

Truven Health Analytics: Market Expert Inpatient Volume Projection Methodology

Truven's inpatient volume forecaster produces five and ten year volume projections by DRG and zip code. Truven uses two primary data sets to produce these forecasts:

- current and projected demographic data from Nielsen Demographics, and
- inpatient claims data from private and public sources.

Inpatient estimates project the total volume of annual acute care admissions and patient days by zip code, age group, sex, payer, and DRG for every market in the United States. To construct population-based use rates, Truven uses all-payer state discharge data for 24 states and Medicare (MEDPAR) data. Then, these rates are applied to demographic projections by zip code to estimate inpatient utilization for current and projected years.

Truven uses hospital discharge data from 2010 and 2011 to create inpatient utilization rates by county, age group, gender, payer, and DRG. Then, to estimate the baseline volume of admissions and patient days that the population will demand, these use rates are multiplied by current (and projected) insurance coverage projections at the zip code level. This results in Truven's "baseline" estimate.

In addition, Truven creates a second set of "adjusted and trended" estimates which take into account the effect of healthcare reform adjustments and DRG forecast trends. The primary impact of healthcare reform that Truven considers is the change in insurance coverage, particularly the increase in the number of adults covered by Medicaid. Truven conducted extensive research to determine the impact of health care reform at a local level. This research incorporates data on the impact of similar legislation that was implemented in Massachusetts, and the differences in current Medicaid coverage by state. Additionally, the projections include an adjustment for CMS readmission penalties starting in fiscal year 2013 and increasing in 2015. Truven projected a decrease (although not a complete elimination) in the number of readmissions after an initial admission of Heart Failure, Heart Attack (AMI), or Pneumonia (in 2013), and PTCA, CABG, COPD, or Other Vascular Surgery (added in 2015). Because the readmission may be for any condition, the projected admissions/readmissions rates for a wide range of conditions (not just the seven targeted conditions) decrease in 2013 and again in 2015. Different adjustments are calculated for the most common reasons for readmission, and planned readmissions were taken into account. The adjustments were spread over two years, 2012-2013 and 2014-2015, to take into account early adapter policies to reduce readmissions before the penalties apply.

Beyond the health care reform adjustments, DRG specific forecast trends are overlaid on the estimates. The trends are calculated by examining historical trends in diagnostic categories from 2003 to 2011, continuing the trend into the future, and then applying a transforming

relationship between diagnostic categories and DRGs. Only trends with sufficient volume and clear direction were overlaid on the “adjusted” projections.

All projections are made by gender and by various age groupings, including the four main age groups, and the more-detailed pediatric age group within the 0-17 age group. The age groups include:

- The main age groups are 0-17, 18-44, 45-64, and 65+
- The pediatric age groups are <1, 1-4, 5-9, 10-14, and 15-17

This is a sample output from the inpatient forecast tool:

Baseline includes minimum impact of healthcare reform

DRG Product Line
includes all product lines.

Proj 5 Yr Baseline is the 5 year projected discharges by DRG Product Line.
Proj 5 Yr Adjusted & Trended is the 5 year projections of discharges by DRG Product Line.

Variance Difference is the difference between the 5 year projected baseline discharges and 5 year discharges.
Variance % is the percent change between the 5 year projected baseline discharges and 5 year discharges.

Proj 5 Yr Baseline is the 5 year projected days by DRG Product Line.
Proj 5 Yr Adjusted & Trended is the 5 year days of discharges by DRG Product Line.

Variance Difference is the difference between the 5 year projected baseline days and 5 year projected days.
Variance % is the percent change between the 5 year projected baseline days and 5 year projected days.

DRG Product Line	Discharges					Days				
	Proj 5 Yr Baseline	Proj 5 Yr Adjusted & Trended	Variance		Proj 5 Yr Baseline	Proj 5 Yr Adjusted & Trended	Variance		Proj 5 Yr Baseline	Proj 5 Yr Adjusted & Trended
			Difference	%			Difference	%		
Obstetrics Del	8,579	10,888	2,309	26.9%	23,850	30,201	6,351	26.6%		
General Medicine	17,160	18,052	891	5.2%	75,344	80,166	4,822	6.4%		
Psychiatry	3,778	4,364	586	15.5%	26,242	30,418	4,176	15.9%		
General Surgery	6,685	7,053	368	5.5%	54,734	59,257	4,523	8.3%		
Obstetrics ND	1,106	1,422	315	28.5%	3,414	4,400	986	28.9%	"	"
"	"	"	"	"	"	"	"	"	"	"
Total	94,220	99,959	5,739	6.1%	440,233	467,206	26,973	6.1%		

Appendix: Detailed Methodology

Data Preparation, Filters, and Quality Checks

To improve the accuracy of the estimates, Truven implemented multiple filters, groupers, and quality checks to the all-payer state data and the MEDPAR data prior to creation of the use rates. We included only inpatient acute care facilities that are short-term, non-Federal hospitals. To determine which hospitals met these criteria, we used a combination of public reference databases, as well as an empirical analysis of each facility's average length of stay.

In order to keep all estimates consistent, Truven re-grouped all of the state data using the Federal Fiscal Year 2011 MS-DRG grouper, or DRG version 28. Because the data used in these estimates are not all from Federal Fiscal Year 2011 (October, 2010 to September, 2011), the DRG assigned to each record and the estimates that result from them may differ from that provided by the state.

Truven Health Analytics filtered out all records with missing or erroneous values for county, age, sex, payer, and principal diagnosis. In addition, Truven Health Analytics removed invalid combinations of age, sex, DRG, and ICD-9 diagnosis code. Also removed were records with a length of stay value that was missing, negative, or greater than 365 days.

Use Rate Construction

If all-payer state data were available for 2010 Q1 or later, Truven divided the most current and complete four quarters of inpatient volume for each county within the state by the corresponding county population. This yielded use rates by age group, sex, DRG, and county. Use rates were built for both admissions and patient days, and represent the average amount of annual inpatient care consumed by the population.

Out-of-State Migration Adjustment

Truven corrects use rates for out-migration from all counties in order to properly estimate inpatient demand for a population. If a patient from a county in an all-payer state receives care in a state without all-payer data, Truven corrects for this out-migration in one of two ways. Using the Hospital Market Area file, Truven can identify what percentage of Medicare patients left the county for care in a state without all-payer data. If that percentage was greater than 10 percent, Truven did not use local all-payer data, and instead substituted regional rates for the affected counties. If the percentage was less than 10 percent, Truven adjusted all of the county's use rates to account for the observed out-migration.

Identification of Underreported Counties

Most inpatient data sets collected by state agencies or associations are reliable and complete. However, in some situations, facilities are either not required or unable to report all information. To identify the specific counties that appear to be affected by these situations, Truven used the Hospital Market Area file. In such cases, Truven did not use local all-payer data, but instead substituted regional rates for the affected counties.

Payor Categories

The estimates are reported for the following payor categories:

- Medicare
- Medicaid
- Dual Eligible
- Private Exchanges
- Private Direct
- Private Employee Sponsored
- Uninsured

Discharges for Medicaid, Private Exchanges, Private Direct, Private Employee Sponsored, and the Uninsured are all derived from all-payer data available in the Projected Inpatient Database (PIDB). The PIDB is a proprietary database that contains information from various inpatient claims data sources, and is appropriately weighted to reflect the national total number of discharges.

The Dual Eligible population is a special population that receives benefits from both Medicare and Medicaid. The healthcare utilization on this population is not available in the PIDB, but is available from CMS. Therefore, a combination of the MEDPAR data, the CMS Standard Analytical File – 100 percent Inpatient File, and the Standard Analytical File – 100 percent Denominator File was used to determine the expected number of discharges for the Dual Eligible population per DRG and geographic location.

Types of Estimates (Healthcare Reform Estimates)

Inpatient Demand Estimates includes two sets of projections for current through projected years.

Baseline Estimates – The Baseline projections reflect the changes in inpatient demand due to demographic shifts, as well as the minimum impact of reform on payer mix. The utilization rates are assumed constant over the 10 years of projections.

Adjusted and Trended Estimates – The adjusted projections include the impact of the Affordable Care Act (ACA) on the inpatient utilization. The projections include both the shifts in healthcare coverage due to ACA and the expected impact of the ACA on the discharge rate due to specifics in the legislation. Beyond the healthcare reform adjustments, DRG forecast trends are overlaid on

the estimates. Adjusted and Trended projections assume all projected enrollment goals are met for the impact of reform starting in 2014 and in all future year forecasts.

Pediatric Estimates

The Pediatric Estimates are derived using a two-step process. First, estimates are created for the age cohort 0 to 17 years. Then, a national distribution that is DRG- and age-specific method is applied to the localized estimates resulting in reliable estimates of discharges for the refined age cohorts. The national distributions for each DRG are derived from the weighted PIDB, and represent a reliable probability of a specific DRG occurring in the specific age cohort.

Regional and National Models

A regional rate model is created by assigning each state available in the PIDB to a Census region. Then, the discharges are counted for each DRG, region, age, payer, and gender cohort. The count of discharges is then divided by the region-specific population, resulting in a regional utilization rate. The regional estimates are calculated by applying the regional rate to the locally-defined population.

The national rate model is calculated by summing up the weighted discharges from the PIDB for each DRG, age, payer, and sex cohort. We then divide by the total national population for each corresponding cohort. The result is a national rate model that is applied to the locally-defined populations.

The regional- and national-based local estimates are intended as benchmarks for the local utilization.

Population Data

The use rates previously described are applied to demographic data at the zip code level to yield estimates of inpatient discharges by a given population from 2014 through 2024. Truven factors in age, sex, and insurance mix of each population to ensure that the estimates reflect local variation. Age and sex statistics at the Zip code level are obtained from Nielsen Demographic data. Insurance mix for the population is derived from the Truven 2014 Insurance Coverage Estimates database, which estimates the number of people covered by various health insurance arrangements at the Zip code level. Truven has done extensive research to forecast the year-by-year impact of Healthcare Reform on insurance enrollment. The forecasted impact of the extended coverage at the Zip code level incorporates local employer-based coverage, household income statistics, Medicaid eligibility rules, and other local factors.