150:Extensive Third-Degree Burns	5.4975	150.3	0.0013	0.9708
HCC154:Severe Head Injury	-1.4218	0.352	16.3125	<.0001
HCC155:Major Head Injury	0.1324	0.0841	2.4754	0.1156
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0636	0.0483	1.737	0.1875
HCC158:Hip Fracture/Dislocation	0.0394	0.0447	0.7756	0.3785
HCC161:Traumatic Amputation	0.159	0.1215	1.7114	0.1908
HCC164:Major Complications of Medical Care and Trauma	0.1432	0.0286	25.1218	<.0001
HCC174:Major Organ Transplant Status	0.1575	0.13	1.4685	0.2256
HCC176:Artificial Openings for Feeding or Elimination	0.0179	0.0484	0.1373	0.711
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.2566	0.0637	16.2056	<.0001

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Age Older than 65 Years	-0.0501	0.00156	1029.497	<.0001
Male	-0.1349	0.0115	138.7039	<.0001
Disability	-0.0158	0.1435	0.0121	0.9126
Dual Eligible	0.051	0.0134	14.3737	0.0001
Medicare-Aged	0.1149	0.1517	0.5739	0.4487
Medicare-Disabled	-0.2432	0.1507	2.6035	0.1066
MS-DRG: Complications and Comorbidity	-0.1705	0.018	89.9711	<.0001
MS-DRG:Major Complications and Comorbidity	-0.4583	0.0174	696.5368	<.0001
Number of IP visits in last 12 months for condition	-0.0757	0.0132	33.1174	<.0001
Number of ED visits in last 12 months for condition	-0.0882	0.0126	49.1121	<.0001

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	69586.71	59393.62
SC	69596.292	60188.951
-2 Log L	69584.710	59227.62

Table 1 (b): CHF: Regression of 30-day Likelihood of No Potentially Preventable Readmissions for 30-day episodes of CHF (N=107,185)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	-14.904	0.7588	385.7619	<.0001
HCC1:HIV/AIDS	-0.1904	0.0648	8.6345	0.0033
HCC2:Septicemia/Shock	-0.4766	0.0172	763.5846	<.0001
HCC5:Opportunistic Infections	-0.4371	0.0524	69.6921	<.0001
HCC7:Metastatic Cancer and Acute Leukemia	-0.2816	0.0287	96.443	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.1358	0.0303	20.1072	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.1406	0.027	27.162	<.0001
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.1465	0.0204	51.7155	<.0001
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	-0.1367	0.0147	86.5229	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	-0.1573	0.018	76.0867	<.0001
HCC17:Diabetes with Acute Complications	-0.0754	0.074	1.0403	0.3077
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	-0.0991	0.0324	9.3784	0.0022
HCC19:Diabetes without Complication	-0.0808	0.00931	75.2267	<.0001
HCC21:Protein-Calorie Malnutrition	-0.3192	0.0161	392.7572	<.0001
HCC25:End-Stage Liver Disease	-0.3789	0.0397	91.1808	<.0001
HCC26:Cirrhosis of Liver	-0.1503	0.0391	14.7798	0.0001
HCC27:Chronic Hepatitis	-0.1534	0.0548	7.8349	0.0051
HCC31:Intestinal Obstruction/Perforation	-0.4212	0.0256	271.5815	<.0001
HCC32:Pancreatic Disease	-0.3793	0.0326	135.4714	<.0001
HCC33:Inflammatory Bowel Disease:	-0.3167	0.0493	41.3402	<.0001
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0546	0.0396	1.8978	0.1683
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	-0.1577	0.0212	55.1166	<.0001
HCC44:Severe Hematological Disorders	-0.1475	0.0222	44.1582	<.0001
HCC45:Disorders of Immunity	-0.18	0.0442	16.5596	<.0001
HCC51:Drug/Alcohol Psychosis	-0.4262	0.0487	76.6629	<.0001
HCC52:Drug/Alcohol Dependence	-0.3075	0.044	48.7413	<.0001
HCC54:Schizophrenia	-0.3865	0.0413	87.6667	<.0001
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-0.227	0.0209	117.6419	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	-0.3911	0.0468	69.9092	<.0001
HCC68:Paraplegia	-0.3005	0.0703	18.2436	<.0001
HCC69:Spinal Cord Disorders/Injuries	-0.233	0.062	14.1117	0.0002
HCC70:Muscular Dystrophy	-0.1349	0.1812	0.5544	0.4565
HCC71:Polyneuropathy:	-0.2015	0.0177	129.3944	<.0001

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC72:Multiple Sclerosis	-0.2471	0.0885	7.7909	0.0053
HCC73:Parkinsons and Huntingtons Diseases	-0.117	0.029	16.3169	<.0001
HCC74:Seizure Disorders and Convulsions	-0.2116	0.0225	88.208	<.0001
HCC75:Coma, Brain Compression/Anoxic Damage	-0.2805	0.0403	48.4757	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	-0.467	0.0501	86.9759	<.0001
HCC78:Respiratory Arrest	-0.4006	0.0446	80.6426	<.0001
HCC79:Cardio-Respiratory Failure and Shock	-0.2944	0.00848	1204.437	<.0001
HCC80:Congestive Heart Failure	-0.4598	0.1988	5.3489	0.0207
HCC81:Acute Myocardial Infarction	-0.826	0.0202	1668.811	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.3706	0.0129	821.3057	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.265	0.0119	495.6367	<.0001
HCC92:Specified Heart Arrhythmias:	-0.2618	0.00839	972.8426	<.0001
HCC95:Cerebral Hemorrhage	-0.4448	0.0546	66.3863	<.0001
HCC96:Ischemic or Unspecified Stroke	-0.3137	0.0164	366.5531	<.0001
HCC100:Hemiplegia/Hemiparesis	-0.1954	0.0226	74.9832	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.1222	0.091	1.8024	0.1794
HCC104:Vascular Disease with Complications	-0.3243	0.0182	318.4448	<.0001
HCC105:Vascular Disease	-0.1706	0.00967	311.0187	<.0001
HCC107:Cystic Fibrosis	-0.5228	0.2315	5.0991	0.0239
HCC108:Chronic Obstructive Pulmonary Disease	-0.2469	0.00814	919.2687	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.3456	0.0195	313.5549	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.2618	0.0304	74.0771	<.0001
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.24	0.0729	10.8267	0.001
HCC130:Dialysis Status	-0.6272	0.0244	661.1393	<.0001
HCC131:Renal Failure	-0.3972	0.0088	2037.593	<.0001
HCC132:Nephritis	-0.0287	0.0713	0.1618	0.6875
HCC148:Decubitus Ulcer of Skin	-0.2718	0.0173	247.2397	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.00109	0.0216	0.0025	0.9597
HCC150:Extensive Third-Degree Burns	-0.2334	0.4601	0.2572	0.612
HCC154:Severe Head Injury	-0.7948	0.3709	4.5904	0.0322
HCC155:Major Head Injury	-0.428	0.0617	48.1148	<.0001
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.3669	0.0329	124.5624	<.0001
HCC158:Hip Fracture/Dislocation	-0.427	0.0318	180.766	<.0001
HCC161:Traumatic Amputation	0.0169	0.0691	0.06	0.8065
HCC164:Major Complications of Medical Care and Trauma	-0.4793	0.0178	722.0348	<.0001
HCC174:Major Organ Transplant Status	-0.1782	0.0679	6.8799	0.0087
HCC176:Artificial Openings for Feeding or Elimination	-0.237	0.0401	34.9272	<.0001

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.1028	0.0416	6.0944	0.0136
Age Older than 65 Years	0.00842	0.00109	59.7377	<.0001
Male	0.0482	0.0083	33.7569	<.0001
Disability	-0.0532	0.0621	0.733	0.3919
Dual Eligible	0.00518	0.00937	0.3055	0.5805
Medicare-Aged	-0.0963	0.0684	1.9825	0.1591
Medicare-Disabled	-0.00213	0.065	0.0011	0.9738
MS-DRG: Complications and Comorbidity	0.0882	0.0107	67.4542	<.0001
MS-DRG:Major Complications and Comorbidity	0.3509	0.0118	883.0399	<.0001
Number of IP visits in last 12 months for condition	-0.1605	0.00885	328.7599	<.0001
Number of ED visits in last 12 months for condition	-0.0776	0.00901	74.1785	<.0001

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	119702.6	99872.13
SC	119712.18	100667.46

Table 2 (a): Medical AMI: Regression of 30-day Survival Likelihood for 30-day episodes of Medical AMI (N=34,194)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	-0.3981	1.4825	0.0721	0.7883
HCC1:HIV/AIDS	0.0504	0.2692	0.035	0.8516
HCC2:Septicemia/Shock	-0.2621	0.0286	84.0871	<.0001
HCC5:Opportunistic Infections	0.1484	0.1214	1.4946	0.2215
HCC7:Metastatic Cancer and Acute Leukemia	-0.6738	0.0477	199.3967	<.0001
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.3401	0.0589	33.3626	<.0001
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.08	0.0651	1.5098	0.2192
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.1893	0.0538	12.3796	0.0004
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.396	0.0475	69.6343	<.0001
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.2269	0.054	17.6484	<.0001
HCC17:Diabetes with Acute Complications	0.277	0.1365	4.1178	0.0424
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.2924	0.0974	9.0147	0.0027
HCC19:Diabetes without Complication	0.106	0.0222	22.7911	<.0001
HCC21:Protein-Calorie Malnutrition	-0.1588	0.0328	23.3702	<.0001
HCC25:End-Stage Liver Disease	-0.407	0.1015	16.0866	<.0001
HCC26:Cirrhosis of Liver	-0.0885	0.1352	0.4288	0.5126
HCC27:Chronic Hepatitis	0.1503	0.1976	0.5783	0.447
HCC31:Intestinal Obstruction/Perforation	-0.1174	0.0507	5.3544	0.0207
HCC32:Pancreatic Disease	0.0116	0.074	0.0248	0.8749
HCC33:Inflammatory Bowel Disease:	0.132	0.1195	1.2201	0.2693
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0116	0.1036	0.0126	0.9105
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.168	0.0642	6.8451	0.0089
HCC44:Severe Hematological Disorders	0.0694	0.0601	1.3358	0.2478
HCC45:Disorders of Immunity	0.2459	0.1109	4.9172	0.0266
HCC51:Drug/Alcohol Psychosis	0.3201	0.123	6.7734	0.0093
HCC52:Drug/Alcohol Dependence	-0.0598	0.1439	0.1728	0.6776
HCC54:Schizophrenia	-0.0364	0.1229	0.0878	0.7669
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.2936	0.065	20.4316	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	-0.1615	0.1021	2.5032	0.1136
HCC68:Paraplegia	0.2652	0.2079	1.6273	0.2021
HCC69:Spinal Cord Disorders/Injuries	0.0748	0.1458	0.2629	0.6081
HCC70:Muscular Dystrophy	0.0342	0.5414	0.004	0.9497
HCC71:Polyneuropathy:	0.2479	0.063	15.4853	<.0001
HCC72:Multiple Sclerosis	-0.0161	0.1751	0.0085	0.9265
HCC73:Parkinsons and Huntingtons Diseases	0.00756	0.0638	0.014	0.9057

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC74:Seizure Disorders and Convulsions	0.0775	0.0496	2.4427	0.1181
HCC75:Coma, Brain Compression/Anoxic Damage	-0.7499	0.0526	203.0717	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	-0.5524	0.0748	54.475	<.0001
HCC78:Respiratory Arrest	-0.7545	0.0694	118.2275	<.0001
HCC79:Cardio-Respiratory Failure and Shock	-0.4537	0.0208	476.7313	<.0001
HCC80:Congestive Heart Failure	-0.0689	0.0258	7.1399	0.0075
HCC81:Acute Myocardial Infarction	0.3281	0.0477	47.2159	<.0001
HCC92:Specified Heart Arrhythmias:	-0.00725	0.019	0.1462	0.7022
HCC95:Cerebral Hemorrhage	-0.3407	0.0785	18.8171	<.0001
HCC96:Ischemic or Unspecified Stroke	-0.1278	0.0298	18.3418	<.0001
HCC100:Hemiplegia/Hemiparesis	-0.1312	0.0419	9.7952	0.0017
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.2281	0.2108	1.1708	0.2792
HCC104:Vascular Disease with Complications	0.00139	0.0395	0.0012	0.9718
HCC105:Vascular Disease	0.1504	0.024	39.2609	<.0001
HCC107:Cystic Fibrosis	-1.3555	0.7156	3.5878	0.0582
HCC108:Chronic Obstructive Pulmonary Disease	0.0981	0.0207	22.3605	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1417	0.0337	17.6564	<.0001
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.1157	0.0712	2.644	0.1039
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.6357	0.5082	1.565	0.2109
HCC130:Dialysis Status	0.00881	0.0693	0.0162	0.8988
HCC131:Renal Failure	-0.197	0.0204	93.301	<.0001
HCC132:Nephritis	-0.2872	0.2261	1.6133	0.204
HCC148:Decubitus Ulcer of Skin	-0.0758	0.037	4.2014	0.0404
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.1339	0.0738	3.2951	0.0695
HCC154:Severe Head Injury	-0.9681	0.5851	2.7375	0.098
HCC155:Major Head Injury	0.0777	0.1145	0.4605	0.4974
HCC157:Vertebral Fractures without Spinal Cord Injury	0.1179	0.0887	1.7659	0.1839
HCC158:Hip Fracture/Dislocation	-0.0688	0.0705	0.9521	0.3292
HCC161:Traumatic Amputation	-0.00637	0.1969	0.001	0.9742
HCC164:Major Complications of Medical Care and Trauma	0.143	0.0389	13.4834	0.0002
HCC174:Major Organ Transplant Status	-0.1894	0.2181	0.7539	0.3852
HCC176:Artificial Openings for Feeding or Elimination	0.0324	0.0763	0.1804	0.671
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.2079	0.1028	4.0866	0.0432
Age Older than 65 Years	-0.0583	0.00259	508.6781	<.0001
Male	-0.0771	0.0191	16.3402	<.0001
Disability	-0.5191	0.1851	7.8651	0.005
Dual Eligible	-0.00252	0.0225	0.0125	0.9111
Medicare-Aged	-0.1903	0.2027	0.8809	0.3479
Medicare-Disabled	0.7722	0.2095	13.5885	0.0002

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
MS-DRG: Complications and Comorbidity	-0.2083	0.0336	38.3892	<.0001
MS-DRG:Major Complications and Comorbidity	-0.3722	0.0314	140.674	<.0001
Number of IP visits in last 12 months for condition	-0.0298	0.00842	12.5215	0.0004
Number of ED visits in last 12 months for condition	-0.1519	0.0863	3.0973	0.0784

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	24667.358	21163.261
SC	24675.855	21842.993
-2 Log L	24665.358	21003.261

Table 2 (b): Medical AMI: Regression of 30-day Likelihood of No Potentially Preventable Readmissions for 30-day episodes of Medical AMI (N=34,194)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	174.2	4537.2	0.0015	0.9694
HCC1:HIV/AIDS	2.2714	101.2	0.0005	0.9821
HCC2:Septicemia/Shock	5.4577	27.1294	0.0405	0.8406
HCC5:Opportunistic Infections	3.1356	116.1	0.0007	0.9785
HCC7:Metastatic Cancer and Acute Leukemia	3.4286	62.6847	0.003	0.9564
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-1.9055	0.8086	5.5532	0.0184
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	3.7056	71.5765	0.0027	0.9587
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	3.4531	51.9072	0.0044	0.947
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	2.7726	41.6102	0.0044	0.9469
HCC16:Diabetes with Neurologic or Other Specified Manifestation	-1.7443	0.8948	3.8004	0.0512
HCC17:Diabetes with Acute Complications	3.4306	116.9	0.0009	0.9766
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	3.16	88.5494	0.0013	0.9715
HCC19:Diabetes without Complication	-1.0098	0.7468	1.8284	0.1763
HCC21:Protein-Calorie Malnutrition	4.2652	34.6634	0.0151	0.9021
HCC25:End-Stage Liver Disease	2.8374	61.1705	0.0022	0.963
HCC26:Cirrhosis of Liver	2.0584	77.3644	0.0007	0.9788
HCC27:Chronic Hepatitis	1.5384	86.1576	0.0003	0.9858
HCC31:Intestinal Obstruction/Perforation	-1.5877	0.726	4.7835	0.0287
HCC32:Pancreatic Disease	3.7183	61.4847	0.0037	0.9518
HCC33:Inflammatory Bowel Disease:	2.2345	84.0195	0.0007	0.9788
HCC37:Bone/Joint/Muscle Infections/Necrosis	2.3049	69.0455	0.0011	0.9734
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	3.3576	52.8875	0.004	0.9494
HCC44:Severe Hematological Disorders	3.6816	49.3917	0.0056	0.9406
HCC45:Disorders of Immunity	2.6452	87.7094	0.0009	0.9759
HCC51:Drug/Alcohol Psychosis	3.745	64.7547	0.0033	0.9539
HCC52:Drug/Alcohol Dependence	3.3877	56.2384	0.0036	0.952
HCC54:Schizophrenia	3.5465	57.5542	0.0038	0.9509
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	2.5664	37.3564	0.0047	0.9452
HCC67:Quadriplegia, Other Extensive Paralysis	2.8467	116.8	0.0006	0.9806
HCC68:Paraplegia	2.6715	130	0.0004	0.9836
HCC69:Spinal Cord Disorders/Injuries	2.5107	129.8	0.0004	0.9846
HCC70:Muscular Dystrophy	0.7055	285.9	0	0.998
HCC71:Polyneuropathy:	4.2278	33.595	0.0158	0.8999
HCC72:Multiple Sclerosis	1.6349	145.3	0.0001	0.991
HCC73:Parkinsons and Huntingtons Diseases	3.1857	70.2567	0.0021	0.9638

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC74:Seizure Disorders and Convulsions	-1.7825	0.7466	5.6992	0.017
HCC75:Coma, Brain Compression/Anoxic Damage	3.3598	58.5731	0.0033	0.9543
HCC77:Respirator Dependence/Tracheostomy Status	2.8057	68.2315	0.0017	0.9672
HCC78:Respiratory Arrest	3.6347	99.9034	0.0013	0.971
HCC79:Cardio-Respiratory Failure and Shock	-0.5829	0.5916	0.9708	0.3245
HCC80:Congestive Heart Failure	-4.1894	22.6522	0.0342	0.8533
HCC81:Acute Myocardial Infarction	0.7467	113.7	0	0.9948
HCC92:Specified Heart Arrhythmias:	-0.267	0.5579	0.229	0.6322
HCC95:Cerebral Hemorrhage	3.171	85.9332	0.0014	0.9706
HCC96:Ischemic or Unspecified Stroke	3.8261	26.9317	0.0202	0.887
HCC100:Hemiplegia/Hemiparesis	3.9899	36.0416	0.0123	0.9119
HCC101:Cerebral Palsy and Other Paralytic Syndromes	3.335	220.9	0.0002	0.988
HCC104:Vascular Disease with Complications	3.1811	40.3721	0.0062	0.9372
HCC105:Vascular Disease	-0.5769	0.5899	0.9563	0.3281
HCC107:Cystic Fibrosis	-5.5565	4094.8	0	0.9989
HCC108:Chronic Obstructive Pulmonary Disease	-0.5347	0.6531	0.6704	0.4129
HCC111:Aspiration and Specified Bacterial Pneumonias	4.5173	35.427	0.0163	0.8985
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	3.4378	63.7571	0.0029	0.957
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	2.046	184.8	0.0001	0.9912
HCC130:Dialysis Status	2.3209	63.5366	0.0013	0.9709
HCC131:Renal Failure	-0.3519	0.5755	0.3739	0.5409
HCC132:Nephritis	1.3209	178.4	0.0001	0.9941
HCC148:Decubitus Ulcer of Skin	3.2237	40.1953	0.0064	0.9361
HCC149:Chronic Ulcer of Skin, Except Decubitus	4.0881	47.852	0.0073	0.9319
HCC154:Severe Head Injury	-0.2612	1804.8	0	0.9999
HCC155:Major Head Injury	3.0453	115.7	0.0007	0.979
HCC157:Vertebral Fractures without Spinal Cord Injury	3.5908	100.2	0.0013	0.9714
HCC158:Hip Fracture/Dislocation	2.7589	101.6	0.0007	0.9783
HCC161:Traumatic Amputation	2.5074	159.5	0.0002	0.9875
HCC164:Major Complications of Medical Care and Trauma	4.0537	28.6274	0.0201	0.8874
HCC174:Major Organ Transplant Status	3.8735	114.5	0.0011	0.973
HCC176:Artificial Openings for Feeding or Elimination	3.1549	75.5207	0.0017	0.9667
HCC177:Amputation Status, Lower Limb/Amputation Complications	3.4119	67.3392	0.0026	0.9596
Age Older than 65 Years	-0.0495	0.0957	0.267	0.6054
Male	-4.4036	19.3841	0.0516	0.8203
Disability	-0.6159	206.5	0	0.9976
Dual Eligible	-0.1677	0.6633	0.064	0.8004
Medicare-Aged	-2.3583	231.1	0.0001	0.9919

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Medicare-Disabled	-4.696	207.1	0.0005	0.9819
MS-DRG: Complications and Comorbidity	-0.107	0.6797	0.0248	0.8749
MS-DRG:Major Complications and Comorbidity	0.8428	0.8969	0.883	0.3474
Number of IP visits in last 12 months for condition	0.000398	0.2118	0	0.9985
Number of ED visits in last 12 months for condition	7.6531	149.4	0.0026	0.9591

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	82.882	200.627
SC	91.379	880.359
-2 Log L	80.882	40.627

Table 3 (a): Pneumonia: Regression of 30-day Survival Likelihood for 30-day episodes of Pneumonia (N=86,869)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	2.0914	0.9682	4.6661	0.0308
HCC1:HIV/AIDS	-0.1276	0.0906	1.9816	0.1592
HCC2:Septicemia/Shock	-0.021	0.0191	1.2116	0.271
HCC5:Opportunistic Infections	-0.0311	0.051	0.3708	0.5425
HCC7:Metastatic Cancer and Acute Leukemia	-0.023	0.0271	0.7204	0.396
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.041	0.03	1.8702	0.1715
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0464	0.0321	2.0876	0.1485
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0226	0.0278	0.6644	0.415
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.0151	0.0301	0.2517	0.6159
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0322	0.0295	1.1924	0.2748
HCC17:Diabetes with Acute Complications	0.0469	0.1161	0.1634	0.686
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.0924	0.0569	2.6344	0.1046
HCC19:Diabetes without Complication	-0.00012	0.0127	0.0001	0.9924
HCC21:Protein-Calorie Malnutrition	-0.0356	0.0198	3.2139	0.073
HCC25:End-Stage Liver Disease	-0.0163	0.0764	0.0456	0.831
HCC26:Cirrhosis of Liver	0.0755	0.0733	1.0624	0.3027
HCC27:Chronic Hepatitis	0.0281	0.0772	0.1325	0.7158
HCC31:Intestinal Obstruction/Perforation	-0.00504	0.033	0.0234	0.8784
HCC32:Pancreatic Disease	-0.0342	0.0312	1.2017	0.273
HCC33:Inflammatory Bowel Disease:	0.048	0.0638	0.5654	0.4521
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0218	0.0641	0.1158	0.7336
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.00182	0.0247	0.0054	0.9412
HCC44:Severe Hematological Disorders	0.0427	0.0315	1.831	0.176
HCC45:Disorders of Immunity	-0.014	0.0389	0.13	0.7184
HCC51:Drug/Alcohol Psychosis	-0.0109	0.0535	0.0417	0.8382
HCC52:Drug/Alcohol Dependence	0.0689	0.058	1.4137	0.2344
HCC54:Schizophrenia	-0.053	0.0376	1.9815	0.1592
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-0.0138	0.026	0.2825	0.5951
HCC67:Quadriplegia, Other Extensive Paralysis	0.0393	0.0503	0.6097	0.4349
HCC68:Paraplegia	0.0593	0.0835	0.5047	0.4775
HCC69:Spinal Cord Disorders/Injuries	0.0551	0.0727	0.5745	0.4485
HCC70:Muscular Dystrophy	-0.0375	0.162	0.0535	0.817

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC71:Polyneuropathy:	-0.0537	0.0258	4.327	0.0375
HCC72:Multiple Sclerosis	0.0581	0.0758	0.5877	0.4433
HCC73:Parkinsons and Huntingtons Diseases	-0.0169	0.0288	0.3471	0.5558
HCC74:Seizure Disorders and Convulsions	0.0168	0.0253	0.4407	0.5068
HCC75:Coma, Brain Compression/Anoxic Damage	-0.0654	0.0534	1.4966	0.2212
HCC77:Respirator Dependence/Tracheostomy Status	0.0687	0.0735	0.8722	0.3503
HCC78:Respiratory Arrest	0.0368	0.079	0.2171	0.6413
HCC79:Cardio-Respiratory Failure and Shock	0.00038	0.0116	0.0011	0.9737
HCC80:Congestive Heart Failure	-0.00261	0.0116	0.0506	0.822
HCC81:Acute Myocardial Infarction	0.0231	0.0353	0.4298	0.5121
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0174	0.0292	0.3552	0.5512
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.00201	0.0219	0.0084	0.927
HCC92:Specified Heart Arrhythmias:	-0.00971	0.0121	0.6419	0.423
HCC95:Cerebral Hemorrhage	-0.08	0.0713	1.2593	0.2618
HCC96:Ischemic or Unspecified Stroke	0.0154	0.0232	0.4433	0.5055
HCC100:Hemiplegia/Hemiparesis	0.00257	0.0313	0.0068	0.9345
HCC101:Cerebral Palsy and Other Paralytic Syndromes	0.00097	0.0789	0.0002	0.9901
HCC104:Vascular Disease with Complications	-0.0253	0.0292	0.748	0.3871
HCC105:Vascular Disease	0.00113	0.0148	0.0058	0.9391
HCC107:Cystic Fibrosis	0.0412	0.2663	0.0239	0.8771
HCC108:Chronic Obstructive Pulmonary Disease	0.005	0.0109	0.2105	0.6464
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.00834	0.0177	0.2229	0.6368
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.0017	0.018	0.009	0.9246
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.2532	0.1652	2.3476	0.1255
HCC130:Dialysis Status	-0.0461	0.0492	0.8805	0.3481
HCC131:Renal Failure	0.012	0.0141	0.7253	0.3944
HCC132:Nephritis	0.0153	0.1058	0.0209	0.885
HCC148:Decubitus Ulcer of Skin	0.00554	0.0235	0.0556	0.8136
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.0213	0.0402	0.282	0.5954
HCC150:Extensive Third-Degree Burns	-0.6295	0.6134	1.0532	0.3048
HCC154:Severe Head Injury	0.1624	0.5253	0.0956	0.7572
HCC155:Major Head Injury	0.0935	0.0851	1.2061	0.2721
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.00156	0.0415	0.0014	0.97
HCC158:Hip Fracture/Dislocation	0.0139	0.0452	0.0945	0.7586
HCC161:Traumatic Amputation	-0.00112	0.0283	0.0016	0.9684
HCC164:Major Complications of Medical Care and Trauma	0.0198	0.0247	0.6417	0.4231
HCC174:Major Organ Transplant Status	-0.0658	0.0759	0.7511	0.3861

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC176:Artificial Openings for Feeding or Elimination	0.0179	0.037	0.2329	0.6294
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0351	0.0725	0.234	0.6286
Age Older than 65 Years	-0.00286	0.00136	4.4142	0.0356
Male	-0.00159	0.0109	0.0214	0.8837
Disability	-0.0746	0.1037	0.5168	0.4722
Dual Eligible	-0.0142	0.0121	1.3779	0.2405
Medicare-Aged	-0.0467	0.1174	0.1582	0.6908
Medicare-Disabled	0.0151	0.1068	0.02	0.8876
MS-DRG: Complications and Comorbidity	0.00739	0.0134	0.3027	0.5822
MS-DRG:Major Complications and Comorbidity	0.014	0.0171	0.6681	0.4137
Number of IP visits in last 12 months for condition	-0.0226	0.0227	0.9952	0.3185
Number of ED visits in last 12 months for condition	0.1083	0.0266	16.5154	<.0001

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	63169.018	63256.661
SC	63178.368	64032.66
-2 Log L	63167.018	63090.661

Table 3 (b): Pneumonia: Regression of 30-day Likelihood of No Potentially Preventable Readmissions for 30-day episodes of Pneumonia (N=86,869)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	5.4334	40.0984	0.0184	0.8922
HCC1:HIV/AIDS	-0.0691	0.0831	0.6914	0.4057
HCC2:Septicemia/Shock	0.00404	0.0169	0.0574	0.8107
HCC5:Opportunistic Infections	-0.0714	0.0435	2.6914	0.1009
HCC7:Metastatic Cancer and Acute Leukemia	0.0375	0.0244	2.3596	0.1245
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.00768	0.0251	0.0937	0.7596
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0212	0.0273	0.603	0.4375
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.0277	0.0234	1.4004	0.2367
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.0112	0.026	0.1863	0.666
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0409	0.026	2.477	0.1155
HCC17:Diabetes with Acute Complications	-0.00417	0.0964	0.0019	0.9655
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.0565	0.048	1.3878	0.2388
HCC19:Diabetes without Complication	-0.00853	0.011	0.5991	0.4389
HCC21:Protein-Calorie Malnutrition	0.0202	0.0178	1.2845	0.2571
HCC25:End-Stage Liver Disease	0.0513	0.0695	0.5455	0.4601
HCC26:Cirrhosis of Liver	-0.0678	0.0575	1.3918	0.2381
HCC27:Chronic Hepatitis	0.0518	0.0686	0.5708	0.45
HCC31:Intestinal Obstruction/Perforation	0.00069	0.0289	0.0006	0.9811
HCC32:Pancreatic Disease	-0.011	0.0276	0.1582	0.6908
HCC33:Inflammatory Bowel Disease:	0.0366	0.0546	0.4501	0.5023
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0295	0.0561	0.2773	0.5985
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	-0.0319	0.0211	2.2895	0.1302
HCC44:Severe Hematological Disorders	0.017	0.027	0.3945	0.5299
HCC45:Disorders of Immunity	-0.0125	0.0336	0.138	0.7102
HCC51:Drug/Alcohol Psychosis	-0.0331	0.0459	0.5196	0.471
HCC52:Drug/Alcohol Dependence	0.0301	0.0488	0.3817	0.5367
HCC54:Schizophrenia	0.0105	0.0341	0.0948	0.7582
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-0.00414	0.0228	0.0331	0.8557
HCC67:Quadriplegia, Other Extensive Paralysis	-0.0189	0.0423	0.1992	0.6553
HCC68:Paraplegia	-0.0577	0.0672	0.7364	0.3908
HCC69:Spinal Cord Disorders/Injuries	0.0843	0.0637	1.7488	0.186

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC70:Muscular Dystrophy	0.1254	0.1562	0.6449	0.4219
HCC71:Polyneuropathy:	-0.00919	0.023	0.1593	0.6898
HCC72:Multiple Sclerosis	0.0203	0.0634	0.1019	0.7495
HCC73:Parkinsons and Huntingtons Diseases	-0.0112	0.0253	0.1956	0.6583
HCC74:Seizure Disorders and Convulsions	0.0281	0.022	1.6275	0.202
HCC75:Coma, Brain Compression/Anoxic Damage	-0.0384	0.0479	0.6447	0.422
HCC77:Respirator Dependence/Tracheostomy Status	0.0422	0.0619	0.465	0.4953
HCC78:Respiratory Arrest	0.0653	0.0702	0.8631	0.3529
HCC79:Cardio-Respiratory Failure and Shock	0.00647	0.0101	0.4081	0.5229
HCC80:Congestive Heart Failure	0.0171	0.0101	2.8408	0.0919
HCC81:Acute Myocardial Infarction	-0.0365	0.0298	1.5047	0.2199
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0165	0.0255	0.4215	0.5162
HCC83:Angina Pectoris/Old Myocardial Infarction	0.0152	0.0193	0.6218	0.4304
HCC92:Specified Heart Arrhythmias:	-0.00283	0.0106	0.0716	0.7891
HCC95:Cerebral Hemorrhage	-0.0577	0.0628	0.8443	0.3582
HCC96:Ischemic or Unspecified Stroke	-0.00756	0.0199	0.1439	0.7044
HCC100:Hemiplegia/Hemiparesis	-0.0393	0.0265	2.1953	0.1384
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.0149	0.0683	0.0472	0.8279
HCC104:Vascular Disease with Complications	-0.00979	0.0257	0.1446	0.7038
HCC105:Vascular Disease	-0.0129	0.0128	1.0031	0.3166
HCC107:Cystic Fibrosis	0.00561	0.2252	0.0006	0.9801
HCC108:Chronic Obstructive Pulmonary Disease	-0.00572	0.00948	0.3644	0.5461
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.0149	0.0154	0.9443	0.3312
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.0066	0.0157	0.1766	0.6743
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.0986	0.1249	0.6231	0.4299
HCC130:Dialysis Status	-0.0456	0.0425	1.1491	0.2837
HCC131:Renal Failure	-0.00131	0.0123	0.0114	0.915
HCC132:Nephritis	-0.0903	0.0864	1.0911	0.2962
HCC148:Decubitus Ulcer of Skin	0.0266	0.0207	1.6497	0.199
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.0232	0.035	0.4385	0.5078
HCC150:Extensive Third-Degree Burns	4.1569	40.0945	0.0107	0.9174
HCC154:Severe Head Injury	-0.5225	0.3148	2.7547	0.097
HCC155:Major Head Injury	0.0428	0.0716	0.3569	0.5502
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0208	0.0366	0.3239	0.5693
HCC158:Hip Fracture/Dislocation	0.012	0.0394	0.0921	0.7616
HCC161:Traumatic Amputation	-0.00323	0.0246	0.0172	0.8956
HCC164:Major Complications of Medical Care and Trauma	0.0171	0.0214	0.6345	0.4257

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC174:Major Organ Transplant Status	0.0415	0.0696	0.3544	0.5517
HCC176:Artificial Openings for Feeding or Elimination	-0.0536	0.031	2.9997	0.0833
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0365	0.063	0.3352	0.5626
Age Older than 65 Years	0.0005	0.00118	0.1782	0.6729
Male	0.00424	0.00948	0.2005	0.6543
Disability	-0.00369	0.0894	0.0017	0.9671
Dual Eligible	0.00029	0.0106	0.0008	0.9778
Medicare-Aged	0.00289	0.1011	0.0008	0.9772
Medicare-Disabled	0.0014	0.0922	0.0002	0.9879
MS-DRG: Complications and Comorbidity	-0.0119	0.0117	1.0347	0.3091
MS-DRG:Major Complications and Comorbidity	-0.00847	0.0149	0.3212	0.5709
Number of IP visits in last 12 months for condition	-0.2686	0.0173	242.1864	<.0001
Number of ED visits in last 12 months for condition	-0.1128	0.0163	48.0923	<.0001

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	77937.753	77746.947
SC	77947.102	78522.947

Table 4(a): COPD: Regression of 30-day Survival Likelihood for 30-day episodes of COPD (N=78,760)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	6.9132	45.908	0.0227	0.8803
HCC1:HIV/AIDS	-0.0244	0.139	0.0308	0.8608
HCC2:Septicemia/Shock	0.0256	0.0464	0.3053	0.5806
HCC5:Opportunistic Infections	-0.027	0.0709	0.1453	0.7031
HCC7:Metastatic Cancer and Acute Leukemia	-0.0203	0.0596	0.1163	0.7331
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.0325	0.0461	0.4968	0.4809
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0362	0.0698	0.2687	0.6042
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.0175	0.0471	0.1372	0.7111
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	-0.0559	0.0526	1.1303	0.2877
HCC16:Diabetes with Neurologic or Other Specified Manifestation	-0.0291	0.0461	0.3989	0.5277
HCC17:Diabetes with Acute Complications	0.3569	0.2267	2.4781	0.1154
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.00933	0.0802	0.0135	0.9074
HCC19:Diabetes without Complication	-0.0309	0.0192	2.593	0.1073
HCC21:Protein-Calorie Malnutrition	-0.0266	0.0381	0.4889	0.4844
HCC25:End-Stage Liver Disease	-0.0228	0.1383	0.0272	0.8691
HCC26:Cirrhosis of Liver	0.0336	0.1082	0.0966	0.7559
HCC27:Chronic Hepatitis	-0.0132	0.1191	0.0122	0.912
HCC31:Intestinal Obstruction/Perforation	-0.0276	0.0583	0.2248	0.6354
HCC32:Pancreatic Disease	-0.0379	0.0443	0.7351	0.3912
HCC33:Inflammatory Bowel Disease:	0.2758	0.1274	4.6875	0.0304
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0774	0.1111	0.4851	0.4861
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0376	0.0437	0.7393	0.3899
HCC44:Severe Hematological Disorders	-0.0211	0.0683	0.0952	0.7576
HCC45:Disorders of Immunity	-0.0208	0.0742	0.0782	0.7797
HCC51:Drug/Alcohol Psychosis	-0.0293	0.0735	0.1584	0.6907
HCC52:Drug/Alcohol Dependence	-0.0465	0.0652	0.5091	0.4755
HCC54:Schizophrenia	0.0324	0.057	0.3222	0.5703
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.0147	0.0377	0.1516	0.697
HCC67:Quadriplegia, Other Extensive Paralysis	-0.1185	0.1227	0.9328	0.3341
HCC68:Paraplegia	-0.00846	0.1636	0.0027	0.9588
HCC69:Spinal Cord Disorders/Injuries	0.1217	0.1546	0.6198	0.4311
HCC70:Muscular Dystrophy	0.2429	0.5091	0.2276	0.6333

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC71:Polyneuropathy:	0.00256	0.0414	0.0038	0.9506
HCC72:Multiple Sclerosis	-0.2947	0.1317	5.008	0.0252
HCC73:Parkinsons and Huntingtons Diseases	0.0556	0.0681	0.6674	0.414
HCC74:Seizure Disorders and Convulsions	-0.0295	0.0451	0.4285	0.5127
HCC75:Coma, Brain Compression/Anoxic Damage	0.2084	0.1477	1.9912	0.1582
HCC77:Respirator Dependence/Tracheostomy Status	0.0432	0.1065	0.1642	0.6853
HCC78:Respiratory Arrest	0.1158	0.1247	0.8623	0.3531
HCC79:Cardio-Respiratory Failure and Shock	0.0341	0.0173	3.8712	0.0491
HCC80:Congestive Heart Failure	-0.0092	0.018	0.2625	0.6084
HCC81:Acute Myocardial Infarction	0.00576	0.0625	0.0085	0.9266
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.00571	0.0409	0.0195	0.889
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.00506	0.0308	0.027	0.8695
HCC92:Specified Heart Arrhythmias:	-0.00617	0.0197	0.0983	0.7539
HCC95:Cerebral Hemorrhage	0.2108	0.1971	1.144	0.2848
HCC96:Ischemic or Unspecified Stroke	0.0639	0.0478	1.7838	0.1817
HCC100:Hemiplegia/Hemiparesis	0.025	0.067	0.139	0.7093
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.2148	0.1652	1.6901	0.1936
HCC104:Vascular Disease with Complications	-0.04	0.0459	0.7575	0.3841
HCC105:Vascular Disease	-0.00961	0.0229	0.1758	0.675
HCC107:Cystic Fibrosis	-0.2852	0.2852	1.0001	0.3173
HCC108:Chronic Obstructive Pulmonary Disease	-0.0223	0.1125	0.0391	0.8432
HCC111:Aspiration and Specified Bacterial Pneumonias	0.00748	0.0393	0.0362	0.849
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.0763	0.0516	2.1846	0.1394
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	-0.3334	0.2156	2.3904	0.1221
HCC130:Dialysis Status	0.0123	0.1378	0.008	0.9288
HCC131:Renal Failure	0.0382	0.0244	2.4441	0.118
HCC132:Nephritis	0.1472	0.195	0.5697	0.4504
HCC148:Decubitus Ulcer of Skin	-0.0229	0.0543	0.1771	0.6739
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.00628	0.0716	0.0077	0.9301
HCC154:Severe Head Injury	3.0522	45.8962	0.0044	0.947
HCC155:Major Head Injury	-0.0647	0.1664	0.1509	0.6977
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.0896	0.0553	2.6242	0.1052
HCC158:Hip Fracture/Dislocation	0.0933	0.0975	0.9156	0.3386
HCC161:Traumatic Amputation	-0.0821	0.0454	3.2765	0.0703
HCC164:Major Complications of Medical Care and Trauma	-0.036	0.0524	0.4719	0.4921
HCC174:Major Organ Transplant Status	0.473	0.3578	1.7483	0.1861
HCC176:Artificial Openings for Feeding or Elimination	-0.0711	0.0802	0.7868	0.3751
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.0318	0.1336	0.0565	0.8121

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Age Older than 65 Years	-0.00174	0.00236	0.5435	0.461
Male	-0.00471	0.0172	0.0755	0.7835
Disability	0.1475	0.3778	0.1524	0.6962
Dual Eligible	0.0211	0.0187	1.2712	0.2595
Medicare-Aged	0.1079	0.4119	0.0686	0.7934
Medicare-Disabled	-0.1741	0.3843	0.2054	0.6504
MS-DRG: Complications and Comorbidity	0.0176	0.0209	0.712	0.3988
MS-DRG:Major Complications and Comorbidity	0.0339	0.0216	2.4615	0.1167
Number of IP visits in last 12 months for condition	-0.00203	0.0194	0.011	0.9163
Number of ED visits in last 12 months for condition	-0.0167	0.0125	1.7756	0.1827

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	30,943	31,039
SC	30,952	31,799
-2 Log L	30,941	30,875

Table 4 (b): COPD: Regression of 30-day Likelihood of No Potentially Preventable Readmissions for 30-day episodes of COPD (N=78,760)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	5.8259	39.2234	0.0221	0.8819
HCC1:HIV/AIDS	0.1715	0.0833	4.2339	0.0396
HCC2:Septicemia/Shock	0.0158	0.0246	0.4136	0.5201
HCC5:Opportunistic Infections	-0.00401	0.0388	0.0107	0.9178
HCC7:Metastatic Cancer and Acute Leukemia	-0.0258	0.0325	0.6339	0.4259
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.0148	0.0245	0.3626	0.547
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0311	0.0375	0.6863	0.4074
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.0135	0.0251	0.291	0.5896
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.0187	0.0293	0.4091	0.5224
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.0176	0.0254	0.4765	0.49
HCC17:Diabetes with Acute Complications	0.095	0.0911	1.086	0.2974
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.00188	0.0427	0.0019	0.9649
HCC19:Diabetes without Complication	-0.00879	0.0104	0.7099	0.3995
HCC21:Protein-Calorie Malnutrition	0.0144	0.0209	0.474	0.4911
HCC25:End-Stage Liver Disease	-0.0268	0.0747	0.1285	0.72
HCC26:Cirrhosis of Liver	-0.0253	0.0565	0.1995	0.6552
HCC27:Chronic Hepatitis	-0.025	0.0642	0.1518	0.6968
HCC31:Intestinal Obstruction/Perforation	0.0123	0.0323	0.1449	0.7035
HCC32:Pancreatic Disease	0.0297	0.0251	1.4014	0.2365
HCC33:Inflammatory Bowel Disease:	-0.0884	0.0513	2.9621	0.0852
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.0114	0.0652	0.0304	0.8617
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0102	0.023	0.1953	0.6585
HCC44:Severe Hematological Disorders	0.00151	0.0375	0.0016	0.9679
HCC45:Disorders of Immunity	-0.0149	0.0403	0.1376	0.7107
HCC51:Drug/Alcohol Psychosis	0.00837	0.0405	0.0427	0.8364
HCC52:Drug/Alcohol Dependence	0.0418	0.0371	1.2651	0.2607
HCC54:Schizophrenia	-0.0385	0.0291	1.757	0.185
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.00376	0.0201	0.0349	0.8518
HCC67:Quadriplegia, Other Extensive Paralysis	-0.1287	0.0681	3.575	0.0587
HCC68:Paraplegia	-0.1121	0.085	1.7415	0.1869
HCC69:Spinal Cord Disorders/Injuries	0.149	0.0826	3.2578	0.0711
HCC70:Muscular Dystrophy	-0.078	0.2117	0.1359	0.7124

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC71:Polyneuropathy:	0.0202	0.0227	0.7893	0.3743
HCC72:Multiple Sclerosis	-0.0917	0.0859	1.1396	0.2857
HCC73:Parkinsons and Huntingtons Diseases	-0.0157	0.0347	0.2043	0.6513
HCC74:Seizure Disorders and Convulsions	0.0303	0.0249	1.4799	0.2238
HCC75:Coma, Brain Compression/Anoxic Damage	-0.0245	0.0647	0.1438	0.7046
HCC77:Respirator Dependence/Tracheostomy Status	0.0413	0.0575	0.5158	0.4726
HCC78:Respiratory Arrest	0.1267	0.0662	3.6665	0.0555
HCC79:Cardio-Respiratory Failure and Shock	0.00028	0.00929	0.0009	0.976
HCC80:Congestive Heart Failure	-0.00937	0.0097	0.9321	0.3343
HCC81:Acute Myocardial Infarction	-0.00932	0.0333	0.0781	0.7798
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0199	0.0218	0.8355	0.3607
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.00326	0.0168	0.0378	0.8459
HCC92:Specified Heart Arrhythmias:	0.00379	0.0107	0.1261	0.7225
HCC95:Cerebral Hemorrhage	0.0155	0.0913	0.029	0.8647
HCC96:Ischemic or Unspecified Stroke	-0.00305	0.0246	0.0154	0.9013
HCC100:Hemiplegia/Hemiparesis	-0.0188	0.0346	0.2956	0.5867
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.0433	0.1042	0.1725	0.6779
HCC104:Vascular Disease with Complications	-0.0115	0.0254	0.2059	0.65
HCC105:Vascular Disease	0.00248	0.0125	0.0398	0.842
HCC107:Cystic Fibrosis	0.015	0.1811	0.0068	0.9342
HCC108:Chronic Obstructive Pulmonary Disease	0.0412	0.0586	0.4953	0.4816
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.0341	0.0206	2.7292	0.0985
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.00256	0.0296	0.0075	0.9311
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.2097	0.173	1.4691	0.2255
HCC130:Dialysis Status	0.0822	0.0739	1.2378	0.2659
HCC131:Renal Failure	0.00354	0.013	0.0744	0.785
HCC132:Nephritis	0.0105	0.0958	0.0119	0.913
HCC148:Decubitus Ulcer of Skin	0.0368	0.0304	1.472	0.225
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.0417	0.0397	1.1002	0.2942
HCC154:Severe Head Injury	3.6021	39.2198	0.0084	0.9268
HCC155:Major Head Injury	0.00474	0.0933	0.0026	0.9595
HCC157:Vertebral Fractures without Spinal Cord Injury	0.0114	0.0324	0.1249	0.7238
HCC158:Hip Fracture/Dislocation	0.0197	0.0497	0.1572	0.6918
HCC161:Traumatic Amputation	0.00291	0.0262	0.0123	0.9115
HCC164:Major Complications of Medical Care and Trauma	0.0402	0.0299	1.8134	0.1781
HCC174:Major Organ Transplant Status	0.1135	0.1327	0.7322	0.3922
HCC176:Artificial Openings for Feeding or Elimination	0.0219	0.0462	0.2254	0.635
HCC177:Amputation Status, Lower Limb/Amputation Complications	0.0433	0.0767	0.3186	0.5725

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Age Older than 65 Years	0.000737	0.00127	0.3338	0.5634
Male	0.0106	0.00928	1.3041	0.2535
Disability	0.1114	0.1937	0.3307	0.5653
Dual Eligible	-0.00944	0.01	0.8875	0.3461
Medicare-Aged	0.1265	0.2115	0.3579	0.5497
Medicare-Disabled	-0.0448	0.1965	0.0521	0.8195
MS-DRG: Complications and Comorbidity	0.00668	0.0113	0.3468	0.556
MS-DRG:Major Complications and Comorbidity	0.00269	0.0116	0.0531	0.8177
Number of IP visits in last 12 months for condition	-0.2466	0.00933	698.8072	<.0001
Number of ED visits in last 12 months for condition	-0.1043	0.00699	222.9515	<.0001

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	79,921	79,025
SC	79,930	79,785
-2 Log L	79,919	78,861

Table 5(a): Hip Replacement: Regression of 30-day Survival Likelihood for 30-day episodes of Hip Replacement (N=24,603)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	83.4364	1096.1	0.0058	0.9393
HCC1:HIV/AIDS	-0.7471	0.609	1.5046	0.22
HCC2:Septicemia/Shock	-0.5353	0.1408	14.4423	0.0001
HCC5:Opportunistic Infections	0.1775	0.1208	2.1581	0.1418
HCC7:Metastatic Cancer and Acute Leukemia	-0.6901	0.2695	6.5586	0.0104
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	0.248	0.5785	0.1837	0.6682
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.2354	0.3036	0.6009	0.4382
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.3185	0.3147	1.0239	0.3116
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.3461	0.3564	0.9428	0.3316
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.1583	0.4532	0.122	0.7268
HCC17:Diabetes with Acute Complications	5.1076	231.4	0.0005	0.9824
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.423	0.5594	0.5719	0.4495
HCC19:Diabetes without Complication	-0.0432	0.1208	0.1277	0.7209
HCC21:Protein-Calorie Malnutrition	-0.3027	0.1461	4.2902	0.0383
HCC25:End-Stage Liver Disease	-0.2157	0.5767	0.1399	0.7083
HCC26:Cirrhosis of Liver	4.8317	139.2	0.0012	0.9723
HCC27:Chronic Hepatitis	4.6385	101.1	0.0021	0.9634
HCC31:Intestinal Obstruction/Perforation	-0.245	0.1704	2.0687	0.1503
HCC32:Pancreatic Disease	-0.0146	0.2805	0.0027	0.9585
HCC33:Inflammatory Bowel Disease:	5.0303	60.5849	0.0069	0.9338
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0599	0.1525	0.1543	0.6945
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.0426	0.2135	0.0399	0.8417
HCC44:Severe Hematological Disorders	-0.1929	0.3587	0.2893	0.5907
HCC45:Disorders of Immunity	0.048	0.3961	0.0147	0.9036
HCC51:Drug/Alcohol Psychosis	-0.2672	0.2161	1.5288	0.2163
HCC52:Drug/Alcohol Dependence	5.5794	95.7708	0.0034	0.9535
HCC54:Schizophrenia	5.2853	98.7261	0.0029	0.9573
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.1319	0.2951	0.1998	0.6549
HCC67:Quadriplegia, Other Extensive Paralysis	-1.6737	0.5726	8.5425	0.0035
HCC68:Paraplegia	-0.2083	0.609	0.117	0.7323
HCC69:Spinal Cord Disorders/Injuries	-0.147	0.5756	0.0652	0.7985
HCC70:Muscular Dystrophy	5.4701	445.7	0.0002	0.9902
HCC71:Polyneuropathy:	1.1179	0.5565	4.0352	0.0446
HCC72:Multiple Sclerosis	5.3917	159.2	0.0011	0.973

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	0.00063	0.3382	0	0.9985
HCC74:Seizure Disorders and Convulsions	-0.4832	0.2308	4.3823	0.0363
HCC75:Coma, Brain Compression/Anoxic Damage	-1.4494	0.2571	31.7704	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	-1.2443	0.3173	15.3791	<.0001
HCC78:Respiratory Arrest	-1.6513	0.3774	19.1447	<.0001
HCC79:Cardio-Respiratory Failure and Shock	-1.3308	0.1116	142.1765	<.0001
HCC80:Congestive Heart Failure	0.1107	0.1134	0.9522	0.3291
HCC81:Acute Myocardial Infarction	-0.5333	0.1536	12.0603	0.0005
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	0.118	0.3179	0.1378	0.7105
HCC83:Angina Pectoris/Old Myocardial Infarction	0.4475	0.291	2.3653	0.1241
HCC92:Specified Heart Arrhythmias:	-0.2845	0.1007	7.9844	0.0047
HCC95:Cerebral Hemorrhage	-0.2465	0.4825	0.2611	0.6094
HCC96:Ischemic or Unspecified Stroke	0.0562	0.2063	0.0742	0.7853
HCC100:Hemiplegia/Hemiparesis	5.3679	47.5179	0.0128	0.9101
HCC101:Cerebral Palsy and Other Paralytic Syndromes	5.3319	160.3	0.0011	0.9735
HCC104:Vascular Disease with Complications	-0.0496	0.1619	0.0938	0.7594
HCC105:Vascular Disease	0.1903	0.134	2.0171	0.1555
HCC107:Cystic Fibrosis	4.8885	648.9	0.0001	0.994
HCC108:Chronic Obstructive Pulmonary Disease	0.2074	0.1172	3.1344	0.0767
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1078	0.1591	0.4587	0.4982
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.3763	0.4117	0.8354	0.3607
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	4.9284	505.1	0.0001	0.9922
HCC130:Dialysis Status	-0.4287	0.4532	0.8949	0.3442
HCC131:Renal Failure	-0.4551	0.1071	18.067	<.0001
HCC132:Nephritis	4.6291	230.3	0.0004	0.984
HCC148:Decubitus Ulcer of Skin	0.1682	0.1773	0.9008	0.3426
HCC149:Chronic Ulcer of Skin, Except Decubitus	0.6627	0.6232	1.1308	0.2876
HCC155:Major Head Injury	-0.4202	0.4247	0.9788	0.3225
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.3657	0.3265	1.255	0.2626
HCC158:Hip Fracture/Dislocation	-0.3235	0.1037	9.7336	0.0018
HCC161:Traumatic Amputation	-0.4591	0.1961	5.4779	0.0193
HCC164:Major Complications of Medical Care and Trauma	0.108	0.1102	0.9602	0.3271
HCC174:Major Organ Transplant Status	4.5642	85.2542	0.0029	0.9573
HCC176:Artificial Openings for Feeding or Elimination	0.7365	0.807	0.8329	0.3614
HCC177:Amputation Status, Lower Limb/Amputation Complications	4.5088	156.3	0.0008	0.977
Age Older than 65 Years	-0.0939	0.0148	40.3877	<.0001
Male	-0.2082	0.0987	4.4492	0.0349
Disability	3.7544	114.5	0.0011	0.9738

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Dual Eligible	-0.2374	0.1468	2.6154	0.1058
Medicare-Aged	1.3025	275.7	0	0.9962
Medicare-Disabled	-7.1223	275.7	0.0007	0.9794
MS-DRG: Multi Joint Procedure	-0.4816	0.4644	1.0753	0.2998
MS-DRG: Complications and Comorbidity	-0.3737	0.1133	10.8831	0.001
Number of IP visits in last 12 months for condition	-0.1415	0.5316	0.0708	0.7901

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	2,022	1,260
SC	2,030	1,909
-2 Log L	2,020	1,100

Table 5 (b): Hip Replacement: Regression of 30-day Likelihood of No Potentially Preventable Readmissions for 30-day episodes of Hip Replacement (N=24,603)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	-8.1114	55.209	0.0216	0.8832
HCC1:HIV/AIDS	-0.256	0.1346	3.6161	0.0572
HCC2:Septicemia/Shock	-0.5263	0.067	61.6451	<.0001
HCC5:Opportunistic Infections	-0.0149	0.0217	0.4681	0.4939
HCC7:Metastatic Cancer and Acute Leukemia	-0.0408	0.1054	0.1499	0.6986
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.0687	0.1287	0.2852	0.5933
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.1796	0.077	5.4377	0.0197
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.1562	0.0487	10.2727	0.0014
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	-0.157	0.0881	3.1773	0.0747
HCC16:Diabetes with Neurologic or Other Specified Manifestation	-0.3017	0.0684	19.4736	<.0001
HCC17:Diabetes with Acute Complications	-0.3736	0.2507	2.2201	0.1362
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	-0.2364	0.1172	4.0662	0.0437
HCC19:Diabetes without Complication	-0.1081	0.0249	18.8406	<.0001
HCC21:Protein-Calorie Malnutrition	-0.301	0.0609	24.4603	<.0001
HCC25:End-Stage Liver Disease	0.0978	0.2478	0.1558	0.6931
HCC26:Cirrhosis of Liver	-0.2558	0.1399	3.3445	0.0674
HCC27:Chronic Hepatitis	-0.0858	0.1356	0.4002	0.527
HCC31:Intestinal Obstruction/Perforation	-0.3114	0.0547	32.4178	<.0001
HCC32:Pancreatic Disease	-0.2633	0.0718	13.4326	0.0002
HCC33:Inflammatory Bowel Disease:	-0.0587	0.1069	0.3019	0.5827
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.0557	0.0298	3.4845	0.0619
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	-0.1668	0.0366	20.7524	<.0001
HCC44:Severe Hematological Disorders	-0.271	0.0846	10.2728	0.0014
HCC45:Disorders of Immunity	-0.2661	0.1357	3.8442	0.0499
HCC51:Drug/Alcohol Psychosis	-0.2429	0.0658	13.6255	0.0002
HCC52:Drug/Alcohol Dependence	-0.1725	0.1008	2.9258	0.0872
HCC54:Schizophrenia	0.0142	0.1492	0.0091	0.9239
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-0.34	0.0525	41.9898	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	-0.9153	0.2436	14.1236	0.0002
HCC68:Paraplegia	-1.0297	0.2821	13.3283	0.0003
HCC69:Spinal Cord Disorders/Injuries	-0.1546	0.1161	1.7744	0.1828
HCC70:Muscular Dystrophy	0.1089	0.5663	0.037	0.8475
HCC71:Polyneuropathy:	-0.3538	0.046	59.0614	<.0001
HCC72:Multiple Sclerosis	-0.3034	0.1825	2.7635	0.0964
HCC73:Parkinsons and Huntingtons Diseases	-0.1852	0.0793	5.4548	0.0195

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC74:Seizure Disorders and Convulsions	-0.0831	0.0656	1.6026	0.2055
HCC75:Coma, Brain Compression/Anoxic Damage	-0.0295	0.19	0.0241	0.8767
HCC77:Respirator Dependence/Tracheostomy Status	-0.0459	0.224	0.0419	0.8377
HCC78:Respiratory Arrest	0.1727	0.2842	0.3694	0.5434
HCC79:Cardio-Respiratory Failure and Shock	-0.1643	0.0412	15.931	<.0001
HCC80:Congestive Heart Failure	-0.1376	0.0293	22.0618	<.0001
HCC81:Acute Myocardial Infarction	-0.4152	0.0844	24.2317	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.2911	0.0781	13.8942	0.0002
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.2107	0.0398	27.9802	<.0001
HCC92:Specified Heart Arrhythmias:	-0.128	0.0251	26.0451	<.0001
HCC95:Cerebral Hemorrhage	-0.2991	0.1983	2.2751	0.1315
HCC96:Ischemic or Unspecified Stroke	-0.2831	0.06	22.2722	<.0001
HCC100:Hemiplegia/Hemiparesis	-0.6055	0.083	53.2199	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.4503	0.1801	6.2487	0.0124
HCC104:Vascular Disease with Complications	-0.5837	0.056	108.7093	<.0001
HCC105:Vascular Disease	-0.1986	0.0269	54.4708	<.0001
HCC107:Cystic Fibrosis	4.6804	55.1905	0.0072	0.9324
HCC108:Chronic Obstructive Pulmonary Disease	-0.1777	0.0255	48.7273	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1807	0.0942	3.6807	0.055
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.3423	0.111	9.5187	0.002
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.1762	0.6799	0.0672	0.7955
HCC130:Dialysis Status	-0.5663	0.1919	8.7071	0.0032
HCC131:Renal Failure	-0.2172	0.0326	44.4595	<.0001
HCC132:Nephritis	-0.0243	0.2508	0.0094	0.9227
HCC148:Decubitus Ulcer of Skin	-0.4606	0.0512	80.8158	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.1522	0.0908	2.8087	0.0938
HCC155:Major Head Injury	-0.3936	0.1688	5.4384	0.0197
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.1595	0.1141	1.953	0.1623
HCC158:Hip Fracture/Dislocation	-0.2876	0.0228	158.8108	<.0001
HCC161:Traumatic Amputation	-0.4347	0.0716	36.8478	<.0001
HCC164:Major Complications of Medical Care and Trauma	-0.4589	0.0249	340.3088	<.0001
HCC174:Major Organ Transplant Status	0.2565	0.2206	1.3516	0.245
HCC176:Artificial Openings for Feeding or Elimination	-0.0226	0.1414	0.0256	0.8729
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.3171	0.1524	4.3307	0.0374
Age Older than 65 Years	-0.0199	0.00292	46.5022	<.0001
Male	0.1185	0.0203	33.9767	<.0001
Disability	0.329	0.6078	0.2929	0.5884
Dual Eligible	0.0461	0.0336	1.8896	0.1692

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Medicare-Aged	0.6206	0.6415	0.9359	0.3333
Medicare-Disabled	-0.5208	0.613	0.7219	0.3955
MS-DRG: Multi Joint Procedure	-0.6156	0.0967	40.5411	<.0001
MS-DRG: Complications and Comorbidity	0.3804	0.04	90.5017	<.0001
Number of IP visits in last 12 months for condition	0.1066	0.0858	1.5432	0.2141

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	22,445	19,446
SC	22,454	20,095

Table 6(a): Knee Replacement: Regression of 30-day Survival Likelihood for 30-day episodes of Knee Replacement (N=53,647)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	89.4564	617	0.021	0.8847
HCC1:HIV/AIDS	4.2201	238.6	0.0003	0.9859
HCC2:Septicemia/Shock	-0.7719	0.1488	26.8973	<.0001
HCC5:Opportunistic Infections	4.7253	77.6175	0.0037	0.9515
HCC7:Metastatic Cancer and Acute Leukemia	4.9768	74.9299	0.0044	0.947
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.1732	0.6421	0.0727	0.7874
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	0.0365	0.5355	0.0047	0.9456
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	0.2472	0.3171	0.6073	0.4358
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.934	0.5672	2.7114	0.0996
HCC16:Diabetes with Neurologic or Other Specified Manifestation	0.3561	0.4407	0.6528	0.4191
HCC17:Diabetes with Acute Complications	-0.4437	1.023	0.1881	0.6645
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	0.5075	0.5429	0.8738	0.3499
HCC19:Diabetes without Complication	-0.1528	0.1105	1.9126	0.1667
HCC21:Protein-Calorie Malnutrition	0.0852	0.2266	0.1415	0.7068
HCC25:End-Stage Liver Disease	-0.6118	0.4708	1.6888	0.1938
HCC26:Cirrhosis of Liver	4.7451	94.6154	0.0025	0.96
HCC27:Chronic Hepatitis	-0.0419	0.5852	0.0051	0.943
HCC31:Intestinal Obstruction/Perforation	-0.0558	0.1993	0.0785	0.7793
HCC32:Pancreatic Disease	-0.4621	0.2568	3.2396	0.0719
HCC33:Inflammatory Bowel Disease:	0.1021	0.4281	0.0569	0.8115
HCC37:Bone/Joint/Muscle Infections/Necrosis	0.1082	0.3028	0.1276	0.7209
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.183	0.2699	0.4595	0.4979
HCC44:Severe Hematological Disorders	-0.3647	0.4083	0.7978	0.3717
HCC45:Disorders of Immunity	-0.1871	0.5485	0.1164	0.733
HCC51:Drug/Alcohol Psychosis	1.2375	0.6382	3.7599	0.0525
HCC52:Drug/Alcohol Dependence	-1.0921	0.5287	4.2678	0.0388
HCC54:Schizophrenia	4.9257	88.4928	0.0031	0.9556
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	0.5687	0.5181	1.2047	0.2724
HCC67:Quadriplegia, Other Extensive Paralysis	5.1677	80.4399	0.0041	0.9488
HCC68:Paraplegia	4.4037	190.9	0.0005	0.9816
HCC69:Spinal Cord Disorders/Injuries	4.8816	81.1637	0.0036	0.952
HCC70:Muscular Dystrophy	4.6896	107.3	0.0019	0.9651
HCC71:Polyneuropathy:	0.4001	0.414	0.9339	0.3339
HCC72:Multiple Sclerosis	4.4684	136.7	0.0011	0.9739

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC73:Parkinsons and Huntingtons Diseases	0.769	0.6054	1.6131	0.2041
HCC74:Seizure Disorders and Convulsions	0.0218	0.3391	0.0041	0.9488
HCC75:Coma, Brain Compression/Anoxic Damage	-1.1163	0.2431	21.0872	<.0001
HCC77:Respirator Dependence/Tracheostomy Status	-2.1335	0.3305	41.6805	<.0001
HCC78:Respiratory Arrest	-2.0861	0.307	46.1766	<.0001
HCC79:Cardio-Respiratory Failure and Shock	-1.7588	0.1316	178.5607	<.0001
HCC80:Congestive Heart Failure	-0.0485	0.1175	0.1703	0.6798
HCC81:Acute Myocardial Infarction	-0.753	0.152	24.5525	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.0754	0.2746	0.0754	0.7836
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.3528	0.2015	3.065	0.08
HCC92:Specified Heart Arrhythmias:	0.1082	0.1172	0.8528	0.3558
HCC95:Cerebral Hemorrhage	0.6656	0.7113	0.8757	0.3494
HCC96:Ischemic or Unspecified Stroke	-0.7059	0.2135	10.9351	0.0009
HCC100:Hemiplegia/Hemiparesis	0.0274	0.3248	0.0071	0.9327
HCC101:Cerebral Palsy and Other Paralytic Syndromes	4.36	172.9	0.0006	0.9799
HCC104:Vascular Disease with Complications	-0.2397	0.1389	2.9752	0.0846
HCC105:Vascular Disease	0.4759	0.1795	7.0342	0.008
HCC107:Cystic Fibrosis	4.499	208.6	0.0005	0.9828
HCC108:Chronic Obstructive Pulmonary Disease	-0.00105	0.1184	0.0001	0.9929
HCC111:Aspiration and Specified Bacterial Pneumonias	-0.1489	0.1744	0.7288	0.3933
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.9436	0.5475	2.9708	0.0848
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	4.3867	181.7	0.0006	0.9807
HCC130:Dialysis Status	-0.8563	0.4947	2.9968	0.0834
HCC131:Renal Failure	-0.4282	0.1147	13.9451	0.0002
HCC132:Nephritis	4.3624	142.5	0.0009	0.9756
HCC148:Decubitus Ulcer of Skin	0.2243	0.3259	0.4738	0.4913
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.4345	0.533	0.6644	0.415
HCC154:Severe Head Injury	-3.6576	1.1343	10.3976	0.0013
HCC155:Major Head Injury	0.3688	0.5713	0.4168	0.5185
HCC157:Vertebral Fractures without Spinal Cord Injury	3.9401	93.8927	0.0018	0.9665
HCC158:Hip Fracture/Dislocation	0.1648	0.4602	0.1283	0.7202
HCC161:Traumatic Amputation	-0.2851	0.2206	1.6711	0.1961
HCC164:Major Complications of Medical Care and Trauma	-0.0994	0.121	0.675	0.4113
HCC174:Major Organ Transplant Status	6.1442	67.3678	0.0083	0.9273
HCC176:Artificial Openings for Feeding or Elimination	1.4521	0.767	3.5838	0.0583
HCC177:Amputation Status, Lower Limb/Amputation Complications	5.6446	67.459	0.007	0.9333
Age Older than 65 Years	-0.0543	0.0166	10.714	0.0011
Male	-0.3021	0.1029	8.6129	0.0033

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Disability	4.0121	203.8	0.0004	0.9843
Dual Eligible	-0.0835	0.1656	0.2542	0.6141
Medicare-Aged	2.3129	233.4	0.0001	0.9921
Medicare-Disabled	-6.0265	233.4	0.0007	0.9794
MS-DRG: Multi Joint Procedure	-0.0727	0.1977	0.1351	0.7132
MS-DRG: Complications and Comorbidities	-0.0981	0.1211	0.6569	0.4177
Number of IP visits in last 12 months for condition	0.00539	0.4868	0.0001	0.9912

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
AIC	1,888	1,221
SC	1,896	1,941
-2 Log L	1,886	1,059

Table 6(b): Knee Replacement: Regression of 30-day Survival Likelihood for 30-day episodes of Knee Replacement (N=53,647)

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Intercept	-14.5088	50.0726	0.084	0.772
HCC1:HIV/AIDS	-0.1542	0.2788	0.306	0.5802
HCC2:Septicemia/Shock	-0.5416	0.0547	98.1747	<.0001
HCC5:Opportunistic Infections	-0.3429	0.1744	3.8641	0.0493
HCC7:Metastatic Cancer and Acute Leukemia	-0.3305	0.1236	7.1522	0.0075
HCC8:Lung, Upper Digestive Tract, and Other Severe Cancers	-0.1093	0.1099	0.9886	0.3201
HCC9:Lymphatic, Head and Neck,Brain and Other Major Cancers	-0.0837	0.0709	1.3947	0.2376
HCC10:Breast, Prostate, Colorectal and Other Cancers and Tumors	-0.1054	0.0404	6.8075	0.0091
HCC15:Diabetes with Renal or Peripheral Circulatory Manifestation	0.1006	0.0639	2.4776	0.1155
HCC16:Diabetes with Neurologic or Other Specified Manifestation	-0.2471	0.0439	31.6651	<.0001
HCC17:Diabetes with Acute Complications	0.2372	0.1895	1.5666	0.2107
HCC18:Diabetes with Ophthalmologic or Unspecified Manifestation	-0.2476	0.0761	10.5769	0.0011
HCC19:Diabetes without Complication	-0.0951	0.0166	32.8104	<.0001
HCC21:Protein-Calorie Malnutrition	-0.774	0.0617	157.6117	<.0001
HCC25:End-Stage Liver Disease	-0.2522	0.1899	1.7642	0.1841
HCC26:Cirrhosis of Liver	-0.1354	0.1223	1.2255	0.2683
HCC27:Chronic Hepatitis	-0.1105	0.1204	0.8414	0.359
HCC31:Intestinal Obstruction/Perforation	-0.3994	0.047	72.2707	<.0001
HCC32:Pancreatic Disease	-0.3474	0.0605	32.9876	<.0001
HCC33:Inflammatory Bowel Disease:	-0.2324	0.0748	9.6525	0.0019
HCC37:Bone/Joint/Muscle Infections/Necrosis	-0.341	0.0397	73.8763	<.0001
HCC38:Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	-0.1575	0.0272	33.6356	<.0001
HCC44:Severe Hematological Disorders	-0.3774	0.069	29.9015	<.0001
HCC45:Disorders of Immunity	-0.2572	0.11	5.4679	0.0194
HCC51:Drug/Alcohol Psychosis	-0.1786	0.0495	13.0259	0.0003
HCC52:Drug/Alcohol Dependence	-0.3206	0.0959	11.175	0.0008
HCC54:Schizophrenia	-0.2376	0.1048	5.1433	0.0233
HCC55:Major Depressive, Bipolar, and Paranoid Disorders	-0.3044	0.0383	63.2281	<.0001
HCC67:Quadriplegia, Other Extensive Paralysis	-0.3945	0.2458	2.5749	0.1086
HCC68:Paraplegia	-0.77	0.1903	16.3629	<.0001
HCC69:Spinal Cord Disorders/Injuries	-0.2365	0.0833	8.0541	0.0045
HCC70:Muscular Dystrophy	-0.0838	0.4027	0.0433	0.8352
HCC71:Polyneuropathy:	-0.382	0.0323	140.229	<.0001

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
HCC72:Multiple Sclerosis	-0.3919	0.1355	8.368	0.0038
HCC73:Parkinsons and Huntingtons Diseases	-0.341	0.056	37.0701	<.0001
HCC74:Seizure Disorders and Convulsions	-0.2417	0.0503	23.0418	<.0001
HCC75:Coma, Brain Compression/Anoxic Damage	-0.293	0.1595	3.3767	0.0661
HCC77:Respirator Dependence/Tracheostomy Status	-0.7289	0.2377	9.4028	0.0022
HCC78:Respiratory Arrest	-0.2272	0.2018	1.2675	0.2602
HCC79:Cardio-Respiratory Failure and Shock	-0.2623	0.0311	71.0881	<.0001
HCC80:Congestive Heart Failure	-0.2507	0.0222	127.5857	<.0001
HCC81:Acute Myocardial Infarction	-0.5735	0.0729	61.8056	<.0001
HCC82:Unstable Angina and Other Acute Ischemic Heart Disease	-0.4445	0.059	56.7568	<.0001
HCC83:Angina Pectoris/Old Myocardial Infarction	-0.1703	0.0294	33.5294	<.0001
HCC92:Specified Heart Arrhythmias:	-0.2121	0.0183	133.7533	<.0001
HCC95:Cerebral Hemorrhage	-0.9055	0.1992	20.6567	<.0001
HCC96:Ischemic or Unspecified Stroke	-0.377	0.0505	55.7892	<.0001
HCC100:Hemiplegia/Hemiparesis	-0.7926	0.0638	154.301	<.0001
HCC101:Cerebral Palsy and Other Paralytic Syndromes	-0.4992	0.1632	9.3547	0.0022
HCC104:Vascular Disease with Complications	-0.6248	0.0381	268.8937	<.0001
HCC105:Vascular Disease	-0.2978	0.0195	233.2206	<.0001
HCC107:Cystic Fibrosis	4.5531	50.0558	0.0083	0.9275
HCC108:Chronic Obstructive Pulmonary Disease	-0.2485	0.0197	159.3949	<.0001
HCC111:Aspiration and Specified Bacterial Pneumonias	0.0384	0.097	0.1565	0.6924
HCC112:Pneumococcal Pneumonia, Emphysema, Lung Abscess	-0.1848	0.065	8.0722	0.0045
HCC119:Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	-0.0322	0.3556	0.0082	0.9279
HCC130:Dialysis Status	-0.5835	0.1775	10.803	0.001
HCC131:Renal Failure	-0.3566	0.024	220.5415	<.0001
HCC132:Nephritis	-0.2727	0.1488	3.3564	0.0669
HCC148:Decubitus Ulcer of Skin	-0.5659	0.0581	94.8925	<.0001
HCC149:Chronic Ulcer of Skin, Except Decubitus	-0.2169	0.0838	6.7058	0.0096
HCC154:Severe Head Injury	0.1223	0.7383	0.0275	0.8684
HCC155:Major Head Injury	0.2018	0.0887	5.1745	0.0229
HCC157:Vertebral Fractures without Spinal Cord Injury	-0.4998	0.1276	15.331	<.0001
HCC158:Hip Fracture/Dislocation	-0.3094	0.0588	27.6928	<.0001
HCC161:Traumatic Amputation	-0.6492	0.0493	173.4449	<.0001
HCC164:Major Complications of Medical Care and Trauma	-0.4793	0.0216	490.7652	<.0001
HCC174:Major Organ Transplant Status	0.2711	0.231	1.3774	0.2405
HCC176:Artificial Openings for Feeding or Elimination	-0.4783	0.1207	15.7049	<.0001
HCC177:Amputation Status, Lower Limb/Amputation Complications	-0.8701	0.0841	107.0359	<.0001
Age Older than 65 Years	-0.0295	0.00235	157.5424	<.0001

Parameter	Estimate	Standard Error	Wald Chi-Square	Significance Level
Male	0.1397	0.0149	87.3399	<.0001
Disability	-0.0902	0.4698	0.0369	0.8477
Dual Eligible	-0.0153	0.0217	0.4988	0.48
Medicare-Aged	0.3651	0.5261	0.4817	0.4876
Medicare-Disabled	0.0628	0.4719	0.0177	0.8941
MS-DRG: Multi Joint Procedure	-1.1247	0.024	2200.183	<.0001
MS-DRG: Complications and Comorbidities	0.4893	0.0355	189.5303	<.0001
Number of IP visits in last 12 months for condition	-0.011	0.0568	0.0374	0.8466

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	45,091	37,186
SC	45,100	37,907
-2 Log L	45,089	37,024