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Working Paper: Using State Hospital Discharge Data to Compare Readmission Rates in Medicare Advantage and Medicare's Traditional Fee-for-Service Program

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Working Paper: Using State Hospital Discharge Data to Compare Readmission Rates in Medicare Advantage and Medicare's Traditional Fee-for-Service Program

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SUMMARY

This report is the fourth in a series of studies comparing patterns of care among patients with Medicare Advantage (MA) coverage and in Medicare's traditional fee-for-service (FFS) program. It is an expanded version of a preliminary report presented in September 2009,[1] which compared utilization rates among MA and FFS hospital patients in the states of California and Nevada in 2006 based on publicly available hospital discharge data compiled by the Agency for Healthcare Research and Quality (AHRQ).

This report extends AHIP's earlier comparisons of MA and FFS hospital patients in California and Nevada to an additional year and several other states, and it also attempts to refine the measures in several ways. In general, it appears that the wider range of states and measures presented in this report continue to verify the results of our earlier comparisons of MA and FFS utilization: lower risk-adjusted rates of inpatient days and readmissions, sometimes by quite large amounts.

Summary Table 1 shows basic differences in rates of hospital admissions, days, readmissions, and potentially avoidable admissions, adjusted using a person-based ratio of risk scores based on age, sex, and diagnostic information from inpatient hospitalizations. The comparisons are shown per-enrollee and per-patient with an admission. Readmission rates are computed for readmissions within the same diagnosis related group (DRG) or for "any DRG." Potentially avoidable admission rates are based on specifications published by AHRQ for 13 types of admissions ranging from dehydration to asthma to uncontrolled diabetes.

In this report, we focus primarily on the hospital readmissions measures. Although some readmissions are planned or unavoidable, there is broad agreement that lowering readmission rates through improved hospital and transitional care is a national health care priority.[2] In states where the underlying data seems most reliable, we estimate that risk-adjusted readmission rates were about 27-29 percent lower in MA than FFS per (estimated) enrollee, 16-18 percent lower per person with an admission, and14-17 percent lower measured per hospitalization.

Summary Table 1. Percentage Difference in Risk-Adjusted Utilization Rates, Medicare Advantage vs. FFS, States with Multiple Admission Tracking Codes

	Inpatient Admissions	Inpatient Days	Same-Quarter, Any DRG Readmissions*	Same-Quarter, Same DRG Readmissions*	13 Potentially Avoidable Admissions
	MA Rate vs. FFS Rate (per Estimated Enrollee, with CMS-Style Risk Adjustment**)				
California (2006)	-24%	-43%	-39%	-35%	-25%
California (2007)	-22%	-41%	-35%	-32%	-24%
Nevada (2006)	-11%	-31%	-30%	-36%	-17%
Nevada (2007)	-7%	-24%	-28%	-28%	-17%
Washington (2006)	-34%	-39%	-48%	-44%	-40%
Texas (2007)	-5%	-11%	-23%	-17%	-16%
North Carolina (2007)	-17%	-14%	-30%	-33%	-22%
Pennsylvania (2007)	6%	7%	3%	6%	8%
Hawaii (2007)	2%	-3%	1%	-10%	5%
Arkansas (2007)	-47%	-53%	-65%	-68%	-57%
Arizona (2007)	-24%	-26%	-22%	-19%	-21%
	MA Rate vs. FFS Rate (Patients with at Least One Admission, with CMS-Style Risk Adjustment**)				
California (2006)	-6%	-30%	-25%	-20%	-8%
California (2007)	-6%	-29%	-21%	-18%	-8%
Nevada (2006)	-2%	-24%	-23%	-29%	-9%
Nevada (2007)	2%	-17%	-21%	-21%	-8%
Washington (2006)	0%	-7%	-20%	-15%	-9%
Texas (2007)	2%	-5%	-17%	-11%	-10%
North Carolina (2007)	1%	4%	-16%	-20%	-6%
Pennsylvania (2007)	3%	4%	0%	3%	4%
Hawaii (2007)	-1%	-7%	-3%	-13%	1%
Arkansas (2007)	-1%	-12%	-34%	-40%	-19%
Arizona (2007)	2%	-1%	4%	8%	6%

Source: AHIP Center for Policy and Research. Based on analysis of state hospital discharge restricted-access public use datasets with multiple admission codes that allow tracking of readmissions, provided by AHRQ's HCUP project (CA, NV, WA, HI, NC, AR, AZ) and by states directly (PA, TX), and FFS 5 percent claims samples in those states.
Note: Excludes patients with an admission listing an out-of-state address. The shadings represent our subjective assessment of the reliability of the MA vs. FFS comparisons based on issues with the underlying datasets. In general, we believe the comparisons for California are highly reliable, and the data from Arizona, Arkansas, and Hawaii are not very reliable.
* Excludes transfer cases.
** Risk scores for FFS and MA enrollees are based on age/sex and HCC relative cost values used in Medicare risk adjustment for beneficiaries living in the community, but do not include disease interactive factors, or factors related to disability or institutional status. Risk scores are based on inpatient hospital diagnoses for all inpatient admissions, but do not include diagnosis information from other health care services, such as hospital outpatient or physician office visits. Relative risk ratios for patients with an admission were used to adjust the estimated per-enrollee results.

There are many ways to measure readmission rates. Per-enrollee readmission rates include the impact of reducing initial admissions as well as subsequent readmissions and may be a particularly good measure for evaluating health plan performance. Readmission rates per hospitalization are commonly used for evaluating hospitals. In general, we compute "same-quarter" readmissions; only the Texas data are detailed enough to allow us to compute the more common 30-day and 90-day readmission rates. However, we find that 30-day readmission rates and same-quarter readmission rates tend to be very well correlated, and differences between MA and FFS rates for either measure are similar.

Summary Table 2 shows same-quarter, any DRG readmission rates per admission in the nine states, unadjusted and using an alternative risk adjuster (based on the distribution of admissions by DRG in MA and FFS and the probabilities of readmissions associated with each DRG).

The magnitude of the reductions in readmissions presented in this report is consistent with AHIP's prior study of 10 MA HMOs in 18 comparison areas[3] and with two other recent studies of MA and FFS readmission rates. On average, the AHIP report showed risk-adjusted per-enrollee MA readmissions were about 39 percent lower than FFS across 18 comparison areas. Since overall hospitalization rates were about 11 percent lower in the MA plans, estimated per-admission rehospitalization rates would be approximately 27-28 percent lower.

Summary Table 2. Same-Quarter, Any DRG Readmission Rates per Admission

	Unadjusted		With DRG-Based Risk Adjustment Based on Readmission Probability*	
	FFS	MA	FFS	MA
California (2006)	20.2%	16.3%	19.8%	16.7%
California (2007)	20.4%	17.0%	20.0%	17.4%
Nevada (2006)	19.2%	15.1%	18.6%	15.7%
Nevada (2007)	18.1%	14.1%	17.4%	14.6%
Washington (2006)	15.4%	12.2%	15.2%	12.5%
Texas (2007)	20.5%	16.7%	20.1%	17.1%
North Carolina (2007)	16.3%	13.6%	16.2%	13.8%
Pennsylvania (2007)	20.1%	19.5%	19.9%	19.7%
Hawaii (2007)	14.9%	14.6%	14.8%	14.7%
Arkansas (2007)	24.3%	16.1%	23.4%	16.7%
Arizona (2007)	14.4%	14.7%	14.3%	14.8%

Source: AHIP Center for Policy and Research. Based on state hospital discharge restricted-access public use datasets (HCUP) compiled by the Agency for Healthcare Research and Quality (AHRQ) and the states of Texas and Pennsylvania.
Note: Excludes transfer cases. Persons with out-of-state admissions were excluded. The shadings represent our subjective assessment of the reliability of the MA vs. FFS comparisons based on issues with the underlying datasets. In general, we believe the comparisons for California are highly reliable, and the data from Arizona, Arkansas, and Hawaii are not very reliable.
* Risk measured based on an index of the likelihood of admissions for DRGs that are associated with higher or lower than average rates of readmissions (any DRG), using the 2006-2007 FFS 5 percent sample file as a benchmark (DRG version 24).

Summary Table 3. Preliminary Assessment of Issues and Concerns with State Hospital Discharge Datasets Analyzed in this Report for Statewide MA vs. FFS Comparisons

State Year(s) Analyzed	CA 2006-7	NV 2006-7	WA 2006	TX 2007	NC 2007	PA 2007	HI 2007	AR 2007	AZ 2007
A. Multiple Admissions Over-Identified			*						
B. Multiple Admissions Under-Identified									X
C. Snowbirds and Out-of-State Residents/Patients		X				X	X	X	X
D. Possible Missing Data					X	X			
E. Identification of MA Enrollees		X	X		X	X	X	X	
F. Risk Scores Not Consistent with FFS 5 Percent Sample File									X
G. Sub-State Composition of Enrollment						X			X
H. Relatively Small Number or Share of MA Enrollees				X	X		X	X	
I. Cannot Exclude Long-Term Hospitals (Psych., Rehab)							X	X	
Overall Confidence in the Statewide Comparisons	High	Medium	Medium	Medium	Some	Some	Not Much	Not Much	Not Much

Source: AHIP Center for Policy and Research. Based on analysis of state hospital discharge restricted-access public use datasets with multiple admission tracking codes, provided by AHRQ's HCUP project (CA, NV, WA, HI, NC, AR, AZ) and by states directly (PA, TX), and FFS 5 percent claims samples in those states.
* 2007 data from Washington (not used) had incorrect multiple admission tracking codes and was returned to AHRQ. The 2007 data for Washington have since been corrected, but not in time for this study.

In a September 2009 study of 30-day readmission rates in 13 MA HMO plans for the Association of Community Health Plans (ACHP), Dr. Gerard Anderson of Johns Hopkins University found average reductions in 30-day (any DRG) readmission rates of 27 percent in MA compared with national FFS (not risk-adjusted).[4]

In May 2010, Dr. Cary Sennett and his colleagues at MedAssurant, Inc. compared 30-day, 60-day, and 90-day readmission rates in 11 MA plans with national FFS data from 2004 computed by Dr. Stephen Jencks and his colleagues, and with 2006-2008 FFS data computed by Dr. Anderson (with and without risk adjustment).[5] The MedAssurant results are consistent with those found in the AHIP and Anderson reports. The Summary Figure below illustrates the main results from the four recent studies.

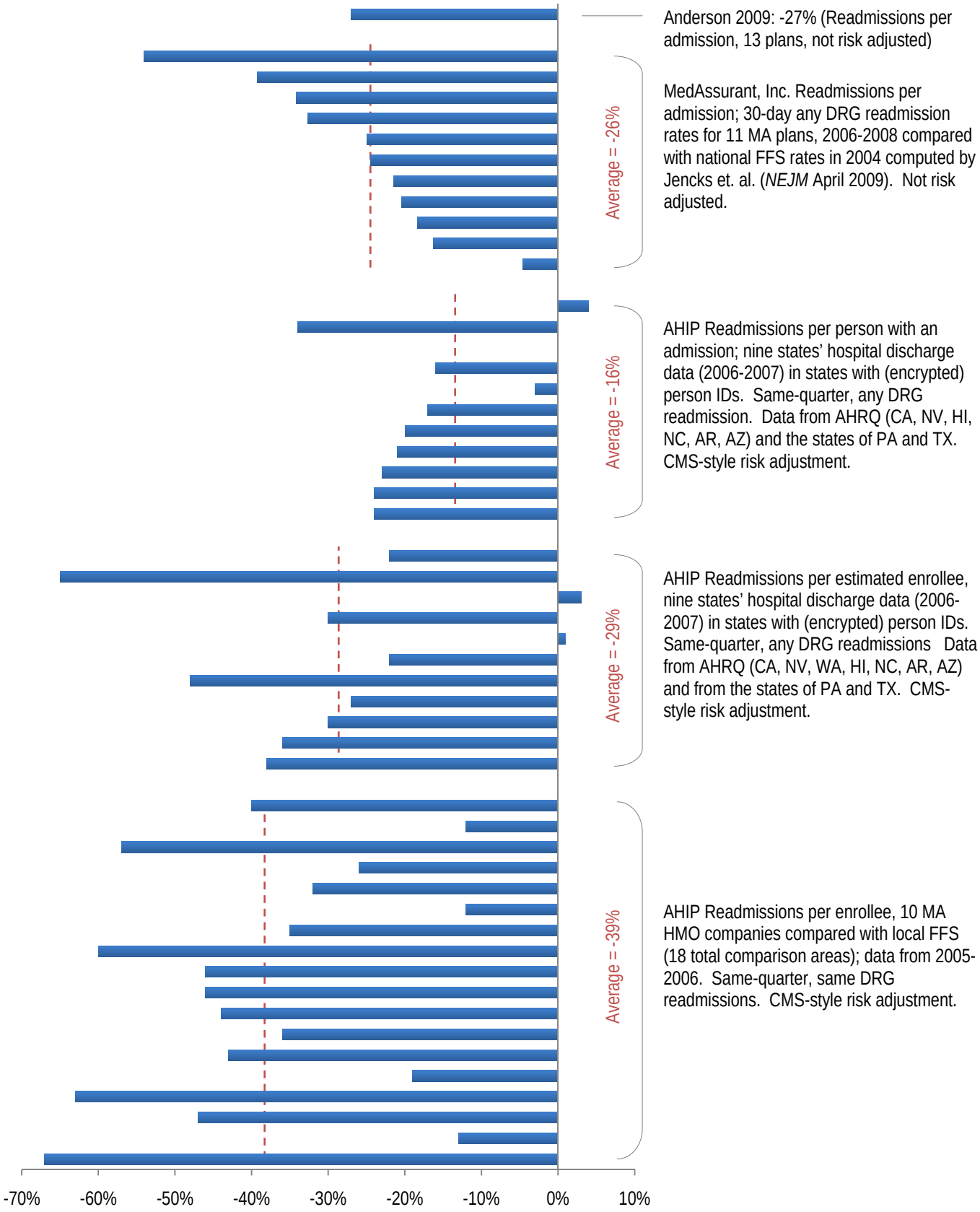
For several reasons, analyses based the study of the state hospital discharge data have several limitations. Hospital discharge data by definition represent a data universe of persons who had a hospitalization, and include utilization and diagnosis data only from inpatient hospital care, not from outpatient or office visits. In addition, in reviewing the hospital data used in this study, we identified issues related to:

- The validity of the codes used to link hospitalizations for patients with multiple admissions or readmissions, which we believe could distort the comparisons, particularly in Arizona;
- Out-of-state residents, part-year residents and "snowbird" retirees, and cross-border medical care, which also affect the comparisons;
- Completeness of the state data and comparisons between the state datasets and the FFS data from the Medicare 5 percent sample file that appear to show gaps or anomalies in some state data; and
- Identification of MA enrollees.

Summary Table 3 illustrates issues with each state's hospital discharge data that could affect the statewide MA vs. FFS comparisons. In Arizona, we identified a potential problem with the data codes in the hospital discharge dataset that allow tracking of multiple admissions and readmissions. In Arkansas, we can find no fault with the data, but there are simply too few MA enrollees in the state to have much confidence in the comparisons. In Hawaii, there are relatively few MA enrollees, and many are in "cost-based" private plans, not "risk-based" MA plans that have powerful incentives to reduce avoidable admissions and readmissions. In Pennsylvania, MA and FFS patients show similar statewide readmission rates, but when we looked at local regions within the state, the local MA readmission rates tended to be lower than local FFS. This is because MA enrollees are more concentrated in urban areas (Pittsburgh and the Philadelphia area), where readmission rates appear to be higher in general.

The intention of this nine-state study was to examine additional data from different sources and explore alternative measures in an attempt to verify the results of prior research. Much of the discussion is therefore methodological, and many uncertainties remain. However, the trends are increasingly clear: the results from these new data and the more varied set of measures continue to increase our confidence that MA plans are successfully reducing preventable readmissions. By contrast, readmission rates in Medicare FFS appear to be far higher than they could be. We hope that further examination of these and similar data will spark a sustained national effort to reduce readmission rates for all patients.

Summary Figure. Percent Difference in Readmission Rates, Medicare Advantage vs. FFS, Recent Studies



Sources: AHIP Center for Policy and Research (www.ahipresearch.org) and AHCP (www.ahcp.org).

INTRODUCTION

In September 2009, AHIP presented preliminary comparisons of hospital readmissions and potentially avoidable admissions between enrollees in traditional Medicare fee-for-service coverage and Medicare Advantage plans in California and Nevada.[6] The underlying data were from state-based hospital discharge datasets for those states compiled by the federal Agency for Healthcare Research and Quality (AHRQ) for the year 2006. (Although they do not have identical meanings, we use the terms hospital "discharges" and "admissions" interchangeably throughout this report when referring to basic counts of hospitalizations.)

The California and Nevada comparisons were intended mostly as an initial check or verification for the more comprehensive comparisons of utilization rates between Medicare FFS and MA, which AHIP presented in a series of working papers in 2009. The first AHIP working paper compared results from eight smaller or regional MA plans with FFS in the same local service areas,[7] and the second compared two larger, multi-state MA plans in a total of 10 local areas.[8]

Two other recent studies have compared MA and FFS hospital utilization. In September 2009, Dr. Gerard Anderson of Johns Hopkins University conducted a study of hospital readmissions and avoidable admissions for the Alliance of Community Health Plans (ACHP). Among other things, the study found that the average 30-day readmission rate (likelihood of a readmission for any DRG within 30 days) for the 13 ACHP member plans reporting was 27 percent less for MA patients than the national FFS rate.[9]

In May 2010, Cary Sennett of MedAssurant, Inc. presented a detailed three-year (2006-2008) study of 30-day, 90-day, and one-year readmission rates (any DRG) for 11 MA plans and compared those results with FFS readmission rates computed nationally by Stephen Jencks and his colleagues for 2004, and by Dr. Anderson of Johns Hopkins for 2006-2008.[10] This preliminary report was the first in a series under a collaborative research agreement between MedAssurant and AHIP. The MedAssurant/AHIP report also shows company-by-company (de-identified) comparisons with FFS in each MA plan's local operating areas. The report used a risk adjustment technique based on indexes of DRGs associated with high readmission rates, which was suggested by Dr. Anderson and is also used in this report (and explained below).

(Appendix A provides a brief rundown of some other studies comparing aspects of MA and FFS performance.)

This report extends AHIP's original comparisons of MA and FFS hospital patients in California and Nevada to an additional year and several other states, and also attempts to refine the measures in several ways. In general, it appears that the wider range of states and measures presented in this report continue to verify the results of our more comprehensive comparisons of MA and FFS utilization: lower risk-adjusted rates of inpatient days and readmissions, sometimes by quite large amounts, and smaller average reductions in the 13 AHRQ-defined potentially avoidable admissions.

First, we present the underlying data from the nine states for which MA and FFS enrollees can be compared, and where multiple admissions and readmissions can be tracked. We focus on hospital readmissions, introducing alternative definitions and measures, including a risk adjustment measure based on the risk of readmission. Second, we examine several issues that arise when using state-

Table 1. Details of Record Selection and Data Cleaning, State Hospital Discharge Datasets

	California 2006	California 2007	Nevada 2006	Nevada 2007	Washington 2006
Beginning Number of Admissions	3,997,182	4,012,774	285,162	289,534	634,046
Beginning Number of Patients with an Admission	2,095,319	2,089,895	186,658	165,375	480,296
Discharge Records Removed:					
No Age; Age Under 65 years, Over 89 Years	2,876,023	2,964,877	206,520	221,148	451,886
No Person Identifier	24,178	*	1,207	*	0
No or Conflicting Sex	5,773	4,694	*	19	*
No or Conflicting Coverage Type; Not MA or FFS	143,285	143,057	5,567	4,368	9,286
Not General Acute Care	70,953	56,836	0	0	6,507
Length of Stay Greater than 365 Days	276	181	*	*	*
Discharges of Persons with Out-of-State Addresses in One or More Admissions	12,376	11,155	7,001	5,650	6,935
Ending Number of Admissions	864,318	831,974	64,867	58,348	159,426
Ending Number of Patients with an Admission	544,526	532,730	42,740	39,524	109,753

Table 1 (continued). Details of Record Selection and Data Cleaning, State Hospital Discharge Datasets

	Texas 2007	Hawaii 2007	N. Carolina 2007	Pennsylvania 2007	Arkansas 2007	Arizona 2007
Beginning Number of Admissions	2,937,770	134,521	1,120,313	1,967,829	427,993	775,613
Beginning Number of Patients with an Admission	1,614,190	74,025	524,027	596,203	249,445	596,203
Discharge Records Removed:						
No Age; Age Under 65 years, Over 89 Years	2,155,960	97,776	861,492	1,355,448	281,897	508,384
No Person Identifier	0	1,735	*	2,767	288	9,374
No or Conflicting Sex	8,034	23	2,345	2,363	293	90
No or Conflicting Coverage Type; Not MA or FFS	46,052	3,912	10,559	45,384	8,405	30,645
Not General Acute Care	61,156	**	2,811	20,358	**	46,635
Length of Stay Greater than 365 Days	40	*	*	*	*	*
Discharges of Persons with Out-of-State Addresses in One or More Admissions	21,413	1,155	10,530	20,050	7,615	10,148
Ending Number of Admissions	645,115	29,915	232,576	521,459	129,493	170,337
Ending Number of Patients with an Admission	396,462	20,434	155,552	312,493	73,516	122,412

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge restricted-access public use datasets provided by AHRQ and the states of PA and TX.
Notes: Records were removed based on these data cleaning criteria in a top-to-bottom sequencing. Thus, the first test was no age; age under 65 etc. This process may remove records for one reason that would have been removed for another reason lower in the sequence. Records removed were not double counted – their removal was counted at the first test in the sequence.
*10 or fewer records. In some cases records with this characteristic may exist in the dataset, but were removed by an earlier test in the sequence.
** We were not able to identify and exclude admissions that were not general acute care admissions (long-term, psych. etc.).

based hospital discharge data for this purpose, and discuss ways these issues could affect comparisons of health plan performance. The various state datasets seem to have varying degrees of reliability for statewide MA vs. FFS comparisons, at least based on our investigations to this point.

While there is considerable policy discussion and research on readmissions for the purpose of evaluating hospitals, we are also interested in evaluating health plans or types of health coverage. We briefly discuss this alternative perspective and some of its implications for the study of health plan quality.

DATA AND METHODS

For this study, we used data from AHRQ's Healthcare Cost and Utilization Project (HCUP) files on hospital discharges from seven states, and hospital discharge data provided to us directly by the states of Pennsylvania and Texas.[11]

Data Cleaning and Excluded Records. In general, we studied admission results for patients aged 65 through 89. Patients with out-of-state addresses were excluded, in an attempt to at least partially control for "snowbird" or part-year residents in states. (Studying readmissions from state discharge datasets is complicated by the fact that patients may have had an initial admission in one state and a readmission in another. This issue is discussed in depth below.)

For patients with multiple admissions in the year and differing (but consecutive) ages, we used the average age. For example, a patient may have an admission in January at age 75, turn 76 on her birthday in February, and have a subsequent admission at age 76 in March. This person's age would be coded as 75.5. However, we assumed that patients with multiple admissions that were coded with ages more than one year apart were miscoded, and we excluded those patients.

We also excluded patients with multiple admissions who had admissions coded for both MA and FFS in the year (presumably because they switched coverage mid-year), had admissions coded for both genders (we assumed these records were miscoded), or had lengths of stay or total inpatient days greater than 365 days. To the extent possible, we excluded admissions at long-term care hospitals (usually for rehabilitation or psychiatric care), although states varied in their coding systems, and in some states these exclusions were more difficult or impossible.[12]

Table 1 details the record selection and data cleaning performed on each state's discharge dataset.

Linking Multiple Admissions. AHRQ and the individual states providing these datasets have gone to considerable lengths to create codes that allow researchers to link admissions of (de-identified) patients who have had multiple admissions at one or more hospitals in the state. This allows readmissions to be counted.

Tests of validity of the multiple admission codes include checking to see if an identified multiple admission set is coded with the same age range, gender, and residence area (usually a county). Of course, ages can change during a year or be miscoded, gender is occasionally miscoded, and people do move and change addresses. Nevertheless, these tests are very helpful for quality control, e.g. to ensure that codes correctly identify multiple admissions, and to identify possible cases where two or more different patients are inadvertently given the same code. For example, we found that the AHRQ's original 2007 multiple admission codes

Table 2. Derivation of Estimates of Numbers of Medicare Enrollees in Medicare Advantage and FFS for Comparisons, Persons Aged 65-89, by State

Medicare Advantage (MA)	All MA Enrollees, Mid Year (CMS)	Percent of MA Over 89 or Under 65 (MCBS)	Estimated MA Enrollees Aged 65-89	
California (2006)	1,409,518	11%	1,248,927	
California (2007)	1,453,104	13%	1,258,183	
Nevada (2006)	88,664	6%	83,100	
Nevada (2007)	93,486	9%	84,865	
Washington (2006)	142,978	6%	134,656	
Texas (2007)	386,689	14%	331,392	
Hawaii (2007)	67,922	10%*	61,130	
North Carolina (2007)	185,886	17%	153,542	
Pennsylvania (2007)	708,092	21%	556,560	
Arkansas (2007)	45,556	18%	37,401	
Arizona (2007)	288,904	23%	222,456	
Fee-for-Service (FFS)	All Aged (65+) Part A Enrollees (CMS)	Percent Aged 90+ (from FFS 5 Percent Sample)	Estimated Part A Enrollees Aged 65-89	Estimated FFS Enrollees Aged 65-89
California (2006)	3,512,083	3.8%	3,377,219	2,128,292
California (2007)	3,607,382	3.9%	3,467,776	2,209,594
Nevada (2006)	257,561	3.3%	248,984	165,884
Nevada (2007)	267,950	2.3%	261,841	176,976
Washington (2006)	703,296	3.7%	676,993	542,337
Texas (2007)	2,242,904	3.2%	2,172,253	1,840,860
Hawaii (2007)	167,363	4.2%	160,417	99,288
North Carolina (2007)	1,069,367	3.0%	1,037,072	883,530
Pennsylvania (2007)	1,842,615	4.1%	1,767,989	1,211,429
Arkansas (2007)	379,201	3.4%	366,422	329,020
Arizona (2007)	696,728	3.2%	674,502	452,046

Source: AHIP Center for Policy and Research. Estimates based on data from CMS enrollment figures for aged Medicare beneficiaries as of July 1 2006 and 2007, CMS enrollment data on MA for August 2006 and July 2007, the FFS 5 percent samples files, and Medicare Current Beneficiary Survey (MCBS).
* There is no MCBS data for Hawaii – the 10 percent estimate is based on an indirect approximation that reconciles FFS 5 percent sample file information on the number of FFS enrollees in Hawaii with the implied FFS enrollment based on the total Part A enrollees less estimated MA enrollment.

Table 3. Estimated Numbers and Percentages of Medicare Enrollees in FFS and Medicare Advantage, Persons Aged 65-89, by State

	FFS (5 Percent Sample)	Estimated FFS (Used for State Data Comparisons)	Estimated MA	Total Estimated Part A
	Estimated Number of Medicare Enrollees Aged 65-89			
California (2006)	2,175,600	2,128,292	1,248,927	3,377,219
California (2007)	2,199,180	2,209,594	1,258,183	3,467,776
Nevada (2006)	169,920	165,884	83,100	248,984
Nevada (2007)	174,860	176,976	84,865	261,841
Washington (2006)	536,600	542,337	134,656	676,993
Texas (2007)	1,781,440	1,840,860	331,392	2,172,253
Hawaii (2007)	96,820	99,288	61,130	160,417
North Carolina (2007)	857,900	883,530	153,542	1,037,072
Pennsylvania (2007)	1,143,760	1,211,429	556,560	1,767,989
Arkansas (2007)	314,480	329,020	37,401	366,422
Arizona (2007)	427,240	452,046	222,456	674,502
	Percent of Total Estimated Medicare Part A Enrollees Aged 65-89			
California (2006)	64%	63%	37%	100%
California (2007)	63%	64%	36%	100%
Nevada (2006)	68%	67%	33%	100%
Nevada (2007)	67%	68%	32%	100%
Washington (2006)	79%	80%	20%	100%
Texas (2007)	82%	85%	15%	100%
Hawaii (2007)	60%	62%	38%	100%
North Carolina (2007)	83%	85%	15%	100%
Pennsylvania (2007)	65%	69%	31%	100%
Arkansas (2007)	86%	90%	10%	100%
Arizona (2007)	63%	67%	33%	100%

Source: AHIP Center for Policy and Research. Estimates based on data from CMS enrollment figures for aged Medicare beneficiaries as of July 1 2006 and 2007, CMS enrollment data on MA for August 2006 and July 2007, the FFS 5 percent samples files, and Medicare Current Beneficiary Survey (MCBS).
Note: Items may not sum to totals due to rounding.

for the state of Washington failed these tests: admission records with the same code over multiple admissions were found to have widely varying ages, gender, and location identifiers, and AHRQ has since replaced that dataset (but not in time for this report).

On the other hand, we are unable to conclusively test whether states may have inadvertently assigned several multiple admission codes to the same patient. This could happen, for example, if there were discrepancies in Social Security numbers used by patients, or if coding methods used by some hospitals to identify patients were not the same as methods used by other hospitals. In fact, we believe that this could be a serious problem in the Arizona dataset, and this issue is discussed in more detail below.

Estimates of Total Enrollment. The state discharge data only apply to patients who have had at least one hospital admission, not all enrollees in a health plan. Because we are primarily interested in evaluating health plan performance for all enrollees, not just those admitted to a hospital, we started our analysis by creating estimates of the numbers of FFS and MA enrollees in each comparison state.

Table 2 shows how these estimates of total enrollees in a state were derived. For FFS, we started with estimated total Medicare aged (65 and older) enrollment from CMS, centered on the mid-point of each year (July 1). Then we calculated the percentages of aged enrollees in FFS who are age 90 or above from the 5 percent sample claims files for each year. This yielded an estimate of overall Medicare enrollment age 65-89 – the age range studied in this and our prior reports.

Medicare Advantage enrollment was based on mid-year (August 2006 and July 2007) counts of all MA enrollees (all ages) in each state as published by CMS. We then estimated the percentages of enrollees in each state who were age 90 or above or age 64 or below from the Medicare Current Beneficiary Survey (MCBS) for 2006 and 2007 in the respective states, and we used this percentage to estimate MA enrollees aged 65-89.[13]

The number of FFS enrollees in each state was then calculated simply as the difference between the total Medicare enrollment age 65-89 and the estimated MA enrollment age 65-89.

Of course, these estimates are somewhat uncertain. In particular, the MCBS is a relatively small survey, and some of the states had relatively few observations from which to calculate the percentages of MA enrollees with ages outside our study range. However, in the absence of more precise estimates, these figures were used for each state except Hawaii. In Hawaii, which is not covered by the MCBS survey, we estimated that about 10 percent of MA enrollees were over age 90 or under 65, based on comparing the FFS enrollment implied by this process and the FFS enrollment in the state that is indicated by the FFS 5 percent sample file.

Despite the uncertainties, this estimation process for FFS enrollment generally produced estimates that were consistent with the 5 percent sample file results for FFS enrollees age 65-89 by state. We preferred to use the slightly larger FFS enrollment figures derived by subtracting MA from overall Medicare enrollment to simply using the estimates from the 5 percent sample file, because we wanted to err on the side of potentially overestimating FFS enrollment. This makes the per-enrollee comparisons of FFS utilization rates with MA slightly more favorable for FFS.

Table 3 compares the FFS enrollment estimates used in this study with estimates from the 5 percent

Table 4. Estimated Numbers of Patients and Hospital Utilization, FFS and Medicare Advantage in Nine States

	Including Patients with Out-of-State Addresses	Excluding Patients with Out-of-State Addresses (State Discharge Data)			
	Patients with an Admission	Patients with an Admission	Admissions	Inpatient Days	13 Potentially Avoidable Admissions
	Fee-for-Service (5 Percent Sample File)*				
California (2006)	NA	354,400	581,880	3,586,980	99,580
California (2007)	NA	356,760	586,100	3,587,760	98,620
Nevada (2006)	NA	30,640	53,120	350,780	7,960
Nevada (2007)	NA	29,420	52,280	346,300	7,840
Washington (2006)	NA	91,180	140,500	711,300	21,960
Texas (2007)	NA	364,360	644,120	4,155,200	119,380
Hawaii (2007)	NA	13,380	20,020	146,940	3,400
North Carolina (2007)	NA	173,060	284,800	1,636,800	49,920
Pennsylvania (2007)	NA	251,820	441,280	2,698,840	75,140
Arkansas (2007)	NA	67,740	119,920	710,220	21,820
Arizona (2007)	NA	76,340	126,160	677,380	18,240
	Fee-for-Service (State Discharge Data)				
California (2006)	376,721	368,807	602,475	3,724,808	95,231
California (2007)	367,300	362,078	581,476	3,566,266	89,764
Nevada (2006)	33,857	29,394	46,036	262,501	6,482
Nevada (2007)	30,857	27,501	41,718	235,131	5,934
Washington (2006)	99,163	94,302	138,851	613,325	19,128
Texas (2007)	352,791	339,393	561,459	3,285,263	106,865
Hawaii (2007)	13,437	12,479	18,274	132,324	3,000
North Carolina (2007)	143,313	135,982	205,476	1,110,265	36,690
Pennsylvania (2007)	225,843	212,175	356,307	2,027,090	63,938
Arkansas (2007)	73,827	69,299	123,547	729,973	19,148
Arizona (2007)	97,100	89,492	124,055	589,380	17,295
	Medicare Advantage				
California (2006)	176,794	175,719	261,843	1,214,454	40,697
California (2007)	172,110	170,652	250,498	1,160,502	38,043
Nevada (2006)	14,395	13,346	18,831	83,349	2,464
Nevada (2007)	12,790	12,023	16,630	76,733	2,129
Washington (2006)	16,099	15,451	20,575	83,773	2,577
Texas (2007)	58,694	57,069	83,656	458,172	14,022
Hawaii (2007)	8,027	7,955	11,641	79,679	1,957
North Carolina (2007)	20,382	19,570	27,100	151,376	4,540
Pennsylvania (2007)	101,276	100,318	165,152	947,382	29,999
Arkansas (2007)	4,502	4,217	5,946	31,212	752
Arizona (2007)	33,783	32,920	46,282	214,505	6,711

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge restricted-access public use datasets provided by AHRQ and the states (PA, TX), and the CMS FFS 5 percent sample file.

* Since the CMS 5 percent sample file is based on enrollee locations, not service locations, there is no need to adjust for out-of-state services. Thus there are no patients with "out-of-state" service location issues.

sample file, and it shows the estimated percentages of FFS and MA beneficiaries out of total estimated Medicare Part A enrollment. For example, we estimate there were approximately 2.2 million FFS enrollees in California in 2007 age 65 to 89, and about 1.25 million MA enrollees. Estimated MA enrollment represents about 36 percent of the overall Medicare population in the 65-89 age range in California in 2007.

Patients with Admissions, Removing Patients with Out-of-State Addresses. Table 4 shows numbers of patients with an admission by state, as well as the numbers of inpatient hospital admissions, days, and potentially avoidable admissions computed from each state's hospital discharge data. Analogous data for FFS from the 5 percent sample file are also shown.

Data from the 5 percent sample file are based on the primary address location of the FFS enrollee.[14] Thus, if a person living in California had a hospital admission in Nevada, the admission would "count" as a hospital admission for a California person and would be included in the California totals. On the other hand, the state discharge counts are based instead on where the admissions took place, not the primary residence of the enrollee. Each admission in the state data has a state/county location code for the patient's address, but some may be for out-of-state residents. Likewise the out-of-state admissions of in-state residents are, of course, not included. (The codes to identify multiple admission codes do not carry across states.) For example, a California resident who had two admissions, the first admission in California and subsequent readmission in Nevada, would show up in the FFS 5 percent sample file as a person with 2 admissions, one of which was a readmission. However, that same set of admissions would only show up in the California state discharge data as a person with one single admission and in Nevada as a separate person with a single admission – no readmission would be reported in either state. Table 4 shows counts of patients with an admission including all patients admitted in the state, and also excluding patients with admissions that contained an out-of-state address location. To partially address the in-state/out-of-state problem, this latter method of counting will be used throughout this report. More discussion of the issue of in-state and out-of-state admissions in the state discharge data on the MA vs. FFS comparisons is provided below.[15]

Risk Scores and Adjustment. Diagnosis codes recorded for each person's admissions were grouped using Hierarchical Condition Categories (HCCs) for 70 serious diseases. Specifically, a marker for each HCC was generated using ICD-9 diagnosis codes found on each beneficiary hospitalization record, including primary and secondary diagnoses. The comparisons were based on the maximum number diagnoses per claim for both the MA and FFS data, which ranged from nine diagnoses in Arkansas, Arizona, Washington, and Pennsylvania to 25 in California and Texas.

CMS-style risk scores were then calculated for each person ID using the age/sex and HCC-based relative cost factors used by CMS for MA risk adjustment (but not including factors related to program or institutional status, or disease interaction factors). Although CMS risk scores are normally based on diagnoses from hospital inpatient and outpatient care, as well as physician office visits, the state discharge data used in this report are limited to inpatient care. Thus, the risk scores computed in this report are based only on inpatient data (see Table 5).

Table 5 shows the derivation of the CMS-style risk scores. Except in the Hawaii dataset, average risk scores per patient with an admission were lower in MA; on average about 7 percent. Some of the states in which 2006 and 2007 MA enrollment was relatively

Table 5. Patients with At Least One Hospital Admission in a Year, Acute Care Admissions, Risk Scores and Average Age

	Fee-for-Service (5%)		Fee-for-Service (State)*		Medicare Advantage (State)*	
	Number of Patients with an Admission	Sum of Risk Scores**	Number of Patients with an Admission	Sum of Risk Scores**	Number of Patients with an Admission	Sum of Risk Scores**
California (2006)	354,400	616,116	368,807	693,890	175,719	321,915
California (2007)	356,760	615,023	362,078	673,618	170,652	309,026
Nevada (2006)	30,640	53,305	29,394	51,341	13,346	21,402
Nevada (2007)	29,420	49,241	27,501	46,584	12,023	18,254
Washington (2006)	91,180	151,675	94,302	154,192	15,451	22,767
Texas (2007)	364,360	636,402	339,393	656,909	57,069	96,303
Hawaii (2007)	13,380	21,554	12,479	21,802	7,955	14,066
North Carolina (2007)	173,060	288,649	135,982	220,788	19,570	28,921
Pennsylvania (2007)	251,820	432,095	212,175	392,962	100,318	176,437
Arkansas (2007)	67,740	108,078	69,299	107,957	4,217	5,239
Arizona (2007)	76,340	123,518	89,492	190,403	32,920	69,940
	Average Age	Average Risk Score**	Average Age	Average Risk Score**	Average Age	Average Risk Score**
California (2006)	76.6	1.74	77.5	1.88	77.5	1.83
California (2007)	75.8	1.72	77.4	1.86	77.5	1.81
Nevada (2006)	75.2	1.74	75.9	1.75	74.6	1.60
Nevada (2007)	75.3	1.67	75.8	1.69	74.6	1.52
Washington (2006)	76.6	1.66	76.9	1.64	75.3	1.47
Texas (2007)	76.1	1.75	76.3	1.94	73.9	1.69
Hawaii (2007)	76.6	1.61	77.5***	1.75	79.0***	1.77
North Carolina (2007)	76.1	1.67	76.2	1.62	74.1	1.48
Pennsylvania (2007)	77.4	1.72	79.4	1.85	78.0	1.76
Arkansas (2007)	76.0	1.60	76.3	1.56	72.3	1.24
Arizona (2007)	75.9	1.62	76.1	2.13	76.3	2.12

Source: AHIP Center for Policy and Research. Based on state hospital discharge restricted-access public use datasets (HCUP) compiled by the Agency for Healthcare Research and Quality (AHRQ) and the states of Texas and Pennsylvania.
Note: Shaded cells illustrate questionable results that could indicate problems in the underlying data.
* Counts do not include patients with admissions having out-of-state addresses.
** CMS-style risk scores for FFS and MA enrollees based on age/sex and HCC relative cost values used in Medicare risk adjustment for beneficiaries living in the community, but do not include disease interactive factors, or factors related to disability or institutional status. Risk scores based only on diagnoses associated with inpatient hospital care, and only for persons with at least one admission. Risk score method based on http://www.cms.hhs.gov/MedicareAdvtgSpecRateStats/. Accessed March 19, 2009.
*** Estimated by AHIP based on AHRQ data for Hawaii ages specified in 5-year age bands.

Table 6. Same-Quarter Readmissions (Any DRG) and Alternative Risk Scores, Medicare Advantage vs. FFS

	Risk Measure (MA vs. FFS)		Comparison of Any DRG Readmission Rate, Persons with an Admission (MA vs. FFS)	
	CMS-Style*	Readmission Probability-Based**	CMS-Style*	Readmission Probability-Based**
California (2006)	-2.6%	-4.3%	-25%	-23%
California (2007)	-2.7%	-4.1%	-21%	-20%
Nevada (2006)	-8.2%	-6.8%	-23%	-24%
Nevada (2007)	-10.4%	-7.1%	-21%	-23%
Washington (2006)	-9.9%	-3.5%	-20%	-26%
Texas (2007)	-12.8%	-4.1%	-17%	-25%
North Carolina (2007)	-9.0%	-1.6%	-16%	-22%
Pennsylvania (2007)	-5.0%	-2.2%	0%	-3%
Hawaii (2007)	1.2%	-1.0%	-3%	-1%
Arkansas (2007)	-20.3%	-6.8%	-34%	-44%
Arizona (2007)	-0.1%	-0.8%	4%	5%

Source: AHIP Center for Policy and Research. Based on state hospital discharge restricted-access public use datasets (HCUP) compiled by the Agency for Healthcare Research and Quality (AHRQ) and the states of Texas and Pennsylvania.
Note: The shadings represent our subjective assessment of the reliability of the MA vs. FFS comparisons based on issues with the underlying datasets. In general, we believe the comparisons for California are highly reliable, and the data from Arizona, Arkansas, and Hawaii are not very reliable.
* CMS-style risk scores for FFS and MA enrollees based on age/sex and HCC relative cost values used in Medicare risk adjustment for beneficiaries living in the community, but do not include disease interactive factors, or factors related to disability or institutional status. Person-based risk scores are based on inpatient hospital diagnoses for all admissions, but do not include diagnosis information from other health care services, such as hospital outpatient or physician office visits. Relative risk ratios for patients with an admission were used to adjust the per-enrollee results.
** Risk measure based on an index of the likelihood of admissions for DRGs that are associated with higher or lower than average rates of readmissions (any DRG).

low but increasing rapidly – such as Texas, North Carolina, and Arkansas – have considerably lower risk scores in MA, possibly because new enrollees would not tend to be in the middle of complex episodes of care represented in the HCC groups. The risk scores in the Arizona state FFS data are suspiciously high compared with risk scores computed comparably (based on hospital inpatient stays only) from the 5 percent FFS sample claims file. Likewise, we cannot explain why the average age of FFS patients in the Pennsylvania state dataset is two years higher than that indicated in the FFS 5 percent sample file.

The CMS-style risk scores are designed to predict or control for risk of health care costs. We believe this is a good all-purpose risk adjuster for comparisons of FFS and MA enrollees. However, it is not necessarily an indicator of the risk of a specific element of utilization, such as risk of hospital readmission. An alternative risk indexing process based on observed likelihoods of readmissions for each DRG is shown in Table 6; however, the impact on risk-adjusted comparison of readmission rates is not large.

Appendix B provides detailed examples and reference information on the computation of HCCs and CMS-style risk scores. Appendix C provides

Table 7. Same-Quarter Readmissions, FFS and Medicare Advantage in Nine States

	Any DRG		Same DRG	
	All	No Transfers	All	No Transfers
	Fee-for-Service (5 Percent Sample File)			
California (2006)	123,320	112,460	19,880	17,740
California (2007)	125,160	114,440	18,560	16,060
Nevada (2006)	13,320	11,920	2,040	1,740
Nevada (2007)	14,280	12,640	1,900	1,460
Washington (2006)	27,100	24,180	3,260	2,820
Texas (2007)	161,520	146,560	23,020	20,100
Hawaii (2007)	3,580	3,280	500	460
North Carolina (2007)	61,540	54,400	9,100	7,580
Pennsylvania (2007)	107,260	95,320	14,500	11,800
Arkansas (2007)	30,380	27,100	4,520	3,840
Arizona (2007)	28,540	25,660	3,460	2,900
	Fee-for-Service (State Discharge Data)			
California (2006)	134,514	121,913	22,543	17,525
California (2007)	125,929	118,537	19,628	18,113
Nevada (2006)	9,642	8,841	1,378	1,215
Nevada (2007)	8,209	7,545	1,106	980
Washington (2006)	23,762	21,438	3,719	3,260
Texas (2007)	125,263	115,109	22,423	19,888
Hawaii (2007)	3,009	2,718	555	520
North Carolina (2007)	36,929	33,494	5,546	4,919
Pennsylvania (2007)	78,867	71,614	10,717	9,239
Arkansas (2007)	33,636	29,976	5,345	4,492
Arizona (2007)	18,665	17,840	2,350	2,235
	Medicare Advantage (State Discharge Data)			
California (2006)	49,610	42,683	8,863	6,484
California (2007)	46,023	42,702	7,521	6,800
Nevada (2006)	3,050	2,849	384	360
Nevada (2007)	2,506	2,344	324	305
Washington (2006)	2,706	2,518	446	410
Texas (2007)	15,126	13,975	2,826	2,596
Hawaii (2007)	1,885	1,704	324	292
North Carolina (2007)	4,006	3,697	569	518
Pennsylvania (2007)	35,219	32,163	4,827	4,287
Arkansas (2007)	1,072	959	153	130
Arizona (2007)	7,032	6,820	914	885

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge restricted-access public use datasets provided by AHRQ and the states (PA, TX), and the FFS 5 percent sample file.
Note: Persons with out-of-state addresses are excluded from the state discharge data.

detailed information and examples from the computation of DRG-based risk indexes.

Defining Readmissions and Readmission Rates. Readmission rates can be defined in many ways, and some definitions may be better suited for different purposes. We find that virtually any definition "works" for the broad purpose of evaluating health plan performance, such as comparing Medicare Advantage and traditional Medicare FFS. Nevertheless, some definitions may be better suited for evaluating hospital performance than others.

Readmissions can be measured for the same DRG, any DRG, or particular sets of DRGs. The same DRG concept might miss some readmissions for complications related to an initial admission, such as a readmission for pneumonia where the infection was acquired in a prior admission for surgery.[16] On the other hand, the any DRG measure undoubtedly captures many coincidental readmissions that are clinically unrelated to a prior admission. However, when comparing readmission rates for MA and FFS Medicare, the distinction does not seem to matter very much – the percentage differences between MA and FFS readmission rates tend to be about the same for any DRG and same DRG readmissions in all the states studied. Because DRG numbers are added or subtracted with each new version (sometimes annually), it is often considerably more complicated to study sets of DRGs or to make exclusions for particular types of hospitalizations, especially in a multi-year analysis. For this report we have used the same DRG and any DRG concepts simply because they are easiest.

Table 7 shows the total numbers of same-quarter readmissions in the studied states, with and without the exclusion of transfer cases. Transfer cases are very important when studying readmission rates on a hospital-by-hospital basis, because one would not want to "blame" a hospital for a readmission that was actually a transfer to another hospital. Since some hospitals may be much more likely to transfer patients or receive transferred patients than others, not excluding transfer cases when studying hospital-by-hospital readmission counts could bias the results.

However, when comparing readmission rates for large populations, such as our comparisons of MA and FFS enrollees or patients with an admission, we find that the choice of whether to exclude transfer cases in the same-quarter readmission counts does not seem to have a large impact. In effect, MA and FFS patients are transferred at approximately the same rates. For example, Table 8 shows comparisons of various readmission rates for MA and FFS in California in 2006, with and without transfer cases. Nevertheless, unless otherwise specified in this report, the readmission counts, rates, and comparisons shown exclude transfer cases.[17]

With the exception of the Texas data, the state discharge data do not allow computation of 30-day, 60-day, or 90-day hospital readmissions (the typical computations used in hospital performance measures) because the data available to us do not show specific dates of service. However, the state discharge data in each state report the calendar quarter in which admissions occurred. Thus, we mostly compare same-quarter readmission rates, which can be computed from any of the state datasets and from the FFS 5 percent sample file. Our method of counting same-quarter readmissions is simply to count all the admissions in the quarter less one.

We find that the same-quarter readmission rates appear to be very much in line with 30-day, 60-day, or 90-day readmission rates. The Texas data available to us have dates of admission and discharge. Table 9 compares our same-quarter readmission rates with the more customary 30-day,

Table 8. Same-Quarter Readmission Rates, with and without Transfers, Medicare Advantage vs. FFS, California 2006

	Any DRG		Same DRG	
	All	No Transfers	All	No Transfers
	Per Estimated Enrollee*			
FFS (state discharge data)	6.3%	5.7%	1.1%	0.8%
MA (state discharge data)	4.0%	3.4%	0.7%	0.5%
MA vs. FFS	-37%	-40%	-33%	-37%
	Per Admission			
FFS (state discharge data)	22.3%	20.2%	3.7%	2.9%
MA (state discharge data)	18.9%	16.3%	3.4%	2.5%
MA vs. FFS	-15%	-19%	-10%	-15%
	Per Person with an Admission			
FFS (state discharge data)	36.5%	33.1%	6.1%	4.8%
MA (state discharge data)	28.2%	24.3%	5.0%	3.7%
MA vs. FFS	-23%	-27%	-17%	-22%

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge restricted-access public use data from the Agency for Healthcare Research and Quality (AHRQ).
* Enrollment estimated by AHIP for FFS and MA for the 65-89 population based on enrollment data from CMS and other sources.

Table 9. Same-Quarter Readmission Rates and Readmission Rates from Date of Discharge, Medicare Advantage vs. FFS, Texas 2007

	Readmission Rate, Same-Quarter (Any DRG)	Readmission Rate from Discharge Date (Any DRG)		
		30-Days	60-Days	90-Days
	per Enrollee (with CMS-style Risk Adjustment)			
FFS (state discharge data)	5.8%	5.3%	7.0%	8.1%
MA (state discharge data)	4.5%	4.0%	5.4%	6.1%
MA vs. FFS	-23%	-24%	-24%	-24%
	per Person with an Admission (with Risk Adjustment Based on DRGs)			
FFS (state discharge data)	33.2%	30.1%	40.2%	46.1%
MA (state discharge data)	25.0%	22.2%	29.8%	34.0%
MA vs. FFS	-25%	-26%	-26%	-26%
	per Admission (Unadjusted)			
FFS (state discharge data)	20.5%	19.0%	25.4%	29.1%
MA (state discharge data)	16.7%	15.0%	20.2%	23.1%
MA vs. FFS	-19%	-21%	-20%	-21%
	per Admission (with Risk Adjustment Based on DRGs)			
FFS (state discharge data)	20.1%	18.6%	24.8%	28.5%
MA (state discharge data)	17.1%	15.4%	20.6%	23.6%
MA vs. FFS	-15%	-17%	-17%	-17%

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge data provided by the state of Texas.
Note: The denominator for these per-admission readmission rates includes all discharges during the year (and a few admissions that carried over from the prior year), not a specified set of "initial" admissions to be followed. Readmission rates exclude transfer cases.

60-day, and 90-day readmission rates for Texas patients in 2007. The table shows readmission rates per-enrollee (which are lower since many enrollees do not have a hospitalization in the first place) with a CMS-style risk adjustment, per person with an admission (with risk adjustment based on the overall distribution of MA and FFS admissions and their likelihood of readmission), per-admission without risk adjustment (which is how overall readmission rates are often reported), and per-admission with risk adjustment again based on the distribution of admissions. These various measures show similar results, although we find that in general, the per-enrollee readmission rates tend to show greater differences between MA and FFS because MA enrollees seem to have fewer "initial" admissions in the first place.

Potentially Avoidable Admissions. Potentially avoidable admissions were defined by AHRQ in 13 disease categories: dehydration, bacterial pneumonia, urinary tract infection, hypertension, angina, perforated appendix, asthma, uncontrolled diabetes, diabetes with short-term complications, diabetes with long-term complications, congestive heart failure, chronic obstructive pulmonary disease, and lower extremity amputation for patients with diabetes.[18] Appendix D provides details on the process for computing potentially avoidable admissions.

ISSUES WITH DATA FROM STATE HOSPITAL DISCHARGE DATASETS

In general, the California data seem very complete and consistent across both 2006 and 2007. For a variety of reasons, we believe that the data available from other states may be more problematic. In Arizona, in particular, potential problems with person IDs, risk scores, out-of-state admissions, and sub-state enrollment patterns probably make the comparisons in that state unreliable. In Arkansas, the state dataset seems good in many respects, but there are probably too few MA patients to be sure the comparisons are sound. We continue to investigate the Pennsylvania dataset, but we suspect that a combination of a known problem identifying MA enrollees, and issues with out-of-state admissions, missing data, and local or sub-state enrollment patterns may affect validity of the comparisons.

Issues with Out-of-State Patients, Part-Year Residents and "Snowbird" Retirees. We believe that FFS enrollees are more likely to live in multiple states for parts of the year, and would be more likely to have hospital admissions or readmissions in more than one state. For example, "snowbird" retirees may spend summers in the Northeastern states and winters in the South. Yet because MA plans may have limited out-of-area coverage, we believe that snowbirds and other retirees who maintain homes in multiple states would be less likely to choose MA plans. Thus simply tallying the "in-state" admissions for state-identified person IDs could substantially understate FFS admissions or readmissions relative to MA.

In this report, we exclude person IDs whose admissions were coded with an out-of-state address (we call these "inbound snowbirds"). When analyzing single-state data, however, we cannot know whether residents of the state may have admissions or readmissions in other states. (This includes other states whose data we have, since the person IDs are not the same from state to state.) Thus we have no way of identifying or controlling for "outbound snowbirds" or patients admitted in other states.

Excluding inbound snowbirds alone makes a small but noticeable difference in several states (see Table 10). In California, the MA vs. FFS results were mostly unaffected by excluding any inbound

snowbirds. Texas, Washington and North Carolina also show little to no impact. However, in Nevada, the results for MA improved compared with FFS for three measures when inbound snowbirds were excluded: risk-adjusted inpatient days, any DRG readmissions, and potentially avoidable admissions per person with an admission. In Hawaii and Pennsylvania, MA results improved on all measures compared with FFS, including improvements of 3 or 4 percentage points for readmissions in Hawaii, and 2 or 3 percentage points for readmissions and potentially avoidable admissions in Pennsylvania.

We believe the inability to exclude or control for outbound snowbirds could also substantially affect the comparison results, especially in Hawaii and Pennsylvania, likely understating FFS admissions and readmissions relative to MA. (The comparison results could also be affected in Arizona, although possible problems with the person IDs in that state, discussed below, may overwhelm the impact of out-of-state admissions.)

One curiosity regarding the Hawaii and Pennsylvania data is that those were the only two states whose MA patients had more admissions per estimated enrollee than FFS (with or without risk adjustment). This is a result not seen in any of the 18 areas compared in the comprehensive studies. Table 11 shows admissions per estimated enrollee (without risk adjustment) and MA vs. FFS percentage difference in rates with and without risk adjustment.

Table 10. Comparison of Medicare Advantage and FFS Utilization Before and After Exclusion of Patients with Admissions with Out-of-State Addresses ("Inbound Snowbirds"), Selected States

	Inpatient Days	Same-Quarter, Any DRG Readmissions*	Same-Quarter, Same DRG Readmissions*	13 Potentially Avoidable Admissions
	MA Rate vs. FFS Rate (Patients with at Least One Admission, per Risk Score** Value)			
California (2006)				
Including "Inbound Snowbirds"	-30%	-24%	-20%	-6%
Excluding "Inbound Snowbirds"	-30%	-25%	-20%	-8%
North Carolina (2007)				
Including "Inbound Snowbirds"	4%	-16%	-19%	-5%
Excluding "Inbound Snowbirds"	4%	-16%	-20%	-6%
Nevada (2006)				
Including "Inbound Snowbirds"	-23%	-21%	-29%	-6%
Excluding "Inbound Snowbirds"	-24%	-23%	-29%	-9%
Hawaii (2007)				
Including "Inbound Snowbirds"	-5%	1%	-9%	2%
Excluding "Inbound Snowbirds"	-7%	-3%	-13%	1%
Pennsylvania (2007)				
Including "Inbound Snowbirds"	4%	2%	5%	7%
Excluding "Inbound Snowbirds"	4%	0%	3%	4%

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge restricted-access public use datasets provided by AHRQ and the state of Pennsylvania.
* Excludes transfer cases.
** CMS-style risk scores for FFS and MA enrollees based on age/sex and HCC relative cost values used in Medicare risk adjustment for beneficiaries living in the community, but do not include disease interactive factors, or factors related to disability or institutional status. Person-based risk scores are based on inpatient hospital diagnoses for all admissions, but do not include diagnosis information from other health care services, such as hospital outpatient or physician office visits. Relative risk ratios for patients with an admission were used to adjust the per-enrollee results.

We believe the lack of a way to exclude outbound snowbirds may be an important reason for that anomaly, especially in Hawaii but also in Pennsylvania. Another reason may be related to the MCBS percentages used in estimating the share of MA patients age 65-89 in the states. In Pennsylvania, the MCBS indicates an unusually high (and perhaps incorrect) percentage of MA enrollees who were over age 89 or under age 65 (over 20 percent). Thus, we may have underestimated MA enrollment in Pennsylvania, which would cause the per-enrollee MA utilization rates shown in Table 11 to be overestimated. In general, we have attempted to err on the side of potentially underestimating FFS utilization rates and potentially overestimating MA utilization, so as not to possibly exaggerate the MA vs. FFS differences.

Validity of Multiple Admission Codes. AHRQ and the states providing discharge data run various tests to make sure that the multiple admission codes correctly link admissions to the same (de-identified) patient. These tests include looking at the age, sex, address and other variables associated with a unique patient. Although there may be some coding errors, and people do move from time to time, these tests can help assure that multiple admission codes correctly link admissions for the same patient.[19]

However, we have no easy test to ensure that the same patient is not inadvertently given more than one multiple admission code in the discharge data. If fact, we believe this could be the case in several states.

Table 11. Hospital Admissions per Estimated Enrollee, Medicare Advantage vs. FFS

	Admissions per Estimated Enrollee* (Not Risk-Adjusted)		MA Rate vs. FFS Rate	
	FFS	MA	Without Risk Adjustment	With CMS-Style Risk Adjustment**
California (2006)	0.28	0.21	-26%	-24%
California (2007)	0.26	0.20	-24%	-22%
Nevada (2006)	0.28	0.23	-18%	-11%
Nevada (2007)	0.24	0.20	-17%	-7%
Washington (2006)	0.26	0.15	-40%	-34%
Texas (2007)	0.30	0.25	-17%	-5%
Hawaii (2007)	0.18	0.19	3%	2%
North Carolina (2007)	0.23	0.18	-24%	-17%
Pennsylvania (2007)	0.29	0.30	1%	6%
Arkansas (2007)	0.38	0.16	-58%	-47%
Arizona (2007)	0.27	0.21	-24%	-24%

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge restricted-access public use datasets provided by AHRQ and the states (PA, TX).
Note: Some states, especially North Carolina, and Pennsylvania, had far fewer FFS admissions than expected in the state datasets, compared with data from the Medicare FFS 5 percent sample file. Thus the rates of admissions per estimated enrollee in this table might be low for those states. Shaded rows illustrate Hawaii and Pennsylvania as the only states with higher estimated admissions per enrollee in MA.
* Enrollment estimated by AHIP for FFS and MA for the 65-89 population based on CMS program data.
** CMS-style risk scores for FFS and MA enrollees based on age/sex and HCC relative cost values used in Medicare risk adjustment for beneficiaries living in the community, but do not include disease interactive factors, or factors related to disability or institutional status. Person-based risk scores are based on inpatient hospital diagnoses for all admissions, but do not include diagnosis information from other health care services, such as hospital outpatient or physician office visits. Relative risk ratios for patients with an admission were used to adjust the per-enrollee results.

Table 12 shows distributions of the likelihood of one or more admissions in the FFS data from the 5 percent sample file vs. FFS data from the state discharge data. In California and Arkansas, the state discharge data and the 5 percent sample data produce nearly identical distributions. In most of the other states, the state discharge data have slightly higher rates of one admission, and slightly lower rates of more than one admission. This could be because some patients were inadvertently given more than one multiple admission code, or because there are large numbers of in-state residents who had one or more out-of-state admissions. However, the distributions for Washington, Nevada, Texas, Hawaii, and North Carolina are not identical, but not so dissimilar as to suspect that the codes are terribly wrong.

The Arizona distributions, on the other hand, are very different. In Arizona, the multiple admission codes in the state data indicated much lower percentages of multiple admissions than the FFS 5 percent sample data showed. Likewise, the state data indicated a much higher percentage of patients with only one admission. This seems to be due to some problem with the multiple admission codes that likely goes beyond the in-state/out-of-state issue described above.

We suspect that the problem with multiple admission codes in Arizona is more likely to affect FFS patients than MA patients. This is because we believe that the underlying cause of the coding error is likely to be incompatible codes across hospitals, and that FFS patients in the state would be more likely to have admissions in different hospitals. Thus we may be substantially understating the numbers of FFS readmissions – in effect, the Arizona coding problems may have caused us to count a new person instead of a readmission in many cases.

Possible Missing Data. Table 13 compares the numbers of admissions found in the state datasets with the Medicare 5 percent sample file. This is not a perfect comparison, since the Medicare files are based on persons residing in a state and the state data are based on admissions in the state (although we have excluded persons with out-of-state addresses).

The state data in California, Washington, and Arkansas reported numbers of FFS admissions and persons with an admission quite close to the numbers indicated in the CMS FFS 5 percent sample file. However, in Nevada, Texas, and Hawaii, there were about 10 percent fewer admissions reported in the state data than in the FFS 5 percent sample, and in North Carolina and Pennsylvania there were about 20 percent fewer admissions. (In Arizona, the number of admissions reported in the state data was very close to the FFS 5 percent sample file, but the number of persons with an admission was much higher. We believe this is due to problems with the multiple admission tracking codes in Arizona – possibly because different codes may have been assigned to the same person with multiple admissions in the state.)

We do not know if these possibly missing data cause the results to be biased toward either FFS or MA. We are investigating whether the missing data may be related to particular hospitals or locations within the state.

Identification of MA Enrollees. In California, Texas, Hawaii, and Arizona, there are relatively straight-forward codes in the state datasets to indicate whether patients admitted to hospitals were enrolled in MA or traditional Medicare FFS. However, in Nevada, Washington, North Carolina and Arkansas, we must infer the MA enrollees. To identify MA enrollees, we assumed that privately insured patients

Table 12. A Test for the Validity of Multiple Admission Tracking Codes: Distributions of Numbers of FFS Admissions per Patient, CMS FFS 5 Percent Sample File vs. State Discharge Datasets

	CA	NV	WA	TX	NC	PA	HI	AR	AZ
Year Analyzed	2006	2006	2006	2007	2007	2007	2007	2007	2007
	Percentages of Patients with Certain Numbers of Admissions								
1 Admission									
FFS 5 Percent Sample	64.3%	61.8%	67.2%	59.5%	63.7%	60.0%	69.4%	58.5%	63.6%
FFS HCUP	64.7%	67.1%	70.6%	63.7%	69.3%	62.1%	71.5%	59.0%	76.3%
Percentage Difference	1%	9%	5%	7%	9%	4%	3%	1%	20%
2 Admissions									
FFS 5 Percent Sample	20.9%	21.9%	20.8%	22.4%	21.4%	22.4%	20.5%	23.7%	21.4%
FFS HCUP	21.0%	20.0%	19.1%	21.5%	19.3%	22.0%	18.4%	22.9%	15.9%
Percentage Difference	0%	-9%	-8%	-4%	-10%	-2%	-10%	-3%	-26%
3 Admissions									
FFS 5 Percent Sample	7.9%	8.0%	7.1%	9.1%	8.1%	9.2%	5.4%	8.7%	7.8%
FFS HCUP	7.7%	7.3%	6.3%	8.1%	6.7%	8.6%	6.1%	9.1%	4.7%
Percentage Difference	-3%	-9%	-12%	-11%	-18%	-6%	13%	4%	-39%
4 Admissions									
FFS 5 Percent Sample	3.5%	4.1%	2.8%	4.5%	3.4%	4.2%	2.7%	4.7%	4.0%
FFS HCUP	3.4%	3.0%	2.3%	3.5%	2.6%	3.8%	2.2%	4.4%	1.8%
Percentage Difference	-4%	-26%	-17%	-22%	-24%	-9%	-19%	-7%	-55%
5 Admissions									
FFS 5 Percent Sample	1.6%	1.8%	1.1%	2.1%	1.7%	2.1%	1.0%	2.4%	1.7%
FFS HCUP	1.6%	1.3%	1.0%	1.6%	1.2%	1.7%	0.9%	2.2%	0.7%
Percentage Difference	-2%	-24%	-10%	-22%	-33%	-17%	-15%	-7%	-57%
6 Admissions									
FFS 5 Percent Sample	0.8%	0.8%	0.5%	1.1%	0.6%	0.9%	0.7%	1.1%	0.9%
FFS HCUP	0.8%	0.7%	0.4%	0.8%	0.5%	0.8%	0.5%	1.1%	0.3%
Percentage Difference	-1%	-13%	-26%	-30%	-21%	-6%	-29%	4%	-63%
Overall Confidence in the Validity of the Person IDs	High	Medium	Medium	Medium	Medium	Medium	Medium	High	Not Much

Source: AHIP Center for Policy and Research. Based on analysis of state hospital discharge restricted-access public use datasets provided by AHRQ's HCUP project (CA, NV, WA, HI, NC, AR, AZ) and by states directly (PA, TX), and CMS FFS 5 percent claims samples in those states.
Notes: Excludes patients with admissions listed as having out-of-state addresses.

Table 13. Comparing Observed Admissions, FFS State Data vs. CMS FFS 5 Percent Sample Files

	State Data as a Percent of CMS 5 Percent Sample File	
	Admissions	Persons with an Admission
California (2006)	104%	104%
California (2007)	99%	101%
Nevada (2006)	87%	96%
Nevada (2007)	80%	93%
Washington (2006)	99%	103%
Texas (2007)	87%	93%
Hawaii (2007)	91%	93%
North Carolina (2007)	72%	79%
Pennsylvania (2007)	81%	84%
Arkansas (2007)	103%	102%
Arizona (2007)	98%	117%

Source: AHIP Center for Policy and Research. Based on data from the state hospital discharge restricted-access public use datasets from AHRQ, PA, TX. Excludes patients with admissions listing out-of-state addresses. Note: The Arizona data is suspect not because of missing admissions, but because there appear to be too many person IDs per admission in the state, possibly due to problems with creating person IDs for people with multiple admissions in the year (incorrectly assigning separate IDs to the same person).

over age 65 had MA coverage. Of course, some of these "MA" enrollees may still have full time jobs, and their employer coverage might not be an MA plan in some cases. Our feeling is that these patients' plans are probably similar to the coverage they would receive under MA, so the broader private plan vs. FFS comparisons would remain valid, especially with risk adjustment (since working seniors may be healthier than those who have retired). In Pennsylvania, the coding of MA vs. FFS is more difficult. In consultation with the state data experts, we believe that the state data may not be able to distinguish between traditional FFS and MA's private fee-for-service (PFFS) coverage in some cases. It is unclear how this could affect the results, but it is an indication that the Pennsylvania data may need further study.[20]

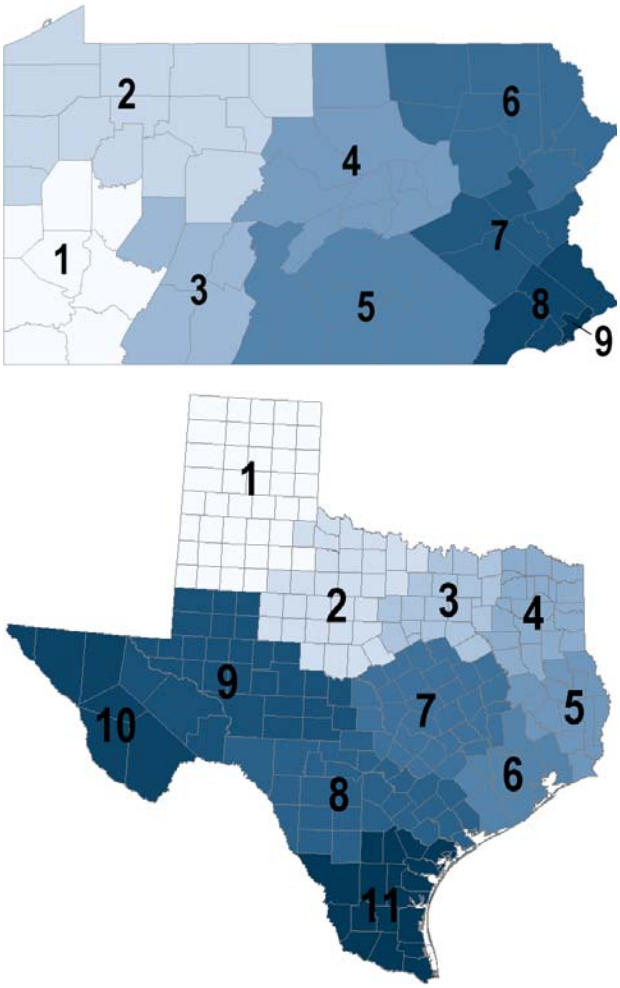
In Hawaii, we classified HMSA (the state's Blue Cross plan) as an MA plan, along with the local Kaiser Foundation plan. However, HMSA is not a risk-based MA plan receiving capitation payments; instead, it operates as Medicare "cost" plan. As a result, HMSA does not necessarily have the same powerful incentive to manage patients' care to avoid readmissions as a risk-based MA plan.

Strikingly, when we reclassified Hawaii's MA enrollment to include only Kaiser Foundation coverage, the Hawaii MA vs. FFS comparisons were quite different. Risk-adjusted (CMS-style) readmission rates for any DRG, went from 3 percent lower than FFS (per person with an admission) when both HMSA and Kaiser were classified as MA to 17 percent lower than FFS when only Kaiser was classified as MA. Part of the difference was that Kaiser's risk scores were higher than FFS when considered separately (risk scores in FFS and MA were about the same when both HMSA and Kaiser were classified as MA). However, the main part of the difference was that Kaiser's unadjusted readmission rates were considerably lower than FFS.

Appendix E details the MA and FFS identification codes used in each state's dataset.

Sub-State Geographic Composition of Enrollment. Health care markets are local, and many states have many local markets with very different characteristics of cost and local practice patterns. However, MA and FFS enrollees may not be evenly distributed throughout a state's health market areas. Some local health market areas may have high percentages of MA enrollees and other areas may have relatively few. Therefore, comparisons of MA and FFS are best done in local markets, to control for the possibility that the distribution of MA and FFS enrollment within sub-areas of the states could

Figure 1. Hospital Regions in Pennsylvania and Texas



Source: AHIP Center for Policy and Research. Based on data from Texas Department of State Health Services and Pennsylvania Health Care Cost Containment Council.

explain the results, not the type of health insurance the enrollees have.

In large states, we have conducted a preliminary analysis of the impact of where the MA and FFS enrollees live, to determine if the distribution of enrollment could affect the statewide comparisons. For example, Figure 1 shows state hospital regions provides in the Pennsylvania and Texas datasets. Tables 14 and 15 show readmission rate comparisons between MA and FFS within these sub-regions of the state.

In California, Texas, and North Carolina, a preliminary analysis of sub-state areas shows MA vs. FFS differences in readmission rates in most regions are similar to the statewide results.[21] In Pennsylvania, however, local or sub-state enrollment patterns make the statewide comparisons different from those in particular regions. For example, in Pennsylvania, we observed that most MA enrollees lived in higher readmission areas; thus, while MA readmission rates were lower than FFS readmission rates in most regions of the state, the statewide comparisons were about the same. In Texas, for example, the rates of readmissions were more similar from region to region, and the MA vs. FFS differences in each region were similar to the statewide differences.

Another interesting example comes from another state with hard-to-interpret results: Arizona, where the per-enrollee results are very different from the results based on the person IDs in the state discharge data. The AHRQ data file for Arizona contains a variable for geo-coded income quartile. Each admission is coded with a proxy measure for the patient's income quartile based on the observed incomes of the neighborhoods where they live.

In Phoenix and Tucson, where most MA enrollees reside, patients in the MA plans have a much higher likelihood of being in the lowest income quartile, and a much lower likelihood of being in the highest income quartile (see Table 16). However, since FFS enrollees outside of those two cities tend to have very low incomes, the overall state average income is closer to equal between MA and FFS. The composition of statewide coverage patterns is the difference.

Table 14. Admissions and Same-Quarter Readmissions and Rates (Any DRG) by Sub-State Region, Pennsylvania 2007

	FFS		MA	
	Admissions	Readmissions	Admissions	Readmissions
Pennsylvania Hospital Regions				
1 Pittsburgh Area	68,334	15,779	64,642	13,004
2 Erie and Northwest	31,694	6,184	7,824	1,393
3 Southwest-Central	13,041	2,569	7,996	1,375
4 North Central	17,775	3,079	6,230	1,005
5 Harrisburg/Lancaster	56,935	10,005	5,538	971
6 Scranton and Northeast	33,613	6,113	2,790	396
7 Allentown Area	45,042	8,697	6,198	1,122
8 Philadelphia Suburbs	57,517	11,905	33,697	6,465
9 Philadelphia City	32,259	7,290	30,209	6,432
Total (Statewide)	356,210	71,621	165,124	32,163

	Readmission Rate (per Admission, Unadjusted)		
Pennsylvania Hospital Regions	FFS	MA	Percentage Difference
1 Pittsburgh Area	23.1%	20.1%	-13%
2 Erie and Northwest	19.5%	17.8%	-9%
3 Southwest-Central	19.7%	17.2%	-13%
4 North Central	17.3%	16.1%	-7%
5 Harrisburg/Lancaster	17.6%	17.5%	0%
6 Scranton and Northeast	18.2%	14.2%	-22%
7 Allentown Area	19.3%	18.1%	-6%
8 Philadelphia Suburbs	20.7%	19.2%	-7%
9 Philadelphia City	22.6%	21.3%	-6%
Total (Statewide)	20.1%	19.5%	-3%

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge restricted-access public use data provided by the state of Pennsylvania.
Note: Persons with out-of-state addresses are excluded from the state discharge data. For simplicity, readmissions were allocated to the hospital region of the admission flagged as a readmission, and same-quarter readmissions were flagged based on their sequence in the data file. Thus the sum of readmissions in the regions equals the reported state total.

Table 15. Admissions and Same-Quarter Readmissions and Rates (Any DRG), by Sub-State Region, Texas 2007

	FFS		MA	
	Admissions	Readmissions	Admissions	Readmissions
Texas Hospital Regions				
1 Amarillo Area	28,351	5,689	1,782	299
2 North Central	23,120	4,722	1,070	189
3 Dallas Area	126,659	25,205	26,913	4,573
4 Northeast	44,585	8,753	2,743	402
5 Southeast	30,795	6,502	3,243	495
6 Houston Area	103,324	22,079	21,954	3,728
7 Austin/ E. Central	60,915	12,112	4,098	634
8 San Antonio/ S. Central	61,458	13,018	13,713	2,334
9 Midland-Odessa Area	16,051	3,042	1,014	163
10 El Paso Area	15,644	3,087	3,777	637
11 S. Rio Grande Valley	50,123	10,748	3,287	510
Total (Statewide)*	561,459	115,109	83,656	13,975

	Readmission Rate (per Admission, Unadjusted)		
Texas Hospital Regions	FFS	MA	Percentage Difference
1 Amarillo Area	20.1%	16.8%	-16%
2 North Central	20.6%	17.7%	-14%
3 Dallas Area	19.9%	17.0%	-15%
4 Northeast	19.6%	14.7%	-25%
5 Southeast	21.1%	15.3%	-28%
6 Houston Area	21.4%	17.0%	-21%
7 Austin/ E. Central	19.9%	15.5%	-22%
8 San Antonio/ S. Central	21.2%	17.0%	-20%
9 Midland-Odessa Area	19.0%	16.1%	-15%
10 El Paso Area	19.7%	16.9%	-15%
11 S. Rio Grande Valley	21.4%	15.5%	-28%
Total (Statewide)*	20.5%	16.7%	-19%

Source: AHIP Center for Policy and Research. Estimates based on state hospital discharge restricted-access public use data provided by the state of Texas.
Note: Persons with out-of-state addresses are excluded from the state discharge data. For simplicity, readmissions were allocated to the hospital region of the admission flagged as a readmission, and same-quarter readmissions were flagged based on their sequence in the data file. Thus the sum of readmissions in the regions equals the reported state total.
* A small number of admissions and readmissions had missing location information (434 FFS admissions and 102 FFS readmissions; 62 MA admissions and 11 MA readmissions). These observations were included in the statewide total.

Table 16. Comparison of Geo-Coded Incomes of MA and FFS Admissions in Arizona

	FFS	MA
	Percent of Admissions Associated with the Lowest Income Quartile	
Arizona	28%	27%
Phoenix	13%	23%
Tucson	26%	40%
Rest of State	47%	51%
	Percent of Admissions Associated with the Highest Income Quartile	
Arizona	22%	18%
Phoenix	32%	20%
Tucson	27%	9%
Rest of State	7%	8%

Source: AHIP Center for Policy and Research. Based on data from the Arizona state hospital discharge dataset (AHRQ-HCUP).

DISCUSSION AND ONGOING RESEARCH

With each new study, it seems increasingly clear that MA plans are able to reduce risk-adjusted readmission rates by substantial amounts relative to FFS, in both higher- and lower-performance localities and via both nonprofit and for-profit health plans. The new data presented in this report continue to increase our confidence in the validity of AHIP's MA vs. FFS comparisons. We continue to observe that in many states and local areas, MA plans' risk-adjusted hospital readmission rates are much lower.

AHIP's reports and working papers comparing MA and FFS utilization patterns have gradually broadened and deepened both the data and the concepts measured. AHIP's original "8 company" working paper was based mostly on local or regional MA plans, which were mostly non-profit HMOs; the second expanded the analysis to two larger, multi-state for-profit plans.

Although we are not satisfied that the underlying data from some of the states presented in this report are reliable in all cases, these results continue to show consistent overall patterns. These patterns are also consistent with new research from Johns Hopkins and MedAssurant, Inc.

Having developed these comparative metrics for managed care vs. fee-for-service, we are looking forward to the next steps. In the immediate future, we are interested in expanding the analysis of state discharge data to local areas within states.
We are also exploring ways to measure how health plans are able to reduce avoidable admissions and readmissions. In particular, we are interested in studying medication reconciliation post hospital discharge, in collaboration with Dr. Sennett and MedAssurant.

AHIP is also preparing a new report on health plan programs to reduce preventable hospital admissions, readmissions, and avoidable emergency room visits.[22] We are finding that readmissions can be avoided through improved discharge planning, rapid medical follow-up, medication reconciliation, help in addressing barriers to care, and coordination with primary care clinicians.

These data on hospital readmissions and avoidable admissions are encouraging in some respects, but discouraging in others. Dr. Jencks' study of readmissions in FFS Medicare found that in half of the readmissions that occurred within 30 days, there was no physician visit billed in the interim. Of course, some hospital readmissions may be planned; others may unavoidable or unrelated to any prior admissions. However, many readmissions are due to sequelae related to the care itself, including hospital-acquired infections, pneumonias, or surgical complications. Others could be due to lack of appropriate care in the post-discharge period. Still

others could be avoided through improved primary or specialty care that helps keep patients healthier and out of the hospital in the first place.

Medicare's FFS readmission rates have been roughly constant since the benchmark study done by Anderson and Steinberg in 1984 (examining FFS Medicare data from the mid-1970s). Yet it appears to be both desirable and possible to reduce Medicare's readmission rates. We hope that the statistics and examples flowing from these AHIP reports will help spark a concerted national effort to actually do so.

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ENDNOTES

[1] AHIP Center for Policy and Research, *Reductions in Hospital Days, Readmissions, and Potentially Avoidable Admissions Among Medicare Advantage Enrollees in California and Nevada, 2006* (revised October 2009), http://www.ahipresearch.org/pdfs/CAvsNV.pdf.

[2] The Medicare program started publishing FFS hospital readmission rates relative to average for certain conditions in 2009, and the Patient Protection and Affordable Care Act of 2010 requires CMS to establish a hospital readmissions reduction program beginning in 2013, which would reduce payments to specified hospitals for certain readmissions.

[3] AHIP Center for Policy and Research, *A Preliminary Comparison of Utilization Measures Among Diabetes and Heart Disease Patients in Eight Regional Medicare Advantage Plans and Medicare Fee-for-Service in the Same Service Areas* (working paper, revised September 2009), http://www.ahipresearch.org/pdfs/MAvsFFS.pdf, and AHIP Center for Policy and Research, Comparisons of Utilization in Two Large Multi-State Medicare Advantage HMOs and Medicare Fee-for-Service in the Same Service Areas (working paper December 2009), http://www.ahipresearch.org/pdfs/MAvsFFS-CO9and10.pdf.

[4] Gerard Anderson, "The Benefits of Care Coordination: A Comparison of Medicare Fee-for-Service and Medicare Advantage," report prepared for the Alliance of Community Health Plans (September 1, 2009), http://www.achp.org/policy/health_care_reform/study_of_ma_plans_vs_ffs/index.1.html.

[5] Cary Sennett, Ray Wang, and Jeff Lemieux, Hospital Readmissions in Medicare Advantage and Medicare's Traditional Fee-for-service Program, MedAssurant, Inc./AHIP Center for Policy and Research (discussion draft, May 2010).

[6] AHIP Center for Policy and Research, *Reductions in Hospital Days, Readmissions, and Potentially Avoidable Admissions Among Medicare Advantage Enrollees in California and Nevada, 2006* (revised October 2009), http://www.ahipresearch.org/pdfs/CAvsNV.pdf.

[7] AHIP Center for Policy and Research, *A Preliminary Comparison of Utilization Measures Among Diabetes and Heart Disease Patients in Eight Regional Medicare Advantage Plans and Medicare Fee-for-Service in the Same Service Areas* (working paper, revised September 2009), http://www.ahipresearch.org/pdfs/MAvsFFS.pdf.

[8] AHIP Center for Policy and Research, Comparisons of Utilization in Two Large, Multi-State Medicare Advantage HMOs and Medicare Fee-for-Service in the Same Service Areas (working paper, December 2009), http://www.ahipresearch.org/pdfs/MAvsFFS-CO9and10.pdf.

[9] Gerard Anderson, "The Benefits of Care Coordination: A Comparison of Medicare Fee-for-Service and Medicare Advantage," report prepared for the Alliance of Community Health Plans (September 1, 2009) http://www.achp.org/policy/health_care_reform/study_of_ma_plans_vs_ffs/index.1.html.

[10] Cary Sennett, Ray Wang, and Jeff Lemieux, Hospital Readmissions in Medicare Advantage and Medicare's Traditional Fee-for-service Program, MedAssurant, Inc./AHIP Center for Policy and Research (discussion draft, May 2010). The preliminary MedAssurant results were originally presented at an AHIP conference in November 2009, and compared with FFS readmission rates in 2004 from Jencks, S., Williams, M., and Coleman, E., "Rehospitalizations in the Medicare Fee-for-Service Program," New England Journal of Medicine (April 2, 2009), available at http://content.nejm.org/cgi/content/full/360/14/1418.

[11] See AHRQ's Overview of the State Inpatient Databases at http://www.hcup-us.ahrq.gov/sidoverview.jsp. Texas data are available from the Center for Health Statistics/ Texas Department of State Health Services (www.dshs.state.tx.us/thcic), and Pennsylvania data are provided by the Pennsylvania Health Care Cost Containment Council (www.phc4.org). "The Pennsylvania Health Care Cost Containment Council (PHC4) is an independent state agency responsible for addressing the problem of escalating health costs, ensuring the quality of health care and increasing access to health care for all citizens

regardless of ability to pay. PHC4 has provided data to this entity in an effort to further PHC4's mission of educating the public and containing health care costs in Pennsylvania. PHC4, its agents, and staff, have made no representation, guarantee, or warranty, express or implied, that the data -- financial, patient, payor, and physician specific information -- provided to this entity, are error free, or that the use of the data will avoid differences of opinion or interpretation. This analysis was not prepared by PHC4. This analysis was done by AHIP. PHC4, its agents and staff, bear no responsibility or liability for the results of the analysis, which are solely the opinion of this entity."

Since this study was completed, AHRQ has added supplemental variables to help refine readmission analysis. These supplemental variables will be examined in subsequent AHIP research. These new files are available at: HCUP Supplemental Files for Revisit Analyses. Healthcare Cost and Utilization Project (HCUP). January 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolssoftware/revisit/revisit.jsp.

[12] In the preliminary California study of 2006 data, we linked the California discharge data with data identifying hospitals and hospital groups using financial data from the state of California's OSHPD datasets. The Nevada state admission data compiled by AHRQ were linked with hospital data from the University of Nevada Las Vegas, Center for Health Information Analysis. Thus we were able to identify and exclude admissions at California and Nevada long-term hospitals.

[13] July 1 Medicare HI (Part A) enrollment for 2006 and 2007 computed from county data files available at http://www3.cms.gov/MedicareEnrpts/. July 2007 and August 2006 MA enrollment from http://www4.cms.gov/MCRAdvPartDEnrolData/.

[14] For confidentiality, actual addresses are not included in the 5 percent sample files available to researchers – instead, a general location code, such as a state and county, is provided.

[15] The preliminary report on MA and FFS comparisons in California and Nevada in 2006 did not exclude patients who had admissions with out-of-state address locations.

[16] Using data from 2007, we studied "same DRG group" readmissions based on the MS-DRGs. This would be a broader approach than same DRG readmissions, but would still contain the readmission counts to DRG that are directly associated, such as those for heart disease or certain cancers. Again, we found no noticeable differences between this concept and the any DRG and same DRG concepts for comparing MA and FFS. However, the same DRG group concept may be useful in follow-up research, particularly when looking at readmissions subsets of admission groups of clinical importance or concern. Details on our methods of computing same DRG group readmissions are available from the authors.

[17] In the preliminary report on California and Nevada state discharge data in 2006, we did not exclude transfer cases when looking at readmissions by sub-areas of the state of California or by hospital group.

[18] Details and specifications at AHRQ Prevention Quality Indicators, Technical Specifications, October 2001 (Version 3.1, March 12, 2007), technical details accessed at http://www.qualityindicators.ahrq.gov/pqi_download.htm. For more general information, please see AHRQ's Guide to the Prevention Quality Indicators, accessible at http://www.qualityindicators.ahrq.gov.

[19] AHRQ has withdrawn and corrected the 2007 Washington state discharge dataset precisely due to problems with the person IDs discovered by AHIP using these sorts of tests.

[20] Special thanks to Joanne Nelson of the staff of the Pennsylvania Cost Containment Commission for alerting us to the possibility that in the state's discharge payer identifiers, "the private fee-for-service may be mixed with the original fee-for-service plans..." (personal communication, October 1, 2009).

ENDNOTES (continued)

[21] AHIP Center for Policy and Research, *Reductions in Hospital Days, Readmissions, and Potentially Avoidable Admissions Among Medicare Advantage Enrollees in California and Nevada, 2006* (revised October 2009), http://www.ahipresearch.org/pdfs/CAvsNV.pdf (page 8).

[22] AHIP Center for Policy and Research, Innovations in Reducing Preventable Hospital Admissions, Readmissions, and Emergency Room Use (forthcoming at www.ahipresearch.org).

Appendix A: Recent Studies Comparing MA and FFS Quality or Service Indicators

With the exception of the new research from AHIP, the Alliance for Community Health Plans, the MedAssurant/AHIP collaboration, and a new (unpublished) study by Niall Brennan and Mark Shepard of the Brookings Institution, empirical studies comparing the patient outcomes or utilization patterns in MA plans and FFS tend to be fairly old and have shown mixed results.

In 2009, researchers Niall Brennan and Mark Shepard of the Brookings Institution derived preliminary FFS results for certain HEDIS measures from datasets built for different purposes, and then compared the FFS HEDIS results with those reported by MA plans.[a] This report has the potential to spur several new comparisons between MA and FFS outcomes.

In their 2002 *Health Affairs* meta-analysis of 79 studies released from 1997-2001, Miller and Luft reported results suggesting that HMO and FFS plans (including non-MA coverage) provide roughly comparable quality of care, while HMOs reduce use of hospital and other expensive resources somewhat. However, HMO enrollees reported less favorable results on access to care and satisfaction measures compared with their FFS counterparts. The researchers concluded that health care quality results were heterogeneous, varying widely among providers, plans (HMO and non-HMO), and geographic regions.[b]

A 2003 report in *Inquiry* (Davidson), based on a study of more than 80,000 patients with three chronic conditions (asthma, diabetes, and congestive heart failure), found that health plan patients were more likely than those with FFS coverage to see primary care physicians and specialists within a year and less likely to use hospital emergency rooms or have inpatient admissions.[c]

An October 2004 study in *Health Services Research* (Dhanani) on hospital use among Medicare HMO and FFS beneficiaries in California found that when beneficiaries joined a group/staff HMO, their total inpatient days per year were 18 percent lower than if they had remained in Medicare FFS. Medicare group/staff and IPA-model HMO members had approximately 60 percent of the total

[a] Niall Brennan and Mark Shepard, Quality of Care in the Medicare Fee-For-Service and Medicare Advantage Programs (unpublished manuscript, 2009).

[b] Miller, R., & Luft, H.S. (2002). HMO Plan Performance Update: An Analysis of the Literature, 1997-2001. *Health Affairs*. 21(4). 63-86.

[c] Davidson, S.M. (2003). Utilization of Services by Chronically Ill People in Managed Care and Indemnity Plans: Implications for Quality. *Inquiry*. 40(Spring 2003). 57-70.

inpatient days per thousand in 1995 as did FFS beneficiaries. The study did not compare the quality of care received by the two groups.[d]

A report in the May 2003 issue of *JAMA* (McCarthy) found that Medicare health plan members who were dying from cancer had higher rates of hospice use than did those with FFS Medicare. Among hospice users, length of stay was longer for Medicare health plan members than for those with FFS coverage.[e]

A 2004 article in *JAMA* (Landon) showed that Medicare health plan members reported fewer problems with paperwork, information, and customer service than did beneficiaries with Medicare FFS coverage. In addition, those in Medicare health plans were more likely to report having received shots for flu and pneumonia, and smokers in Medicare health plans were more likely than those with Medicare FFS coverage to report having been counseled to quit. However, those with FFS Medicare rated their experiences with care higher than did those in Medicare health plans.[f]

A 2004 study in *Inquiry* (Meara) found that the presence of Medicare health plans in a local market had a slight spillover effect in FFS Medicare with respect to use of a diagnostic procedure for heart attack patients. Specifically, increased penetration of Medicare managed care in local markets modestly reduced the likelihood that beneficiaries in FFS Medicare who were hospitalized for heart attacks would receive the diagnostic imaging procedure known as coronary angiography (also called cardiac catheterization) for all categories of appropriateness (appropriate, discretionary, or inappropriate).[g]

Based on analysis and modeling of data from the Medicare Current Beneficiary Survey (MCBS) cost and use files, Michael Chernew (NBER 2008) found that a one percentage point increase in Medicare HMO penetration in a county was associated with reduced spending on Medicare FFS beneficiaries by 0.9 percent. This relationship was driven by beneficiaries with at least one chronic condition, and there was no systematic relationship for beneficiaries with no reported chronic conditions.[h]

[d] Dhanani, N., et al. (2004). The Effect of HMOs on the Inpatient Utilization of Medicare Beneficiaries. *Health Services Research*. 39(5). 1607-1627.

[e] McCarthy, E. et al. (2003). Hospice Use Among Medicare Managed Care and Fee-for-Service Patients Dying with Cancer. *JAMA*. 289(17). 2238-2245.

[f] Landon, B. (2004). Comparison of Performance of Traditional Medicare vs Medicare Managed Care. *JAMA*. 291(14). 1744-1752.

[g] Meara, E. (2004). The Effect of Managed Care Market Share on Appropriate Use of Coronary Angiography Among Traditional Medicare Beneficiaries. *Inquiry*. 41(Summer 2004). 144-158.

[h] Chernew, M. et al. (2008). Managed Care and Medical Expenditures of Medicare Beneficiaries. Working Paper 13747. Cambridge, MA: National Bureau of Economic Research.

Recently, MedPAC has focused mostly on relative costs, not quality, comparing the county-by-county estimates of projected FFS costs with MA plan reimbursements[i] and consumer satisfaction surveys. In its March 2008 Report to Congress, MedPAC reported that beneficiaries in FFS and MA had similar experiences in accessing care, obtaining needed care, and delaying care because of costs, based on data derived from the 2005 MCBS. Higher proportions of FFS beneficiaries reported not having a usual source of care or a usual doctor.

A recent non-empirical study in *Health Affairs* by Marsha Gold of Mathematica Policy Research, Inc. concluded that private fee-for-service (PFFS) plans, a subset currently comprising about 20 percent of all MA plans, would likely not be able to raise quality levels because of inherent difficulties coordinating care with non-network physicians.[j]

[i] See, for example, Chapter 3 of MedPAC's "Report to Congress: Medicare Payment Policy" (March 2008), and Carlos Zarabosa and Scott Harrison, "Payment Policy and the Growth of Medicare Advantage," *Health Affairs* (January 2009).

[j] Gold, M. "Medicare's Private Plans: A Report Card on Medicare Advantage." *Health Affairs* (January 2009). Gold's article asserted that there were "no apparent quality gains" among all MA plans, and this phrase was used in several news reports. However, the analysis of the potential for quality improvements was not empirical and was based only on PFFS plans.

Appendix B: CMS-Style Risk Score Description and Methodology

In this study, we used the main elements of the risk scores developed for payment purposes by CMS. The CMS risk scores are based on the beneficiaries' demographic status and relative cost values of their Hierarchical Condition Categories[k] (HCCs), which are major diagnosis groups.

HCC codes were derived from the ICD-9 diagnosis codes assigned to each Medicare discharge for beneficiaries in the state datasets. Table B-1 is an example of the ICD-9 to HCC crosswalk for HCC 79 (Cardio-Respiratory Failure and Shock). In addition to the primary diagnosis code, there were up to 24 secondary diagnosis codes in each of the states. Risk scores for each patient were based on diagnoses from all discharges in the year. If a beneficiary had an ICD-9 diagnosis within the HCC category, the beneficiary was assigned the value of "1" for the HCC. The patient's risk score was then calculated as the sum of each value that the CMS risk adjustment system provides each of the 70 HCCs, as well as the elements for the age and sex of the beneficiary (see Tables B-2 and B-3).

The risk scores used for comparison in this study are not identical to the CMS risk scores used for payment purposes. First, we did not use the CMS risk score elements for disease interaction, disability, or institutional status elements. Second, the risk score calculations were based only on patients with a hospitalization – thus, they are much higher than risk scores computed for a whole Medicare-age population.

[k] The definitions of HCCs are based on the concept of disease hierarchies. Condition Categories (CCs) and RxGroups (RxGs) are grouped into hierarchies within clinically related medical conditions (CCs) or pharmaceutical groups (RxGs). The hierarchies are used in the risk calculation process to diminish the risk inflation caused when a single individual has two or more closely related conditions. The imposition of the hierarchies causes the lesser conditions within each hierarchy to be ignored for the purpose of calculating risk. http://www.dxcg.com/docs/news-events/Glossary.pdf.

Table B-1. Example of ICD-9-CM Code Crosswalk with Hierarchical Condition Category 79

ICD-9-CM Code	ICD9_Description	CMS-HCC Model Category	Category Name
4274	Ventricular Fibrillation/Flutter	79	Cardio Respiratory Failure And Shock
42741	Ventricular Fibrillation	79	Cardio Respiratory Failure And Shock
42742	Ventricular Flutter	79	Cardio Respiratory Failure And Shock
4275	Cardiac Arrest	79	Cardio Respiratory Failure And Shock
5184	Acute Lung Edema Nos	79	Cardio Respiratory Failure And Shock
5185	Post Traumatic Pulmonary Insufficiency	79	Cardio Respiratory Failure And Shock
51881	Acute Respiratory Failure	79	Cardio Respiratory Failure And Shock
51882	Other Pulmonary Insufficiency	79	Cardio Respiratory Failure And Shock
51883	Chronic Respiratory Failure	79	Cardio Respiratory Failure And Shock
51884	Acute & Chronic Respiratory Fail	79	Cardio Respiratory Failure And Shock
7855	Shock Without Trauma	79	Cardio Respiratory Failure And Shock
78550	Shock Nos	79	Cardio Respiratory Failure And Shock
78551	Cardiogenic Shock	79	Cardio Respiratory Failure And Shock
798	Sudden Death Cause Unknown	79	Cardio Respiratory Failure And Shock
7980	Sudden Infant Death Syndrome	79	Cardio Respiratory Failure And Shock
7981	Instantaneous Death	79	Cardio Respiratory Failure And Shock
7982	Death Within 24 Hr Symptom	79	Cardio Respiratory Failure And Shock
7989	Unattended Death	79	Cardio Respiratory Failure And Shock
7990	Asphyxia	79	Cardio Respiratory Failure And Shock
79901	Asphyxia	79	Cardio Respiratory Failure And Shock
79902	Hypoxemia	79	Cardio Respiratory Failure And Shock

Source: The ICD-9-CM to HCC crosswalk is from the Centers for Medicare & Medicaid Services (CMS).

Table B-2. Age/Sex Risk Factor Values

Sex, Age	Risk Factor Value
Female, Age 65-69	0.307
Female, Age 70-74	0.384
Female, Age 75-79	0.483
Female, Age 80-84	0.572
Female, Age 85-89	0.665
Male, Age 65-69	0.346
Male, Age 70-74	0.453
Male, Age 75-79	0.577
Male, Age 80-84	0.657
Male, Age 85-89	0.79

Source: Age/sex risk factor values are from the 2005 MA Ratebook compiled by the Centers for Medicare & Medicaid Services (CMS).

Table B-3. Disease Group Factors

HCC	Description	Risk Factor Value
HCC1	HIV/AIDS	0.685
HCC2	Septicemia/Shock	0.89
HCC5	Opportunistic Infections	0.652
HCC7	Metastatic Cancer and Acute Leukemia	1.464
HCC8	Lung, Upper Digestive Tract, and Other Severe Cancers	1.464
HCC9	Lymphatic, Head and Neck, Brain, and Other Major Cancers	0.69
HCC10	Breast, Prostate, Colorectal and Other Cancers and Tumors	0.233
HCC15	Diabetes with Renal or Peripheral Circulatory Manifestation	0.764
HCC16	Diabetes with Neurologic or Other Specified Manifestation	0.552
HCC17	Diabetes with Acute Complications	0.391
HCC18	Diabetes with Ophthalmologic or Unspecified Manifestation	0.343
HCC19	Diabetes without Complication	0.2
HCC21	Protein-Calorie Malnutrition	0.922
HCC25	End-Stage Liver Disease	0.9
HCC26	Cirrhosis of Liver	0.516
HCC27	Chronic Hepatitis	0.359
HCC31	Intestinal Obstruction/Perforation	0.408
HCC32	Pancreatic Disease	0.445
HCC33	Inflammatory Bowel Disease	0.307
HCC37	Bone/Joint/Muscle Infections/Necrosis	0.496
HCC38	Rheumatoid Arthritis and Inflammatory Connective Disease Tissue	0.322
HCC44	Severe Hematological Disorders	1.011
HCC45	Disorders of Immunity	0.83
HCC51	Drug/Alcohol Psychosis	0.353
HCC52	Drug/Alcohol Dependence	0.265
HCC54	Schizophrenia	0.543
HCC55	Major Depressive, Bipolar, and Paranoid Disorders	0.431
HCC67	Quadriplegia/Other Extensive Paralysis	1.181
HCC68	Paraplegia	1.181
HCC69	Spinal Cord Disorders/Injuries	0.492
HCC70	Muscular Dystrophy	0.386
HCC71	Polyneuropathy	0.268
HCC72	Multiple Sclerosis	0.517
HCC73	Parkinson's and Huntington's Diseases	0.475
HCC74	Seizure Disorders and Convulsions	0.269
HCC75	Coma, Brain Compression/Anoxic Damage	0.568
HCC77	Respirator Dependence/Tracheostomy Status	2.102
HCC78	Respiratory Arrest	1.429
HCC79	Cardio-Respiratory Failure and Shock	0.692
HCC80	Congestive Heart Failure	0.417
HCC81	Acute Myocardial Infarction	0.348
HCC82	Unstable Angina and Other Acute Ischemic Heart Disease	0.348

Table B-3 (continued). Disease Group Factors

HCC83	Angina Pectoris/Old Myocardial Infarction	0.235
HCC92	Specified Heart Arrhythmias	0.266
HCC95	Cerebral Hemorrhage	0.392
HCC96	Ischemic or Unspecified Stroke	0.306
HCC100	Hemiplegia/Hemiparesis	0.437
HCC101	Cerebral Palsy and Other Paralytic Syndromes	0.164
HCC104	Vascular Disease with Complications	0.677
HCC105	Vascular Disease	0.357
HCC107	Cystic Fibrosis	0.376
HCC 108	Chronic Obstructive Pulmonary Disease	0.376
HCC111	Aspiration and Specified Bacterial Pneumonias	0.693
HCC112	Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.202
HCC119	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.349
HCC130	Dialysis Status	3.076
HCC131	Renal Failure	0.576
HCC132	Nephritis	0.273
HCC148	Decubitus Ulcer of Skin	1.03
HCC149	Chronic Ulcer of Skin, Except Decubitus	0.484
HCC150	Extensive Third-Degree Burns	0.962
HCC154	Severe Head Injury	0.568
HCC155	Major Head Injury	0.242
HCC157	Vertebral Fractures without Spinal Cord Injury	0.49
HCC158	Hip Fracture/Dislocation	0.392
HCC161	Traumatic Amputation	0.843
HCC164	Major Complications of Medical Care and Trauma	0.262
HCC174	Major Organ Transplant Status	0.722
HCC176	Artificial Openings for Feeding or Elimination	0.79
HCC177	Amputation Status, Lower Limb/Amputation Complications	0.843

Source: Centers for Medicare & Medicaid Services (CMS).

Appendix C: Risk Adjustment Based on Likelihood of Readmission by DRG

Based on the suggestion of Dr. Gerard Anderson, we computed an alternative form of risk adjustment based on the degree to which the distribution of admissions in MA and FFS tended to be associated with higher or lower rates of readmissions. The benchmarks for these calculations were the likelihoods of readmissions for each DRG (version 24) for national FFS Medicare in 2006 and 2007 (pooled) from the 5 percent sample file.

The first step in this process is to gather samples of admissions by DRG in each of the studied states, as shown in Table C-1. The second step is to compare the distribution of admissions by DRG in MA and FFS with the benchmark likelihood that an admission in that DRG will be associated with a readmission (see Table C-2).[I] Finally, an index of the "riskiness" of the MA and FFS admissions distributions is calculated. For example, if MA plans tended to have admissions that were associated with lower-than-average expected rates of readmissions relative to FFS, then this risk adjuster would raise reported MA readmission rates (and lower those of FFS) in proportion to the difference in the index.

[I] These relative readmission rates for each DRG from 2006 and 2007 FFS national data were based on the same-quarter readmission concept. Thus we are not sure which was the "index" or initial admission in some sense. We simply used the sequence of admission records as they occurred in the FFS 5 percent sample file to flag "subsequent" admissions within the quarter as readmissions, by DRG, to create the benchmark distribution.

Table C-1. Number of Inpatient Admissions and Distribution, per DRG

	California 2007 – FFS Enrollees		California 2007 – Medicare Advantage Enrollees	
DRG version 24	Number of Admissions per DRG	Percent of Admissions	Number of Admissions per DRG	Percent of Admissions
001	1,449	0.249%	602	0.240%
002	562	0.097%	269	0.107%
007	593	0.102%	242	0.097%
008	118	0.020%	39	0.016%
009	105	0.018%	53	0.021%
010	1,070	0.184%	509	0.203%
011	157	0.027%	85	0.034%
012	3,388	0.583%	1,296	0.517%
013	92	0.016%	37	0.015%
014	14,291	2.458%	7,403	2.955%
015	631	0.109%	315	0.126%
...				
Sum	581,469	100%	250,493	100%

Source: AHIP Center for Policy and Research. Based on analysis of state hospital discharge public use datasets with encrypted "person" identifiers, provided by AHRQ's HCUP project. Excludes patients with an admission listing an out-of-state address.

Table C-2. Number of National FFS Admissions and Readmissions, Readmission Rates and Ratios to Average Rate, per DRG

	National 2006-2007 FFS Enrollees			
DRG version 24	Number of Admissions per DRG	Number of Same-Quarter Readmission per DRG	Readmission Rate per DRG	Ratio to Average
001	1,022	278	27.2%	1.18
002	338	74	21.9%	0.95
007	467	138	29.6%	1.28
008	85	11	12.9%	0.56
009	76	29	38.2%	1.65
010	757	220	29.1%	1.26
011	116	34	29.3%	1.27
012	4,230	1,165	27.5%	1.19
013	69	16	23.2%	1.01
014	10,578	2,767	26.2%	1.13
015	582	148	25.4%	1.10
...				
Sum (5 Percent sample)	457,585	105,544	23.1%	

Source: AHIP Center for Policy and Research. Analysis of Medicare FFS 5 percent sample claims file.

Appendix D: Potentially Avoidable Admissions Description and Methodology

The potentially avoidable admissions definitions in this report were based on criteria developed by the Agency for Health Research and Quality (AHRQ) – the Prevention Quality Indicators – to measure inpatient admissions for ambulatory care sensitive conditions. AHRQ's research has found that patients with these conditions would benefit from early intervention and outpatient care to potentially avoid hospitalization and worsening of the conditions.

For this study, we used 13 of the 14 potentially avoidable admissions targeted by AHRQ. (One of the conditions, low birth weight, was not applicable to the population we studied.) The 13 AHRQ classifications we studied were:

- Diabetes, short-term complications
- Perforated appendicitis
- Diabetes, long-term complications
- Chronic obstructive pulmonary disease
- Hypertension
- Congestive heart failure
- Dehydration
- Bacterial pneumonia
- Urinary tract infections
- Angina without procedure
- Uncontrolled diabetes
- Lower extremity amputations among patients with diabetes
- Adult asthma

Each condition has a specified set of diagnosis codes and procedures to include or exclude in order to identify an individual with the potentially avoidable hospitalization. As an illustration, Table D-1 describes the criteria used to identify individuals with a potentially avoidable inpatient admission for bacterial pneumonia.

Table D-1. Criteria for Identifying Preventable Admissions for Bacterial Pneumonia

INCLUSIONS	EXCLUSIONS
ICD-9-CM Principal Diagnosis Codes for Bacterial Pneumonia	Exclude These Cases
481 (Pneumococcal Pneumonia)	Transferring From Another Institution (SID ASOURCE=2)
4822 (H.Influenzae Pneumonia)	MDC 14 (Pregnancy, Childbirth, And Puerperium)
48230 (Strep Pneumonia Unspecified)	MDC 15 (Newborn And Other Neonates)
48231 (Grp A Strep Pneumonia)	With Diagnosis Code For Sickle Cell Anemia Or HB-S Disease...
48232 (Grp B Strep Pneumonia)	
48239 (Oth Strep Pneumonia)	Exclude These ICD-9-CM Diagnosis Codes
4829 (Bacterial Pneumonia Nos)	28241 (Thalassemia HB-S W/O Crisis)
4830 (Mycoplasma Pneumonia)	28242 (Thalassemia HB-S W Crisis)
4831 (Chlamydia Pneumonia Oct96-)	28260 (Sickle Cell Disease Nos)
4838 (Oth Spec Org Pneumonia)	28261 (HB-S Disease W/O Crisis)
485 (Bronchopneumonia Org Nos)	28262 (HB-S Disease W Crisis)
486 (Pneumonia, Organism Nos)	28263 (HB-S/HB-C Disease W/O Crisis)
	28264 (HB-S/HB-C Disease W Crisis)
	28268 (HB-S Disease W/O Crisis Nec)
	28269 (HB-Ss Disease Nec W Crisis)

Source: AHRQ Quality Indicators, Prevention Quality Indicators: Technical Specifications; Department of Health and Human Services, Agency for Healthcare Research and Quality, http://www.qualityindicators.ahrq.gov. October 2001. Version 3.1 (March 12, 2007).

Appendix E: Identifying MA Patients in the State Discharge Data

This appendix documents the payer codes used to identify patients enrolled in MA and Medicare (traditional) FFS program in the various state hospital discharge datasets. Blue/gray shadings indicate the variables used to identify MA and FFS enrollees. Two of the states' data documentation indicated that there were variables that would appear to be useful for this purpose, but these variables in fact contained no data in the datasets.

Table E-1. Identification of Payer Source in the Arizona AHRQ Dataset

PAY1_X		PAY1	
Value	Description	Value	Description
05, 5	Medicare	1	Medicare
11	Medicare Risk		
6	Arizona Health Care Cost Containment System (AHCCCS) Health Care Group/ Medicaid	2	Medicaid
1	Commercial (Indemnity)	3	Private Insurance
2	HMO		
03, 3	PPO		
4	Arizona Health Care Cost Containment System (AHCCCS) Health Care Group (for the self employed, small businesses (under 50 employees), and the uninsured employees of political subdivisions)		
0	Self pay	4	Self pay
12	Charity	5	No charge
7	CHAMPUS/TRICARE	6	Other
8	Children's Rehab Services		
9	Worker's Compensation		
10	Indian Health Services		
13	Foreign National		
14	Other		
15	Tobacco Tax (beginning in 1998, discontinued 2007)		
Blank, 99	Missing	.	Missing
	Any values not documented by the data source	.A	Invalid

Medicare FFS descriptor Medicare Advantage descriptor

Source: AHRQ HCUP project.
Note: Valid beginning 2003.

Table E-2. Identification of Payer Source in the Arkansas AHRQ Dataset

PAY1_X and PAY2_X		PAY1 and PAY2	
Value	Description	Value	Description
M	Medicare	1	Medicare
D	Medicaid	2	Medicaid
I	Commercial Insurance	3	Private Insurance
B	Blue Cross/Blue Shield, Medi-Pak, Medi-Pak Plus		
H	HMO/Managed Care		
S	Self Insured		
P	Self-pay	4	Self pay
Z	Medically Indigent/Free	5	No charge
C	CHAMPUS	6	Other
E	County or State (ex: state or county employees)		
L	Managed Assistance		
N	Division of Health Services		
O	Other		
V	Other Federal Programs		
W	Worker's Compensation		
Blank	Missing	.	Missing
	Any values not documented by the data source	.A	Invalid

Medicare FFS descriptor Medicare Advantage descriptor

Source: AHRQ HCUP project.

Table E-3. Identification of Payer Source in the California AHRQ Dataset

PAY1_X		PAY1	
Value	Description	Value	Description
10	Medicare	1	Medicare
11	Medicare (HMO)		
12	Medicare (Managed care - Other)		
13	Medicare (fee for service)		
20	Medi-Cal	2	Medi-Cal
21	Medi-Cal (HMO)		
22	Medi-Cal (Managed care - Other)		
23	Medi-Cal (fee for service)		
30	Private Coverage	3	Private insurance
31	Private Coverage (HMO)		
32	Private Coverage (Managed care - Other)		
33	Private Coverage (fee for service)		
08n, where n=0-3	Self-pay	4	Self-pay
--		5	No charge
04n, where n=0-3	Worker's Compensation	6	Other
05n, where n=0-3	County Indigent Programs		
06n, where n=0-3	Other Government		
07n, where n=0-3	Other Indigent (includes charity care)		
09n, where n=0-3	Other		
0, 000	Type of coverage not considered applicable to the payer category	.	Missing
	Any values not documented by the data source	.A	Invalid

Medicare FFS descriptor Medicare Advantage descriptor

Source: AHRQ HCUP project.
Note: Valid beginning in 1999. The first two digits of PAY1_X describes the payer category (e.g., Medicare (01), Medi-Cal (02), Private coverage (03), Workers' Compensation (04), County Indigent Programs (05), Other Government (06), Other Indigent (07), Self Pay (08), and Other Payer (09)). The third digit of PAY1_X describes the type of coverage (e.g., Knox-Keene (HMO)* or Medi-Cal County Organized Health Systems (MCOHS) plan (1), Managed Care Other (PPO, IPO, POS, etc.) (2), traditional coverage (fee for service) (3), and type of coverage not considered applicable to the payer category (0).
* HMOs are regulated in California under the Knox-Keene Health Care Service Plan Act of 1975.

Table E-4. Identification of Payer Source in the Hawaii AHRQ Dataset

PAY1_X		PAY1	
Value	Description	Value	Description
1	Medicare	1	Medicare
18	HMSA 65C+		
19	Kaiser 65C+		
25	Secure Horizons Medicare Advantage - beginning 2008		
26	AlohaCare Advantage/Advantage Plus - beginning 2008		
2	Medicaid	2	Medicaid
13	Hawaii QUEST (managed care) Beginning in 2006, the general QUEST category was discontinued and split into plan-specific categories		
15	AlohaCare (plan participating in QUEST) beginning in 2003		
22	HMSA QUEST - beginning 2006		
23	Kaiser QUEST - beginning 2006		
24	QUEST (Any QUEST Plan except AlohaCare, HMSA Quest, Kaiser Quest) - beginning 2006		
14	HMSA's Health Plan Hawaii beginning in 2003	3	Private Insurance
16	Hawaii Management Alliance Association (HMAA) beginning in 2003		
17	University Health Alliance (UHA) beginning in 2003		
4	HMSA (any other HMSA plan)		
5	Kaiser		
6	Other Insurance		
8	No Fault		
7	Self pay	4	Self pay
--		5	No charge
9	Worker's Compensation	6	Other
10	Tricare/CHAMPUS/VA/Other Government - Discontinued in 2006		
12	Department of Defense		
20	Veterans Administration (VA) - Beginning 2006		
21	Tricare/CHAMPUS/Other Government - Beginning 2006		
11, Blank	Unknown, Missing	.	Missing
	Any values not documented by the data source	.A	Invalid

Medicare FFS descriptor Medicare Advantage descriptor

Source: AHRQ HCUP project.
Note: Valid beginning in 2003.

Table E-5. Identification of Payer Source in the Nevada AHRQ Dataset

PAY1_X and PAY2_X and PAY3_X		PAY1 and PAY2	
Value	Description	Value	Description
10	Medicare	1	Medicare
27	Medicare HMO *		
16	Nevada Medicaid	2	Medicaid
17	Other Medicaid		
28	Medicaid HMO		
20	Commercial Insurer	3	Private insurance
21	Negotiated Discounts e.g. Preferred Provider Organization (PPO)		
22	Health Maintenance Organization (HMO)		
24	State Industrial Insurance System (SIIS) (beginning in 2005)		
25	Nevada Blue Cross/Blue Shield (BC)		
26	Other Blue Cross/Blue Shield (BS)		
18	Self Pay	4	Self-pay
12	Charity	5	No charge
11	Black Lung (beginning in 2006, Black Lung was coded as 11 instead of 6)	6	Other
13	Hill-Burton Free Care (HBFC)		
14	CHAMPUS (or successor)		
15	CHAMPVA (or successor)		
19	Miscellaneous - does not fit any of the other categories. This field covers insurers that are not licensed to sell insurance in Nevada		
23	County Indigent Referral (those already qualified for, or being referred to, the County Indigent program)		
29	Section 1011 undocumented Aliens/unknown		
99, Blank	Missing	.	Missing
	Any values not documented by the data source	.A	Invalid

Medicare FFS descriptor Medicare Advantage descriptor

Source: AHRQ HCUP project.
Note: Valid prior to 2008.
* No data provided by the source.

Table E-6. Identification of Payer Source in the North Carolina AHRQ Dataset

PAY1_X, PAY2_X, and PAY3_X		PAY1 and PAY2	
Value	Description	Value	Description
M	Medicare	1	Medicare
T	Medicare		
D	Medicaid	2	Medicaid
B	Blue Cross	3	Private insurance
H	HMO - PPO		
I	Other Insurance Companies		
A	Automobile Medical		
J	Exclusive Provider Org		
K	Health Maintenance Org		
L	Indemnity Insurance		
Q	Liability		
R	Liability Medical		
Y	Point of Service		
Z	Preferred Provider Org		
P	Self-pay	4	Self-pay
--		5	No charge
C	Champus	6	Other
O	Other		
G	Disability		
V	Other Federal Program		
X	Other Non-Federal Program		
1	Title V		
2	Veteran Administration Plan		
W	Workers' Compensation		
U, Blank	Documented by source as unknown values	.	Missing
	Any values not documented by the data source	.A	Invalid

Medicare FFS descriptor Medicare Advantage descriptor

Source: AHRQ HCUP project.

Table E-7. Identification of Payer Source in the Washington AHRQ Dataset

PAY1_X and PAY2_X		PAY1 and PAY2	
Value	Description	Value	Description
1	Medicare	1	Medicare
2	Medicaid (DSHS)	2	Medicaid
4	Health Maintenance Organization (HMO) (e.g., Group Health, Kaiser Foundation, Good Health)	3	Private Insurance
6	Commercial insurance (e.g., AETNA, Mutual of Omaha, Safeco)		
610	Health Care Service Contractors (e.g., Blue Cross, county medical bureaus, Washington Physicians Service)		
9	Self-pay	4	Self-pay
630	Charity Care as defined in WAC 246-453-010	5	No charge
8	Workers Compensation (includes state fund, self insured employers, and Labor and Industries crime victims claims)	6	Other
625	Other Sponsored Patients (e.g., CHAMPUS, Indian Health)		
Blank	Missing	.	Missing
	Any values not documented by the data source	.A	Invalid

Medicare FFS descriptor Medicare Advantage descriptor

Source: AHRQ HCUP project.
Note: Valid beginning in 1998.

Table E-8. Identification of Payer Source in the Pennsylvania State Dataset

Primary Payer Code	Description
0	Uninsured Self Pay or Charity/Indigent Care
12	Medicare PPO
13	Medicare POS
14	Medicare Part A or B Fee for Service
15	Medicare HMO
22	Medicaid PPO
24	Medicaid Fee for Service
25	Medicaid HMO
32	Blue Cross PPO
33	Blue Cross POS
34	Blue Cross Fee for Service
35	Blue Cross HMO
39	Blue Cross Unknown / Not Listed
42	Commercial PPO
43	Commercial POS
44	Commercial Fee for Service
45	Commercial HMO
47	Commercial Workers' Compensation
48	Commercial Automobile
49	Commercial Unknown / Not Listed
82	Government PPO
84	Government Fee for Service
85	Government HMO
89	Government Unknown / Not Listed
99	Unknown / Not Listed Unknown / Not Listed

Medicare FFS descriptor Medicare Advantage descriptor

Source: State of Pennsylvania Health Care Cost Containment Council (www.phc4.org).
Note: Primary Payer. This is a two-digit code that identifies the primary payer type as submitted by the facility. The first digit describes the general payer class. The second digit generally describes the different types of insurance coverage (products).

Table E-9. Identification of Payer Source in the Texas State Dataset

Code	Description
9	Self Pay HM Health Maintenance Organization
10	Central Certification LI Liability
11	Other Non-federal Programs LM Liability Medical
12	Preferred Provider Organization (PPO) MA Medicare Part A
13	Point of Service (POS) MB Medicare Part B
14	Exclusive Provider Organization (EPO) MC Medicaid
15	Indemnity Insurance TV Title V
16	Health Maintenance Organization (HMO)
*	Medicare Risk
MA	Medicare Part A
MB	Medicare Part B
OF	Other Federal Program
AM	Automobile Medical VA Veteran Administration Plan
BL	Blue Cross/Blue Shield WC Workers Compensation Health Claim
Coding Scheme:	
CH	CHAMPUS ZZ Charity, Indigent or Unknown
CI	Commercial Insurance ** Codes 09 and ZZ, combined for 2004 & 2005
DS	Disability Insurance * Invalid

Medicare FFS descriptor Medicare Advantage descriptor

Source: Center for Health Statistics/Texas Department of State Health Services (www.dshs.state.tx.us/thcic).
* Missing code – no data provided by the source.

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