

AN ANALYSIS OF FACTORS AFFECTING HCAHPS SCORES AND
THEIR IMPACT ON MEDICARE REIMBURSEMENT
TO ACUTE CARE HOSPITALS

THESIS

Presented to the Graduate Council of
Texas State University-San Marcos
in Partial Fulfillment
of the Requirements

for the Degree

Master of BUSINESS ADMINISTRATION

by

Amy Mandaville, B.S., M.A.

San Marcos, Texas
December 2012

AN ANALYSIS OF FACTORS AFFECTING HCAHPS SCORES AND
THEIR IMPACT ON MEDICARE REIMBURSEMENT
TO ACUTE CARE HOSPITALS

Committee Members Approved:

William Chittenden, Chair

Francis Méndez

Ravi Jillapalli

Approved:

J. Michael Willoughby
Dean of the Graduate College

COPYRIGHT

by

Amy Mandaville

2012

FAIR USE AND AUTHOR'S PERMISSION STATEMENT

Fair Use

This work is protected by the Copyright Laws of the United States (Public Law 94-553, section 107). Consistent with fair use as defined in the Copyright Laws, brief quotations from this material are allowed with proper acknowledgement. Use of this material for financial gain without the author's express written permission is not allowed.

Duplication Permission

As the copyright holder of this work, I, Amy Mandaville, authorize duplication of this work, in whole or in part, for educational or scholarly purposes only.

ACKNOWLEDGEMENTS

The author acknowledges the committee members whose knowledge and support were invaluable in the completion of this paper. She also is grateful to her husband, Kevin Mandaville, for his tireless encouragement. Finally, she would like to mention her colleagues at University Medical Center at Brackenridge who inspired her to pursue additional academic endeavors.

This manuscript was submitted on October 21, 2012.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	x
ABSTRACT	xi
 CHAPTER	
I. INTRODUCTION	1
II. REVIEW OF THE LITERATURE.....	3
III. PURPOSE OF THE STUDY	6
IV. RESEARCH OBJECTIVES	7
V. SURVEY DATA.....	8
Description of the sample	9
Incompatibilities between samples	21
VI. METHODS	
Factor Analysis	22
General Linear Regression Analysis and ANOVA	22
Nonparametric Analysis.....	23
Quantile Analysis.....	24

VII.	RESULTS	Page
	Factor Analysis	25
	General Linear Regression Analysis and ANOVA	27
	Nonparametric Analysis.....	47
	Quantile Regression	51
VIII.	CONCLUSION.....	63
IX.	APPENDIX A: HCAHPS SURVEY	66
X.	APPENDIX B: DATA CODES.....	70
XI.	APPENDIX C: QUANTILE ANALYSIS RESULTS TABLES	73
XII.	BIBLIOGRAPHY.....	83

LIST OF TABLES

Table	Page
1. AGE DISTRIBUTION 2005	10
2. HOSPITAL SIZE DISTRIBUTION 2005	10
3. AGE DISTRIBUTION 2006	12
4. HOSPITAL SIZE DISTRIBUTION 2006	12
5. AGE DISTRIBUTION 2007	14
6. HOSPITAL SIZE DISTRIBUTION 2007	15
7. TOTAL AGE DISTRIBUTION	16
8. TOTAL HOSPITAL SIZE DISTRIBUTION	17
9. TEACHING STATUS DISTRIBUTION	18
10. LANGUAGE DISTRIBUTION	18
11. RACE DISTRIBUTION	19
12. CORRELATION COEFFICIENTS (KENDALL TAU)	25
13. FACTOR LOADINGS (VARIMAX ROTATION)	26
14. 2005 MODEL 1 RESULTS	29
15. 2005 MODEL 2 RESULTS	31
16. 2005 MODEL 3 RESULTS	33
17. 2006 MODEL 1 RESULTS	35
18. 2006 MODEL 2 RESULTS	37
19. 2006 MODEL 3 RESULTS	38
20. 2007 MODEL 1 RESULTS	41
21. 2007 MODEL 2 RESULTS	42
22. 2007 MODEL 3 RESULTS	43

Table	Page
23. MODEL GOODNESS OF FIT RESULTS FOR 2005.....	46
24. MODEL GOODNESS OF FIT RESULTS FOR 2006.....	46
25. MODEL GOODNESS OF FIT RESULTS FOR 2007.....	46
26. ROBUST MEASURES OF CENTER AND DISPERSION, 2005	47
27. ROBUST MEASURES OF CENTER AND DISPERSION, 2006	48
28. ROBUST MEASURES OF CENTER AND DISPERSION, 2007	50
29. QUANTILE SUMMARY FOR 2005	53
30. 2005 TEACHING QUANTILE REGRESSION COMPARISONS	55
31. QUANTILE SUMMARY FOR 2006.....	56
32. 2006 TEACHING QUANTILE REGRESSION COMPARISONS.....	58
33. QUANTILE SUMMARY FOR 2007	59
34. 2005 50 th QUANTILE REGRESSION RESULTS	73
35. 2005 25 th QUANTILE REGRESSION RESULTS	75
36. 2005 75 th QUANTILE REGRESSION RESULTS	76
37. 2006 50 th QUANTILE REGRESSION RESULTS	77
38. 2006 25 th QUANTILE REGRESSION RESULTS	78
39. 2006 75 th QUANTILE REGRESSION RESULTS	79
40. 2007 50 th QUANTILE REGRESSION RESULTS	80
41. 2007 25 th QUANTILE REGRESSION RESULTS	81
42. 2007 75 th QUANTILE REGRESSION RESULTS	82

LIST OF FIGURES

Figure	Page
1. Distribution of Hospital Ratings	20
2. Scree Plot for 2005 Survey	26
3. Comparison of Ratings for 2005.....	47
4. Comparison of Ratings for 2006.....	49
5. Comparison of Ratings for 2007.....	50
6. 2005 Base Case Quantile Comparison Chart.....	54
7. 2005 Pain Control Quantile Comparison Chart.....	55
8. 2006 Base Case Quantile Comparison Chart.....	57
9. 2006 Pain Control Quantile Comparison Chart.....	57
10. 2007 Base Case Quantile Comparison Chart.....	60
11. 2007 Pain Control Quantile Comparison Chart.....	61
12. 2007 Teaching Quantile Comparison Chart	61

ABSTRACT

AN ANALYSIS OF FACTORS AFFECTING HCAHPS SCORES AND THEIR IMPACT ON MEDICARE REIMBURSEMENT TO ACUTE CARE HOSPITALS

by

Amy Mandaville, B.S., M.A.

Texas State University-San Marcos

December 2012

SUPERVISING PROFESSOR: WILLIAM CHITTENDEN

Patient responses to the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) for 2005, 2006, and 2007 were analyzed to determine if a pattern of responses correlated with overall acute care hospital ratings. Although a statistically significant difference was noted between major teaching hospitals, minor teaching hospitals, and non-teaching hospitals, there was no practical significance observed when other variables were added. Pain control and nurse interaction with patients were the variables found to be most closely correlated with overall hospital ratings.

I. INTRODUCTION

Medicare is a national health insurance program passed into law in 1965 to provide guaranteed medical coverage for aged and disabled citizens. Medicare is administered by the federal government and currently provides healthcare coverage for U.S. citizens 65 years or older, as well as younger individuals with disabilities and those with permanent kidney disease. It is funded by employee/employer payroll taxes and by premiums deducted from Social Security checks. Medicare is divided into four defined benefits. Part A covers hospital care, Part B provides outpatient services, Part C (or Medicare Advantage) allows participation in a federally subsidized private health plan, and Part D encompasses prescription drug coverage (Social Security 2012).

Medicare is the single largest source of reimbursement for medical services in the United States, paying \$318,009,000,000 to healthcare providers in 2010. Most recipients of Medicare services are over 65 years old, but 16.85% of Medicare patients are younger and disabled (U.S. Social Security Administration 2011). Starting in October 2012, Medicare will begin reimbursing hospitals based on patient satisfaction survey scores. “Under the CMS's (Centers for Medicare and Medicaid Services) proposal, Medicare will begin withholding 1% of its payments to hospitals starting in October 2012. That money — \$850 million in the first year — will go into a pool to be doled out as bonuses to hospitals that score above average on several measures. Patient survey scores would determine 30% of the bonuses, while clinical measures for basic quality care would set

the rest” (Rau 2011). Medicare will increase hospital payments withholding to 2% in 2017 (Adamy 2012). The implications of this funding change may be significant for hospitals that serve patients who are not likely to report high patient satisfaction. Examination of differences in patient satisfaction scores between different types of hospitals and factors measured may yield useful information about adjustments that might be considered to render more equitable distribution of funds under the new system.

II. REVIEW OF THE LITERATURE

Although patient satisfaction surveys have been used in the healthcare community for many years, there was not an approved standardized instrument to compare different facilities before 2005. In addition, the information from the surveys was not publicly reported. In September 1999, an organization was founded to improve national healthcare quality, including standardizing health quality measurement and reporting, called the National Quality Forum (NQF) (National Quality Forum 2011). With the consensus of a variety of stakeholders and in cooperation with RAND, Harvard Medical School, and the American Institutes for Research (Gage 2008), NQF formally endorsed the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey as an instrument that would produce comparable, reportable data about patient care perceptions in May 2005 (Services 2011).

The HCAHPS is a patient satisfaction survey consisting of 27 questions that can be administered by four possible methods or modes: mail, telephone, mail followed by telephone, or active interactive voice response (IVR). Eighteen of the questions are patient rating items that cover “communication with doctors, communication with nurses, responsiveness of hospital staff, pain management, communication about medicines, discharge information, cleanliness of environment, and quietness of the hospital environment” (Services 2011). Additional questions include screener items, such as

overall hospital rating and whether the patient would recommend the hospital demographic items to assist with analysis of the information collected. The survey is available in English, Spanish, Chinese, Russian, and Vietnamese. A copy of the English survey is included in Appendix A (HCAHPS Hospital Survey 2012).

It is well documented (Young 2000) (Fenton 2012) that different demographics of patients respond differently to patient satisfaction survey questions, which will now affect hospital reimbursement. Patient characteristics, as well as mode of survey, were considered in a study by O'Malley in 2005 to develop a model for case-mix adjustment and not penalize hospitals unfairly for types of patients and disorders that present to the hospital. The study indicated that "hospital service (surgery, obstetric, medical), age, race (non-Hispanic black), education, general health status, speaking Spanish at home, having a circulatory disorder, and interactions of each of these variables with service" modestly but significantly affected patient satisfaction ratings (O'Malley 2005, 2162). More recent information indicated that ratings of nurses, doctors, and pain management had the most impact on HCAHPS scores (Maxfield 2012). Identical results were determined in the findings of this study.

Other healthcare facilities have conducted research into variables affecting patient satisfaction scores. "Dr. James Merlino, chief experience officer at the Cleveland Clinic, which scores below average on seven of nine key patient-satisfaction questions, tells Kaiser Health News that doctors and nurses have done their own studies and concluded that very sick and depressed patients give skewed views. Very ill patients are less likely to report that nurses check in on them every hour — even when logs prove they did, he says" (Suttell 2011). It was also found that patients who receive emergency care are

more likely to rate their experiences poorly than patients who receive scheduled care (Gage 2008).

Based on the studies of patient characteristics, CMS determined that an adjustment for mode of survey and patient mix, including emergency room admission (HCAHPS - Hospital Care Quality Care Information from the Customer Perspective 2008), prior to reporting the data on www.hospitalcompare.hhs.gov was warranted (Hospital Compare 2012). The adjustment appeared to have a lesser impact on scores than on overall hospital rating, but CMS felt that the adjustment reduced bias in the comparison of hospitals, particularly for hospitals that served lower socio-economic patients and those with multiple co-morbidities affecting overall health (Gage 2008).

However, there is concern in the medical community that all variables that contribute to patient satisfaction scores have not been considered. For example, teaching hospitals, which provide educational experience to the next generation of physicians, are 33% more costly than non-teaching hospitals (Cameron 1985) and only 10% of them reportedly can compete with non-teaching hospitals based on the provision of patient services (Grosskopf 2001) (Weissman 2002) (Khuri 2001). Although some studies indicate improved patient survival rates and measures of quality care in teaching hospitals (Allison 2011), perceptions of patient satisfaction are not necessarily correlated to better medical care (Fenton 2012). In fact, some research shows that teaching hospital and other large hospitals receive worse patient evaluations than other hospitals, a factor that CMS will not consider in its funding decisions (Weaver 2011).

III. PURPOSE OF THE STUDY

The HCAHPS survey is being used to measure hospital patient satisfaction nationally, and the results will be utilized to determine Medicare funding within the next year. Research about survey mode and patient-mix has resulted in adjustment to scores to accommodate factors that might unfairly lead to lower scores. However, no research has addressed whether or not scores for teaching hospitals have statistically significantly lower scores than the average score of non-teaching hospitals, despite literature to indicate that teaching hospitals may indeed have lower scores and require higher costs to operate than non-teaching hospitals. Changes in Medicare funding will negatively affect teaching hospitals' ability to train new physicians, impacting healthcare across the country. Additional factors, such as pain control, nurse interactions and physician interactions, and their affects on hospital ratings, have not been extensively examined.

This study, then, will examine the relationship between factors such as teaching hospitals' patient satisfaction survey scores and those of non-teaching hospitals, pain control variables, and nurse and physician interactions with patients. A statistically significant difference between these factors may allow CMS to examine adjustment to HCAHPS scores prior to posting them publicly and adjusting levels of reimbursement accordingly. This information is significant for healthcare providers, healthcare administrators, and any individual who will access hospital healthcare services.

IV. RESEARCH OBJECTIVES

In order to determine whether HCAHPS scores vary by different factors, a description of the responses and the population of respondents will be presented. A descriptive analysis of the data will be performed in order to determine the characteristics of the hospitals in the sample. The composition of the sample will be compared to the composition of the target population of hospitals.

A factor analysis will be performed to observe how consistently the individual items load with groupings designated by HCAHPS as nurse care and MD care. These groups will be analyzed separately. The study will present analysis of how these sources of care and the general hospital experience are related to overall quality ratings. As noted in the literature review, quality ratings can be influenced by patients' overall health rating, educational level, race/ethnicity, language spoken in the home, age, and gender. Pain management was not included in previous research (O'Malley 2005), but it will be included in this study as a possible predictor of patient satisfaction. Size of hospital and hospital ownership are not variables that have been suggested to influence patient satisfaction ratings significantly, and they will not be included in the study. In addition, teaching hospitals are suggested by the literature to have lower patient satisfaction scores and higher costs than non-teaching hospitals and are one focus of this investigation.

V. SURVEY DATA

Raw data from HCAHPS surveys from 2005, 2006, and 2007 were obtained from the CAHPS database in Rockville, MD. Current information indicates that HCAHPS survey responses have remained essentially flat over the last five years, varying no more than 8% from year to year (Maxfield 2012), indicating that the raw data obtained from 2005-2007 should be valid for current analysis. The data required some manipulation in order to complete the analyses. Unlike the HCAHPS surveys response files for 2006 and 2007, the data from 2005 surveys were not coded with hospital size, ownership, or teaching status in the same data set; therefore, those hospital codes were added to the 2005 data to facilitate the comparison and the analysis. For the variable age, the code 999 was used as a nonresponse or missing data flag. The 999s were replaced with the missing data identifier used in R language (“NA”). Finally, some of the data utilized actual ages of the patient, while other data were coded as age ranges. Since for the 2006 and 2007 files only ranges are available, the actual ages in the 2005 data were categorized following the same convention of the files for 2006 and 2007. All question responses on the HCAHPS survey were recoded from negative to positive, with the exception of Overall Health rating in the survey. In order to compare items during analysis, the Overall Health rating responses were recoded to place the most negative rating as the first

possible response and the most positive rating as the last possible response. The teaching status, hospital size, hospital ownership, and age range codes can be found in Appendix B. Finally, hospital service (obstetric, medical, or surgical) was not coded in the 2005 data but was available for the 2006 and 2007 data.

Description of the sample

The 2005 HCAHPS data consist of 151,296 responses from 254 hospitals. 52,322 (34.58%) of respondents were male and 96,912 (64.05%) respondents were female. Gender was not specified in 2062 (1.36%) cases. A total of 26,849 (17.75%) responses were from major teaching hospitals, 49,487 (32.70%) were from minor teaching hospitals, and 74,960 (49.55%) were from non-teaching hospitals. A total of 3,332 (2.20%) responses were from non-profit hospitals, 114,433(75.64%) were from for-profit hospitals, and 33,531(22.16%) were from non-federal government hospitals. A total of 182 respondents in this data set were minor children, under the age of 18. These responses for minor children were eliminated from the study because they will not be included in Medicare reimbursement changes in the future. The following tables show age distributions and hospital size in the 2005 data set:

TABLE 1: AGE DISTRIBUTION 2005

Age	Number of Respondents	Percentage of Respondents
18-24	12624	8.58%
25-29	11457	7.79%
30-34	10985	7.47%
35-39	8842	6.01%
40-44	8520	5.79%
45-49	9559	6.50%
50-54	10374	7.05%
55-59	10809	7.35%
60-64	10601	7.20%
65-69	11138	7.57%
70-74	11607	7.89%
75-79	12030	8.18%
80-84	10278	6.98%
85-89	5760	3.91%
90+	2567	1.74%
Totals	147151	100.00%

TABLE 2: HOSPITAL SIZE DISTRIBUTION 2005

Bedsizes	Number of Respondents	Percentage of Respondents
6-24	1689	1.12%
25-49	6071	4.01%
50-99	12402	8.20%
100-199	28659	18.94%
200-299	26591	17.58%
300-399	30766	20.33%
400-499	12517	8.27%
500+	32601	21.55%
Totals	151296	100.00%

Additional information about the respondents was obtained from the data, including educational level, race, ethnicity, and survey language. Educational level for

the 2005 data included 4,615 (5.61%) of respondents having less than an 8th grade education, 8,943 (10.86%) with some high school, 25,886 (31.45%) reporting to be high school graduates or obtaining G.E.D.s, 22,934 (27.86%) with some college or a two year degree, 10,950 (13.30%) with four year college degrees, and 8,993 (10.92%) with education beyond a four year college degree. The number of respondents who completed the survey in a given language was 76,738 (92.66%) for English, 4,754 (5.74%) for Spanish, and 1,322 (1.60%) for Chinese. Ethnicity was described as 9,052 (11.48%) Spanish/Hispanic/Latino and 69,818 (88.52%) not Spanish/Hispanic/Latino. Race was categorized as 41,267(27.28%) Caucasian/White; 7,678 (5.07%) African-American/Black; 1,131 (0.75%) Asian-American; 260 (0.19%) Pacific Islander; 961 (0.64%) American Indian or Alaska native; and 5,775 (3.82%) Other. The remainder of the data was not coded for race, which included 94,224 (62.28%) respondents in the 2005 data set.

The 2006 HCAHPS data consist of 190,690 responses from 935 hospitals. A total of 67,112 (35.28%) of respondents were male and 123,090 (64.72%) respondents were female, comparable to the composition of 2005. Gender was not specified in 488 (0.26%) cases. A total of 18,423 (9.66%) responses were from major teaching hospitals, 28,452 (14.92%) were from minor teaching hospitals, and 143,815 (75.42%) were from non-teaching hospitals. A total of 10,593 (5.56%) responses were from non-federal government hospitals, 109,652 (57.50%) were from non-profit hospitals, 68,892 (36.13%) were from for-profit hospitals, and 1553 (0.81%) were from federal government hospitals. The following table shows age distributions in the 2006 data set:

TABLE 3: AGE DISTRIBUTION 2006

Age	Number of Respondents	Percentage of Respondents
18-24	11405	6.08%
25-29	11890	6.33%
30-34	11165	5.95%
35-39	8693	4.63%
40-44	7792	4.15%
45-49	9625	5.13%
50-54	11584	6.17%
55-59	13926	7.42%
60-64	14834	7.91%
65-69	17419	9.28%
70-74	18667	9.94%
75-79	20071	10.69%
80-84	16844	8.97%
85-89	9594	5.11%
90+	4204	2.24%
Totals	187713	100.00%

The size of the hospital was coded by number of beds. The following table shows the distribution of hospital size in the 2006 data set.

TABLE 4: HOSPITAL SIZE DISTRIBUTION 2006

Bedsizes	Number of Respondents	Percentage of Respondents
0-24	723	0.38%
25-49	7408	3.88%
50-99	22443	11.77%
100-199	57472	30.14%
200-299	38980	20.44%
300-399	27627	14.49%
400-499	16428	8.62%
500+	19609	10.28%
Totals	190690	100%

Educational level for the 2006 data included 11,947 (6.57%) of respondents having less than an 8th grade education, 18,456 (10.15%) with some high school, 54,510 (29.96%) reporting to be high school graduates or obtaining G.E.D.s, 52,226 (28.71%) with some college or a two year degree, 22,910 (12.59%) with four year college degrees, and 21,873 (12.02%) with education beyond a four year college degree.

The number of respondents who completed the survey in a given language was 167,503 (91.65%) for English, 11,401 (6.24%) for Spanish, and 3,867 (2.12%) for Chinese. Ethnicity was described as 131,562 (76.58%) not Spanish/Hispanic/Latino; 25,037 (14.57%) Puerto Rican; 7,789 (4.53%) Mexican-American/Chicano; 574 (0.33%) Cuban; or 6834 (3.98%) other Spanish/Hispanic/Latino. Race was categorized as 148,801 (78.03%) Caucasian/White; 15,650 (8.21%) African-American/Black; 6,965 (3.65%) Asian-American; 1,303 (0.68%) Pacific Islander; 3,877 (2.03%) American Indian or Alaska native and 14,094 (7.39%) Other. In addition, since the 2006 and 2007 data include principal reason for hospital admission, 22,661 (16.10%) was obstetric, 69,561 (49.43%) was medical, and 48,500 (34.47%) was surgical for the 2006 data.

The 2007 HCAHPS data consist of 547,391 responses from 1325 hospitals. 191,027 (35.38%) of respondents were male and 348,921 (64.62%) respondents were female; a similar distribution to the ones from 2005 and 2006. Gender was not specified in 7,443 (1.36%) cases. A total of 54,671 (9.99%) responses were from major teaching hospitals, 102,672 (18.76%) were from minor teaching hospitals, and 390,047 (71.26%) were from non-teaching hospitals. A total of 345,467 (63.11%) responses were from non-profit hospitals, 159,683 (29.17%) were from for-profit hospitals, 40,036 (7.31%)

were from non-federal government hospitals, and 2204 (0.40%) were from federal government hospitals. The following table shows age distributions in the 2007 data set:

TABLE 5: AGE DISTRIBUTION 2007

Age	Number of Respondents	Percentage of Respondents
18-24	32252	5.94%
25-29	34688	6.38%
30-34	31602	5.82%
35-39	21983	4.05%
40-44	21983	4.05%
45-49	28183	5.19%
50-54	34417	6.33%
55-59	41057	7.56%
60-64	46497	8.56%
65-69	52721	9.70%
70-74	54804	10.09%
75-79	56016	10.31%
80-84	47482	8.74%
85-89	27705	5.10%
90+	11896	2.19%
Totals	543286	100.00%

The size of the hospital was coded by number of beds. The following table shows the distribution of hospital size in the 2007 data set.

TABLE 6: HOSPITAL SIZE DISTRIBUTION 2007

Bedsizes	Number of Respondents	Percentage of Respondents
0-24	5705	1.05%
25-49	31367	5.73%
50-99	68894	12.59%
100-199	144254	26.35%
200-299	115680	21.13%
300-399	76320	13.94%
400-499	37892	6.92%
500+	67278	12.29%
Totals	547390	100.00%

Educational level for the 2007 data was delineated with 35,206 (6.76%) of respondents having less than an 8th grade education, 54,373(10.43%) with some high school, 160,180 (30.74%) reporting to be high school graduates or having obtained G.E.D.s, 148,795 (28.55%) with some college or a two year degree, 63,040 (12.10%) with four year college degrees, and 59,522 (11.42%) with education beyond a four year college degree.

The number of respondents who completed the survey in a given language was 487,809 (92.90%) for English, 27,861 (5.31%) for Spanish, and 9,425 (1.79%) for Chinese. Ethnicity was described as 431,514 (88.11%) not Spanish/Hispanic/Latino; 5,331(1.09%) Puerto Rican; 29,435 (6.01%) Mexican-American/Chicano; 3,269 (0.67%) Cuban; or 20,216 (4.13%) other Spanish/Hispanic/Latino. Race was categorized as 434,348 (79.35%) Caucasian/White; 47,335 (8.65%) African-American/Black; 17,299 (3.16%) Asian-American; 4,363 (0.80%) Pacific Islander; 11,628 (2.12%) American Indian or Alaska native and 32,418 (5.92%) Other. In conclusion, hospital service was coded as 82,911 (16.59%) obstetric, 246,658 (49.36%) medical, and 170,093 (34.04%) surgical for the 2007 data.

TABLE 7 shows a comparison of the composition of the age distributions for the samples of 2005, 2006 and 2007. Although age distribution appears to be fairly consistent across data samples, the 2006 and 2007 respondents appear to be slightly older than the respondents from the 2005 data sample. Beginning at the 60-64 year age range, the survey participants appear to be 1-2% more prevalent in the 2006 and 2007 data sets than in the 2005 data set. In the younger age ranges, respondents appear with 1-2% less frequency in the 2006-2007 data sets than those in the 2005 data sample. It should be noted that the 2005 data set was significantly smaller than the 2006 and 2007 data sets, and older participants may not have been as readily available at that time.

TABLE 7: TOTAL AGE DISTRIBUTION

Age	Percentage of Respondents		
	2005	2006	2007
18-24	8.58%	6.08%	5.94%
25-29	7.79%	6.33%	6.38%
30-34	7.47%	5.95%	5.82%
35-39	6.01%	4.63%	4.05%
40-44	5.79%	4.15%	4.05%
45-49	6.50%	5.13%	5.19%
50-54	7.05%	6.17%	6.33%
55-59	7.35%	7.42%	7.56%
60-64	7.20%	7.90%	8.56%
65-69	7.57%	9.28%	9.70%
70-74	7.89%	9.94%	10.09%
75-79	8.18%	10.69%	10.31%
80-84	6.98%	8.97%	8.74%
85-89	3.91%	5.11%	5.10%
90+	1.74%	2.24%	2.19%
Totals	100.00%	100.00%	100.00%

TABLE 8 shows a comparison of the composition of the hospital bedsize distributions for the samples of 2005, 2006 and 2007. There were more hospitals at the 100-199 bed range and the 200-299 bed range in the 2006-2007 data sets than there were in the 2005 data set. There were fewer beds in the 300+ bed range in the 2006-2007 data sets than there were in the 2005 data set. There is no apparent reason for this variation, other than which hospitals agreed to participate in the survey. Responses for year 2005 had a larger participation for larger hospitals than the ones in 2006 and 2007.

**TABLE 8: TOTAL HOSPITAL
SIZE DISTRIBUTION**

Bedsizes	2005	2006	2007
6-24	1.12%	0.38%	1.04%
25-49	4.01%	3.88%	5.73%
50-99	8.20%	11.77%	12.59%
100-199	18.94%	30.14%	26.35%
200-299	17.58%	20.44%	21.13%
300-399	20.33%	14.49%	13.94%
400-499	8.27%	8.62%	6.92%
500+	21.55%	10.28%	12.30%
Totals	100.00%	100.00%	100.00%

A table comparing distribution of teaching and non-teaching hospitals was included as this variable is one of the subjects of investigation. Major Teaching hospital refers to a facility with a large number of physician residency programs and is typically affiliated with a medical school. Minor Teaching hospital refers to a facility with a small

number of physician residency programs and may or may not be directly affiliated with a medical school. Non-teaching hospitals are those that do not provide clinical education to student physicians.

TABLE 9 shows a comparison of the composition of the teaching status distributions for the samples of 2005, 2006 and 2007. Fewer teaching hospitals (both major and minor) participated in the 2006 and 2007 surveys than did in the 2005 surveys.

TABLE 9: TEACHING STATUS DISTRIBUTION

Hospital Status	2005	2006	2007
Major Teaching	17.75%	9.66%	9.99%
Minor Teaching	32.70%	14.92%	18.76%
Non-Teaching	49.55%	75.42%	71.25%
Total	100.00%	100.00%	100.00%

TABLE 10 shows a comparison of the composition of language distributions for the samples of 2005, 2006 and 2007. No significant difference in language distribution was observed throughout the data sets.

TABLE 10: LANGUAGE DISTRIBUTION

Language	2005	2006	2007
English	92.66%	91.64%	92.90%
Spanish	5.74%	6.24%	5.31%
Chinese	1.60%	2.12%	1.79%
Total	100.00%	100.00%	100.00%

TABLE 11 shows a comparison of the composition of race distributions for the samples of 2005, 2006, and 2007. Since race was not coded for the majority of the 2005 data sample, comparison between 2005 and 2006/2007 would not be accurate. However, race appears to be consistently distributed between data sets of 2006 and 2007. Most of the observations for 2005 appear not coded for race (62.28%); therefore, skewed results were expected concerning this variable.

TABLE 11: RACE DISTRIBUTION

Race	2005	2006	2007
White/Caucasian	27.28%	78.03%	79.35%
Black/African-American	5.07%	8.21%	8.65%
Asian	0.74%	3.65%	3.16%
Pacific Islander/Native Hawaiian	0.18%	0.68%	0.80%
Native American/Native Alaskan	0.63%	2.03%	2.12%
Other	3.82%	7.40%	5.92%
Not Coded	62.28%	0.00%	0.00%
Total	100.00%	100.00%	100.00%

In addition, the initial data analysis revealed the data to be negatively skewed, meaning patients were more likely to rate a hospital, nurse, doctor, etc. favorably, rather than unfavorably. This finding presented challenges, since most regressions and other statistical methods assume data to be normally distributed. Some examples of the negative skew in the data are illustrated in figures below:

Figure 1 shows the Data Distribution of Hospital Ratings (where 1 is worst hospital possible and 10 is best hospital possible) for years 2005, 2006, and 2007.

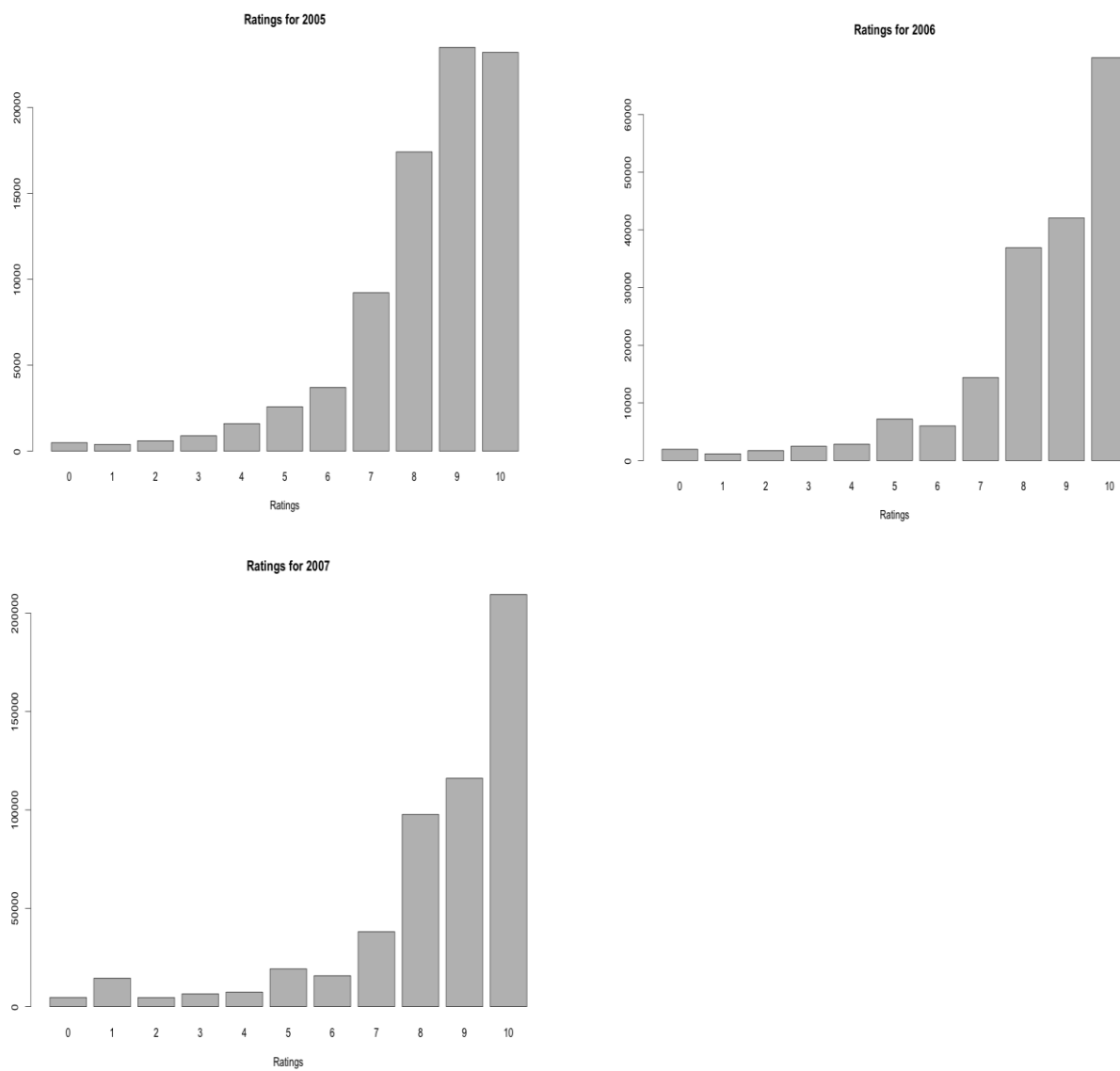


Figure 1: Distribution of Hospital Ratings
2005 (top left), 2006 (top right) and 2007 (bottom left).

Incompatibilities between surveys

Several incompatibilities were found between the 2005 HCAHPS survey and the subsequent 2006 and 2007 surveys. For instance, hospital service (obstetric, medical, or surgical) was absent from the 2005 data and could not be included in our models. In addition, mental health status and major diagnostic categories were not available for any of the data and were excluded from analysis.

It should also be noted that in O'Malley (2005), nurse, doctor, and hospital were each rated on a single ten-point scale. In the 2005-2007 data, nurse and doctor ratings were obtained from three questions, given a four-point scale. The 2006 and 2007 nurse/doctor questions on the HCAHPS are as follows: 1) During this hospital stay, how often did nurses/doctors treat you with courtesy and respect?; 2) During this hospital stay, how often did nurses/doctors listen carefully to you?; 3) During this hospital stay, how often did nurses/doctors explain things in a way you could understand? Possible ratings were *Never*, *Sometimes*, *Usually*, and *Always*.

VI. METHODS

Factor Analysis

Factor analysis (FA) is one of several methods that can be used for data reduction. Beginning with a set of measures on a number of observed variables, a smaller set of artificial variables (factors) accounting for a fraction of the variability in the observed variables is developed. The underlying rationale is that observed variables correlating with a factor are measuring the same construct (Jobson 1992) (Patefield 1991) (Hope 1968).

A Cronbach's α was reported for each factor or subgroup of items being considered. The Cronbach's α is a measure of association studied to assess the consistency (reliability) of the responses within each factor. The absolute value of the coefficient ranges from 0 to 1. The closer the value of the Cronbach's α is to one, the more consistent the responses associated with the factor. Literature in the social sciences usually reports an α of 0.70 or higher to be adequate (Nunnally 1978).

General Linear Regression and ANOVA

Linear regressions were completed to determine which independent variables affected the dependent variable of Hospital Rating. Regressions were completed with individual independent variables to determine which were significant in relation to the

dependent variable, and multiple regressions were completed to develop three separate models for analysis. Model 1 is a linear model that included variables found to be significant in the original case-mix study (O'Malley 2005) and did not contribute to multicollinearity. Model 2 was identical to Model 1, with the addition of a Pain Control variable, which was not included in the original case-mix study. Model 3 consisted of Model 2, plus the Teach indicator variable, which is the focus of this investigation.

An ANOVA was completed for each dataset to determine if changes in hospital ratings could be attributed to three different teaching hospital conditions: Major Teaching Hospital, Minor Teaching Hospital, or Non-teaching Hospital. Both Tukey and Bonferroni confidence interval tests were employed in the event that one correction method revealed different results than the other.

Nonparametric Analysis

A nonparametric measure of Kruskal-Wallis was utilized since it does not assume normally distributed data. The Kruskal-Wallis test is a one-way analysis of variance by ranks. It determines if the different subgroups in the sample have the same median or not. The assumptions in this technique are less restrictive than linear models and may provide additional information about the data that could not be realized utilizing parametric methods.

Quantile Analysis

Finally, since the distribution of the response variable, satisfaction rating, shows a skewed distribution, a quantile regression analysis for Model 3 of each dataset was performed at the 50th, 25th, and 75th quantile to estimate the conditional median (25th and 75th percentiles too), rather than mean. Quantile regression was utilized to employ a different measure of central tendency (median) and statistical dispersion to obtain a more comprehensive analysis of the relationship between the variables, given the negative skewed pattern of the data. This technique was also selected because it makes no distributional assumptions about the error term in the model, which is expected to be non-Gaussian.

VI. RESULTS

Factor Analysis

A factor analysis was performed on the responses to items related to care received from nurses and care received from doctors. The purpose of the factor analysis was to confirm if these items, as a group, reflect the respondents' perception about the care received and the consistency of the responses to these perceptions.

Items 1 through 4 in the survey referred to care received from nurses. Items 5 through 7 referred to care received from doctors (see Appendix A). A correlation analysis revealed some evidence that the responses for items referring to care received from nurses were positively correlated. Likewise, there was some evidence of responses corresponding to care received from doctors being positively correlated. However, there seemed to be little evidence of a correlation between responses to care received from nurses and responses to care received from doctors.

**TABLE 12: CORRELATION COEFFICIENTS
(KENDALL TAU)**

	Q01	Q02	Q03	Q04	Q05	Q06	Q07
Q01	1.0000	0.6405	0.5252	0.4657	0.3099	0.3035	0.2812
Q02	0.6405	1.0000	0.5763	0.5049	0.3120	0.3802	0.3432
Q03	0.5252	0.5763	1.0000	0.4250	0.3150	0.3792	0.4403
Q04	0.4657	0.5049	0.4250	1.0000	0.2382	0.2785	0.2697
Q05	0.3099	0.3120	0.3150	0.2382	1.0000	0.6756	0.5599
Q06	0.3035	0.3802	0.3792	0.2785	0.6756	1.0000	0.6567
Q07	0.2812	0.3432	0.4403	0.2697	0.5599	0.6567	1.0000

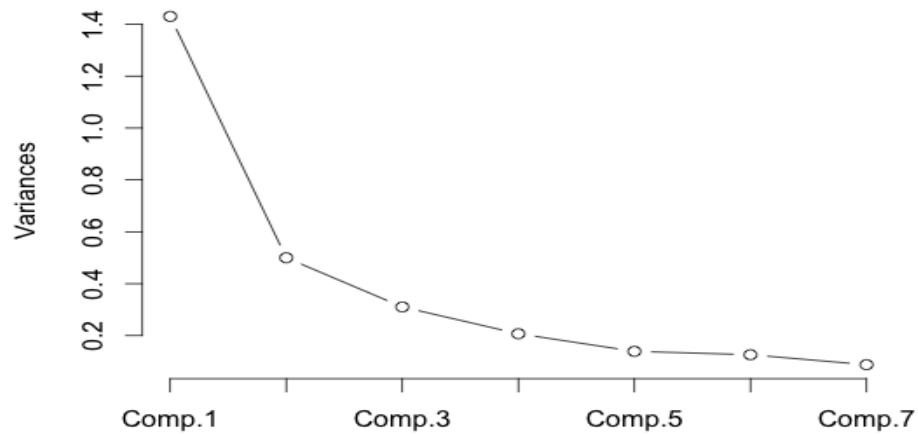


Figure 2: Scree Plot for 2005 Survey

A scree plot suggests that three or four components explain most of the variability in the responses (see Figure 2). A factor analysis with three components (varimax rotation) was then evaluated.

**TABLE 13: FACTOR LOADINGS
(VARIMAX ROTATION)**

	Factor1	Factor2	Factor3
Q01	0.751	0.165	
Q02	0.808	0.134	0.149
Q03	0.638	0.12	0.302
Q04	0.584	0.102	0.13
Q05	0.181	0.941	0.276
Q06	0.267	0.516	0.509
Q07	0.219	0.296	0.863

Three factors explained 66% of the variability in responses. A hypothesis test revealed that three factors were not sufficient to explain the variability in the data.

However, there is some evidence supporting the findings from the correlation analysis (see Tables 12 and 13). Table 13 shows that items 1, 2, 3 and 4 load in the first

component (Cronbach alpha = 0.80). The Cronbach alpha constitutes evidence of consistency in the responses for care received from nurses. Items 5 and 6 load on the second component (Cronbach alpha = 0.79) and item 7 loads on a third component; these were the responses for care received from doctors. The items with nurses correlate well to the first component. A large percentage of the variation in performance is explained by the nurses' performance, implying that the survey performance is consistent. Doctor performance is loaded over two components, in which listening is relevant to both.

General Linear Regression Model and ANOVA

O'Malley (2005) found that hospital service, age, race, education, general health status, circulatory disorder, and language are important case-mix variables and consistent with overall ratings of nurse, doctor, and hospital. The available variables from the 2005 data were included in the initial analysis presented in the manuscript. Age and educational level were excluded from the initial model as being too closely correlated to hospital ratings to yield additional information to the investigation. The first model (1) to analyze is one in which hospital rating is expressed as a function of the following explanatory variables: Nurse Courtesy, Nurse Listening, Nurse Explaining, Doctor Courtesy, Doctor Listening, Doctor Explaining, Overall Health, Race, and Language of the patient.

Nurse Courtesy refers to the question "During this hospital stay, how often did nurses treat you with courtesy and respect?". Nurse Listening refers to the question "During this hospital stay, how often did nurses listen carefully to you?". Nurse Explaining refers to the question "During this hospital stay, how often did nurses explain

things in a way you could understand?”. Doctor Courtesy, Doctor Listening, and Doctor Explaining were posed as identical questions to the nurse questions with doctor substituted for nurse. All of the aforementioned questions were rated as Never, Sometimes, Usually, or Always. Overall Health refers to the question, “In general, how would you rate your overall health?”. Possible responses were Excellent, Very good, Good, Fair, or Poor. Race was coded by self-report as White, Black (or African American), Asian, Pacific Islander (including Native Hawaiian), or Native American (including Alaska Native). Finally, Language refers to self-reported primary language of the home, including English, Spanish, Chinese, Russian, Vietnamese, or Other. For all models, English was the base case against which other languages were compared.

For model 2, the rating of pain management was included, as it was determined to be an important variable in the patient’s overall hospital rating (Maxfield 2012). O’Malley (2005) did not address the pain variable in the original case mix study. This analysis found that if pain was not well managed, overall patient satisfaction ratings were decreased. The inclusion of pain management in this analysis is justified based on an increased Adjusted R^2 when the pain variable was included.

There are three items that encompass characteristics of doctors and nurses that relate to the hospital quality rating, including dimensions of courtesy/respect, listening, and explaining. The reduced model (model 1: TABLE 14) for 2005 is based on O’Malley (2005) models: Nurse Courtesy, Nurse Listening, Nurse Explaining, Doctor Courtesy, Doctor Listening, Doctor Explaining, Overall Health, Race, and Language.

TABLE 14: 2005 MODEL 1 RESULTS

Variable	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.95981	0.10201	9.409	< 2e-16 ***
Nurse Courtesy Sometimes	-0.0674	0.08639	-0.780	0.435591
Nurse Courtesy Usually	0.83919	0.08614	9.742	< 2e-16 ***
Nurse Courtesy Always	1.54854	0.08579	18.051	< 2e-16 ***
Nurse Listening Sometimes	0.93876	0.06407	14.651	< 2e-16 ***
Nurse Listening Usually	1.73765	0.06548	26.537	< 2e-16 ***
Nurse Listening Always	2.32065	0.06558	35.386	< 2e-16 ***
Nurse Explaining Sometimes	0.58854	0.04681	12.572	< 2e-16 ***
Nurse Explaining Usually	1.05538	0.04675	22.577	< 2e-16 ***
Nurse Explaining Always	1.42065	0.04669	30.428	< 2e-16 ***
Doctor Courtesy Sometimes	0.20539	0.07782	2.639	0.008311 **
Doctor Courtesy Usually	0.44570	0.07826	5.695	1.24e-08 ***
Doctor Courtesy Always	0.67388	0.07791	8.649	< 2e-16 ***
Doctor Listening Sometimes	0.54617	0.06428	8.497	< 2e-16 ***
Doctor Listening Usually	0.79793	0.06620	12.053	< 2e-16 ***
Doctor Listening Always	1.02427	0.06639	15.428	< 2e-16 ***
Doctor Explaining Sometimes	0.19996	0.05455	3.665	0.000247 ***
Doctor Explaining Usually	0.32738	0.05477	5.977	2.28e-09 ***
Doctor Explaining Always	0.48941	0.05467	8.952	< 2e-16 ***
Overall Health Fair	0.03764	0.01989	1.892	0.058485
Overall Health Good	0.03019	0.01890	1.597	0.110170
Overall Health Very Good	0.02214	0.01925	1.150	0.250187
Overall Health Excellent	0.13396	0.02080	6.440	1.21e-10 ***
Race White	0.79339	0.01006	78.898	< 2e-16 ***
Race Black	0.87677	0.01722	50.915	< 2e-16 ***
Race Asian	0.55775	0.04571	12.201	< 2e-16 ***
Race Pacific Islander	0.44309	0.08663	5.115	3.15e-07 ***
Race Native American	0.44565	0.04455	10.002	< 2e-16 ***
Language Spanish	0.92905	0.02044	45.459	< 2e-16 ***
Language Chinese	0.22821	0.04046	5.640	1.70e-08 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 1.303 on 76990 degrees of freedom
(74276 observations deleted due to missingness)
Multiple R-squared: 0.4676, Adjusted R-squared: 0.4674
F-statistic: 2332 on 29 and 76990 DF, p-value: < 2.2e-16

In general, the evidence in 2005 Model 1 supports O'Malley's (2005) findings of race, overall health status (when the rating was Excellent), and speaking Spanish at home as important case-mix variables. Nurse and doctor ratings also appear relevant, with the exception of the nurse question about treating the patient with courtesy and respect, when the rating was Sometimes. There was no statistically significant difference between a patient indicating that they had Never been treated with courtesy and respect and when they had Sometimes been treated courteously by the nurse. However, overall nurse ratings appear to be most relevant, based on the magnitude of the coefficients.

Model 2 includes all variables in Model 1 with the pain management question added. Maxfield (2012) reported that the quality of pain management would be associated with the overall quality rating provided by the patient. Pain Control refers to the question "During this hospital stay, how often was your pain well controlled?" Ratings included Never, Sometimes, Usually, or Always. In relation to pain management and the mean ratings obtained, the results for model 2 show that the addition of the pain variable increased the adjusted R^2 from 0.4674 to 0.5018, indicating that the pain variable contributes to the explanatory power of the model.

TABLE 15 - 2005 MODEL 2 RESULTS

Variable	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.365024	0.118808	3.072	0.002125 **
Nurse Courtesy Sometimes	-0.035667	0.097639	-0.365	0.714893
Nurse Courtesy Usually	0.869635	0.097903	8.883	< 2e-16 ***
Nurse Courtesy Always	1.531348	0.097623	15.686	< 2e-16 ***
Nurse Listening Sometimes	0.722839	0.072589	9.958	< 2e-16 ***
Nurse Listening Usually	1.491526	0.074614	19.990	< 2e-16 ***
Nurse Listening Always	2.025143	0.074808	27.071	< 2e-16 ***
Nurse Explaining Sometimes	0.582619	0.053776	10.834	< 2e-16 ***
Nurse Explaining Usually	1.019862	0.054030	18.876	< 2e-16 ***
Nurse Explaining Always	1.339335	0.053965	24.819	< 2e-16 ***
Doctor Courtesy Sometimes	0.227380	0.089807	2.532	0.011348 *
Doctor Courtesy Usually	0.358757	0.090815	3.950	7.81e-05 ***
Doctor Courtesy Always	0.557192	0.090467	6.159	7.37e-10 ***
Doctor Listening Sometimes	0.678212	0.074624	9.088	< 2e-16 ***
Doctor Listening Usually	0.935292	0.077205	12.114	< 2e-16 ***
Doctor Listening Always	1.134605	0.077446	14.650	< 2e-16 ***
Doctor Explaining Sometimes	0.108225	0.063179	1.713	0.086719
Doctor Explaining Usually	0.166509	0.063564	2.620	0.008807 **
Doctor Explaining Always	0.295708	0.063411	4.663	3.12e-06 ***
Overall Health Fair	0.001088	0.022981	0.047	0.962223
Overall Health Good	-0.038279	0.021723	-1.762	0.078049
Overall Health Very Good	-0.061340	0.021860	-2.806	0.005016 **
Overall Health Excellent	0.034523	0.023357	1.478	0.139402
Race White	0.783386	0.011675	67.098	< 2e-16 ***
Race Black	0.886887	0.019637	45.164	< 2e-16 ***
Race Asian	0.567349	0.050203	11.301	< 2e-16 ***
Race Pacific Islander	0.366811	0.095298	3.849	0.000119 ***
Race Native American	0.469516	0.048842	9.613	< 2e-16 ***
Language Spanish	0.937483	0.022360	41.926	< 2e-16 ***
Language Chinese	0.287772	0.045261	6.358	2.06e-10 ***
Pain Control Sometimes	0.644107	0.056818	11.336	< 2e-16 ***
Pain Control Usually	1.012912	0.055702	18.184	< 2e-16 ***
Pain Control Always	1.345891	0.055447	24.274	< 2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 1.277 on 55653 degrees of freedom
(95610 observations deleted due to missingness)
Multiple R-squared: 0.5021, Adjusted R-squared: 0.5018
F-statistic: 1754 on 32 and 55653 DF, p-value: < 2.2e-16

Variables not found to be significant in the 2005 Model 2 included Nurse Courtesy Sometimes as was observed in Model 1, but this model also found Doctor Courtesy Sometimes and Doctor Explaining Sometimes to be insignificant ($p < 0.01$). Overall Health ratings of Fair, Good, and Excellent were not significant, but a rating of Very Good was significant. In Model 1, only a rating of Excellent was significant. Then, Model 3 was fitted to include the teaching variable, with the following codes: Major Teaching hospital (Teach 1), Minor Teaching hospital (Teach 2), and Non-teaching hospital (Teach 3).

TABLE 16 - 2005 MODEL 3 RESULTS

Variable	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.469700	0.119659	3.925	8.67e-05 ***
Minor Teaching	-0.115590	0.017502	-6.604	4.03e-11 ***
Non-teaching	-0.105607	0.015932	-6.629	3.42e-11 ***
Nurse Courtesy Sometimes	-0.033538	0.097597	-0.344	0.731120
Nurse Courtesy Usually	0.872789	0.097861	8.919	< 2e-16 ***
Nurse Courtesy Always	1.534169	0.097581	15.722	< 2e-16 ***
Nurse Listening Sometimes	0.725424	0.072561	9.997	< 2e-16 ***
Nurse Listening Usually	1.493142	0.074584	20.020	< 2e-16 ***
Nurse Listening Always	2.027451	0.074780	27.112	< 2e-16 ***
Nurse Explaining Sometimes	0.581008	0.053753	10.809	< 2e-16 ***
Nurse Explaining Usually	1.016964	0.054011	18.829	< 2e-16 ***
Nurse Explaining Always	1.336744	0.053944	24.780	< 2e-16 ***
Doctor Courtesy Sometimes	0.223290	0.089770	2.487	0.012872 *
Doctor Courtesy Usually	0.352882	0.090780	3.887	0.000102 ***
Doctor Courtesy Always	0.553458	0.090429	6.120	9.40e-10 ***
Doctor Listening Sometimes	0.677138	0.074592	9.078	< 2e-16 ***
Doctor Listening Usually	0.935475	0.077171	12.122	< 2e-16 ***
Doctor Listening Always	1.136125	0.077412	14.676	< 2e-16 ***
Doctor Explaining Sometimes	0.108462	0.063151	1.717	0.085894
Doctor Explaining Usually	0.165178	0.063536	2.600	0.009332 **
Doctor Explaining Always	0.295807	0.063384	4.667	3.06e-06 ***
Overall Health Fair	-0.001691	0.022978	-0.074	0.941327
Overall Health Good	-0.042525	0.021728	-1.957	0.050333
Overall Health Very Good	-0.066623	0.021872	-3.046	0.002320 **
Race White	0.773197	0.011967	64.610	< 2e-16 ***
Race Black	0.866693	0.019858	43.645	< 2e-16 ***
Race Asian	0.561605	0.050207	11.186	< 2e-16 ***
Race Pacific Islander	0.372515	0.095260	3.911	9.22e-05 ***
Race Native American	0.470225	0.048838	9.628	< 2e-16 ***
Language Spanish	0.938264	0.022450	41.794	< 2e-16 ***
Language Chinese	0.285486	0.045249	6.309	2.82e-10 ***
Pain Control Sometimes	0.643342	0.056796	11.327	< 2e-16 ***
Pain Control Usually	1.011790	0.055679	18.172	< 2e-16 ***
Pain Control Always	1.345769	0.055425	24.281	< 2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 1.276 on 55651 degrees of freedom
(95610 observations deleted due to missingness)
Multiple R-squared: 0.5026, Adjusted R-squared: 0.5023
F-statistic: 1654 on 34 and 55651 DF, p-value: < 2.2e-16

2005 Model 3 found insignificant variables identical to 2005 Model 2. Nurse Courtesy Sometimes, Doctor Courtesy Sometimes, Doctor Explaining Sometimes, and Overall Health Ratings of Fair, Good, and Excellent were all found not to be significant ($p < 0.01$) in this model. These findings indicate that adding the Variable Teach did not change the interaction of the other variables in the regression or add to the predictive value of the model. However, there are statistically significant differences between Major and Minor Teaching hospitals, indicating that Minor Teaching hospitals were more likely to correlate negatively to hospital ratings than Major Teaching Hospitals were. It should also be noted that nursing performance across models was the variable most highly correlated with hospital rating.

An ANOVA analysis indicated that there was a significant difference between teaching hospitals and non-teaching hospitals in the 2005 data. Minor teaching hospital and non-teaching hospital indicated a decrease in hospital ratings, relative to the reference Major Teaching hospital. However, although the differences between Teaching hospitals and non-teaching hospitals were statistically significant in the analysis of variance, none of the changes appear to be practically significant in the linear regression model.

Analysis of Variance					
Source	SS	df	MS	F	Prob > F
Between groups	1225.3874	2	612.693699	186.03	0.0000
Within groups	275387.023	83613	3.29359098		
Total	276612.41	83615	3.30816732		
Bartlett's test for equal variances: $\chi^2(2) = 12.7894$ Prob> $\chi^2 = 0.002$					
Comparison of Q21 by Teach (Bonferroni)					
Row Mean- Col Mean	1	2			
2	-.339737 0.000				
3	-.112005 0.000	.227732 0.000			

2006 Data regressions were then completed using Models 1, 2, and 3 to determine if any differences could be determined between the datasets. As noted previously, Model 1 included Nurse Courtesy, Nurse Listening, Nurse Explaining, Doctor Courtesy, Doctor Listening, and Doctor Explaining, Overall Health rating, Race, and Language. Model 2 included the previous variables listed with pain control added, and Model three included all aforementioned variables in addition to teach. The results are outlined below:

TABLE 17 - 2006 MODEL 1 RESULTS

Variable	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.44878	0.07349	6.107	1.02e-09 ***
Nurse Courtesy Sometimes	0.37258	0.06381	5.838	5.28e-09 ***
Nurse Courtesy Usually	1.60463	0.06480	24.764	< 2e-16 ***
Nurse Courtesy Always	2.35774	0.06496	36.296	< 2e-16 ***
Nurse Listening Sometimes	1.12943	0.04454	25.356	< 2e-16 ***
Nurse Listening Usually	2.15907	0.04652	46.411	< 2e-16 ***
Nurse Listening Always	2.71621	0.04701	57.780	< 2e-16 ***
Nurse Explaining Sometimes	0.66795	0.03411	19.583	< 2e-16 ***
Nurse Explaining Usually	1.17491	0.03471	33.852	< 2e-16 ***
Nurse Explaining Always	1.53979	0.03508	43.897	< 2e-16 ***
Doctor Courtesy Sometimes	0.52129	0.05768	9.038	< 2e-16 ***
Doctor Courtesy Usually	0.92047	0.05933	15.516	< 2e-16 ***
Doctor Courtesy Always	1.12980	0.05967	18.934	< 2e-16 ***
Doctor Listening Sometimes	0.34000	0.04689	7.251	4.15e-13 ***
Doctor Listening Usually	0.59949	0.04900	12.235	< 2e-16 ***
Doctor Listening Always	0.77791	0.04957	15.693	< 2e-16 ***
Doctor Explaining Sometimes	0.11763	0.03997	2.943	0.003250 **
Doctor Explaining Usually	0.20459	0.04082	5.012	5.40e-07 ***
Doctor Explaining Always	0.31689	0.04118	7.696	1.41e-14 ***
Overall Health Fair	0.05689	0.01571	3.622	0.000292 ***
Overall Health Good	0.03497	0.01506	2.323	0.020183 *
Overall Health Very Good	0.06216	0.01533	4.054	5.04e-05 ***
Overall Health Excellent	0.16451	0.01673	9.832	< 2e-16 ***
Race White	-0.08315	0.02527	-3.290	0.001001 **
Race Black	-0.05226	0.02672	-1.956	0.050506
Race Asian	-0.01924	0.03177	-0.606	0.544743
Race Pacific Islander	-0.09663	0.04793	-2.016	0.043795 *
Race Native American	-0.00915	0.02698	-0.339	0.734485
Language Spanish	0.50135	0.02002	25.047	< 2e-16 ***
Language Chinese	0.03299	0.02916	1.131	0.258017

TABLE 17 - 2006 MODEL 1 RESULTS (CONTINUED)

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
 Residual standard error: 1.41 on 153101 degrees of freedom
 (37559 observations deleted due to missingness)
 Multiple R-squared: 0.4816, Adjusted R-squared: 0.4815
 F-statistic: 4905 on 29 and 153101 DF, p-value: < 2.2e-16

The evidence in 2006 Model 1 supports O’Malley’s (2005) findings of nurse performance, doctor performance, and speaking Spanish at home as important case-mix variables. However, in 2006 Model 1, indicating an Overall Health Rating of Good, and Race of Black, Asian, Pacific Islander, and Native American descent were not found to be significant. Speaking Chinese at home was also not found to be significant, as had been noted in the previous study.

TABLE 18 - 2006 MODEL 2 RESULTS

Variable	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.263335	0.085515	-3.079	0.002075 **
Nurse Courtesy Sometimes	0.451570	0.072233	6.252	4.08e-10 ***
Nurse Courtesy Usually	1.638001	0.073628	22.247	< 2e-16 ***
Nurse Courtesy Always	2.322473	0.073893	31.430	< 2e-16 ***
Nurse Listening Sometimes	1.027985	0.050335	20.423	< 2e-16 ***
Nurse Listening Usually	1.975457	0.052900	37.343	< 2e-16 ***
Nurse Listening Always	2.484238	0.053525	46.413	< 2e-16 ***
Nurse Explaining Sometimes	0.651547	0.039312	16.574	< 2e-16 ***
Nurse Explaining Usually	1.131843	0.040200	28.155	< 2e-16 ***
Nurse Explaining Always	1.478435	0.040664	36.357	< 2e-16 ***
Doctor Courtesy Sometimes	0.432440	0.066998	6.455	1.09e-10 ***
Doctor Courtesy Usually	0.773937	0.069228	11.180	< 2e-16 ***
Doctor Courtesy Always	0.966286	0.069637	13.876	< 2e-16 ***
Doctor Listening Sometimes	0.337545	0.054824	6.157	7.45e-10 ***
Doctor Listening Usually	0.559553	0.057620	9.711	< 2e-16 ***
Doctor Listening Always	0.716025	0.058306	12.280	< 2e-16 ***
Doctor Explaining Sometimes	0.171752	0.047370	3.626	0.000288 ***
Doctor Explaining Usually	0.217371	0.048561	4.476	7.61e-06 ***
Doctor Explaining Always	0.288304	0.048969	5.887	3.93e-09 ***
Overall Health Fair	0.003619	0.018518	0.195	0.845076
Overall Health Good	-0.063964	0.017690	-3.616	0.000299 ***
Overall Health Very Good	-0.052685	0.017797	-2.960	0.003074 **
Overall Health Excellent	0.042532	0.019133	2.223	0.026216 *
Race White	-0.085206	0.028196	-3.022	0.002512 **
Race Black	-0.028887	0.029874	-0.967	0.333559
Race Asian	0.014348	0.035687	0.402	0.687647
Race Pacific Islander	-0.076648	0.053827	-1.424	0.154453
Race Native American	0.020570	0.030375	0.677	0.498277
Language Spanish	0.507634	0.022962	22.108	< 2e-16 ***
Language Chinese	0.046190	0.033287	1.388	0.165247
Pain Control Sometimes	0.699201	0.040382	17.314	< 2e-16 ***
Pain Control Usually	1.159846	0.039558	29.320	< 2e-16 ***
Pain Control Always	1.483748	0.039610	37.459	< 2e-16 ***

--

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 1.374 on 106831 degrees of freedom
(83826 observations deleted due to missingness)
Multiple R-squared: 0.523, Adjusted R-squared: 0.5229
F-statistic: 3660 on 32 and 106831 DF, p-value: < 2.2e-16

Variables not found to be significant in the 2006 Model 2 included Overall Health ratings of Fair and Excellent ($p < 0.01$), which were not observed in 2006 Model 1. Race

of Black, Asian, Pacific Islander or Native American were again found to be insignificant, and Chinese language continued to be insignificant in 2006 Model 2, as had been observed in Model 1.

TABLE 19 - 2006 MODEL 3 RESULTS

Variable	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.149472	0.086637	-1.725	0.084483
Minor Teaching	-0.114044	0.017480	-6.524	6.87e-11 ***
Non-teaching	-0.114991	0.014305	-8.038	9.19e-16 ***
Nurse Courtesy Sometimes	0.451178	0.072213	6.248	4.18e-10 ***
Nurse Courtesy Usually	1.637108	0.073608	22.241	< 2e-16 ***
Nurse Courtesy Always	2.321567	0.073873	31.427	< 2e-16 ***
Nurse Listening Sometimes	1.027677	0.050321	20.422	< 2e-16 ***
Nurse Listening Usually	1.974452	0.052885	37.335	< 2e-16 ***
Nurse Listening Always	2.483839	0.053512	46.417	< 2e-16 ***
Nurse Explaining Sometimes	0.648941	0.039301	16.512	< 2e-16 ***
Nurse Explaining Usually	1.129145	0.040190	28.095	< 2e-16 ***
Nurse Explaining Always	1.475188	0.040654	36.287	< 2e-16 ***
Doctor Courtesy Sometimes	0.431468	0.066978	6.442	1.18e-10 ***
Doctor Courtesy Usually	0.773743	0.069207	11.180	< 2e-16 ***
Doctor Courtesy Always	0.965881	0.069616	13.874	< 2e-16 ***
Doctor Listening Sometimes	0.336057	0.054809	6.131	8.74e-10 ***
Doctor Listening Usually	0.558067	0.057605	9.688	< 2e-16 ***
Doctor Listening Always	0.714562	0.058289	12.259	< 2e-16 ***
Doctor Explaining Sometimes	0.172594	0.047356	3.645	0.000268 ***
Doctor Explaining Usually	0.217332	0.048547	4.477	7.59e-06 ***
Doctor Explaining Always	0.289692	0.048955	5.918	3.28e-09 ***
Overall Health Fair	0.002688	0.018513	0.145	0.884580
Overall Health Good	-0.064928	0.017685	-3.671	0.000241 ***
Overall Health Very Good	-0.053919	0.017795	-3.030	0.002446 **
Overall Health Excellent	0.041630	0.019130	2.176	0.029540 *
Race White	-0.088936	0.028198	-3.154	0.001611 **
Race Black	-0.039591	0.029910	-1.324	0.185612
Race Asian	0.010183	0.035682	0.285	0.775345
Race Pacific Islander	-0.082662	0.053816	-1.536	0.124534
Race Native American	0.017842	0.030369	0.588	0.556856
Language Spanish	0.509201	0.022971	22.167	< 2e-16 ***
Language Chinese	0.045540	0.033281	1.368	0.171206
Pain Control Sometimes	0.699231	0.040371	17.320	< 2e-16 ***
Pain Control Usually	1.160405	0.039548	29.342	< 2e-16 ***
Pain Control Always	1.483974	0.039599	37.475	< 2e-16 ***

TABLE 19 - 2006 MODEL 3 RESULTS (CONTINUED)

---Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
 Residual standard error: 1.374 on 106829 degrees of freedom
 (83826 observations deleted due to missingness)
 Multiple R-squared: 0.5233, Adjusted R-squared: 0.5231
 F-statistic: 3449 on 34 and 106829 DF, p-value: < 2.2e-16

2006 Model 3 found insignificant variables identical to 2006 Model 2. Overall Health of Fair and Excellent, Black Race, Asian Race, Pacific Islander Race, Native American Race, and Chinese Language were all found to lack significance in the model. These findings indicate that adding the Variable Teach did not change the interaction of the other variables in the regression or add to the predictive value of the model.

An ANOVA analysis indicated that there was a significant difference between teaching hospitals and non-teaching hospitals in the 2006 data. Minor teaching hospitals and non-teaching hospitals indicate a decrease in hospital ratings, relative to the reference Major Teaching hospitals. However, none of the changes appear to be significant in the linear regression model.

Source	Analysis of Variance			F	Prob > F
	SS	df	MS		
Between groups	741.027034	2	370.513517	92.43	0.0000
Within groups	748287.452	186673	4.00854677		
Total	749028.479	186675	4.01247344		
Bartlett's test for equal variances: chi2(2) = 171.9703 Prob>chi2 = 0.000					
Comparison of Q21_06 by FINAL_TEACHING (Bonferroni)					
Row Mean- Col Mean	1	2			
2	-.258609 0.000				
3	-.137795 0.000	.120814 0.000			

2005-2006 Model Comparisons

Qualitative analysis between results of linear regression models for 2005 and 2006 revealed similarities and differences between the two datasets. For all models for 2006, Chinese as the primary language of the home was found to be insignificant ($p>0.01$), but it was significant for all models in 2005. All findings for race were significant in the 2005 data set, but Black, Asian, Pacific Islander, and Native American were insignificant ($p>0.01$) for all models in the 2006 data. Self-report of Fair or Good health was not found to be significant ($p>0.01$) for all models in the 2005 dataset, and Excellent health was not significant in Models 2 and 3, while Very Good health was not significant in Model 1. In the 2006 data set, Good health was not significant in Model 1, and Fair and Excellent health were not significant in Models 2 and 3. A rating of nurse treating the patient with courtesy and respect “Sometimes” was found not to be significant in all three models of the 2005 dataset. Finally, doctor ratings of Sometimes treating patients with courtesy/respect and explaining to patients was not significant for Models 2 and 3 for the 2005 data set, but these ratings were significant for Model 1 in 2005 and all models in 2006.

Finally, 2007 Data regressions were completed using Models 1, 2, and 3 to determine if any differences could be determined between the datasets. Identical to procedures for datasets 2005 and 2006, Model 1 included Nurse Courtesy, Nurse Listening, Nurse Explaining, Doctor Courtesy, Doctor Listening, and Doctor Explaining, Overall Health rating, Race, and Language. Model 2 added the variable pain control, and Model 3 added the teaching variable to the variables from Model 2. The results are outlined below:

TABLE 20 - 2007 MODEL 1 RESULTS

Variable	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.65601	0.04969	13.201	< 2e-16 ***
Nurse Courtesy Sometimes	0.37095	0.04323	8.582	< 2e-16 ***
Nurse Courtesy Usually	1.50147	0.04396	34.159	< 2e-16 ***
Nurse Courtesy Always	2.27221	0.04404	51.596	< 2e-16 ***
Nurse Listening Sometimes	1.07218	0.03104	34.538	< 2e-16 ***
Nurse Listening Usually	2.06297	0.03249	63.497	< 2e-16 ***
Nurse Listening Always	2.66237	0.03280	81.172	< 2e-16 ***
Nurse Explaining Sometimes	0.55048	0.02372	23.208	< 2e-16 ***
Nurse Explaining Usually	1.11317	0.02424	45.925	< 2e-16 ***
Nurse Explaining Always	1.52807	0.02448	62.415	< 2e-16 ***
Doctor Courtesy Sometimes	0.31297	0.03905	8.014	1.11e-15 ***
Doctor Courtesy Usually	0.65866	0.04010	16.425	< 2e-16 ***
Doctor Courtesy Always	0.88283	0.04028	21.916	< 2e-16 ***
Doctor Listening Sometimes	0.32333	0.03216	10.053	< 2e-16 ***
Doctor Listening Usually	0.63892	0.03360	19.015	< 2e-16 ***
Doctor Listening Always	0.84228	0.03397	24.796	< 2e-16 ***
Doctor Explaining Sometimes	0.18969	0.02710	6.999	2.58e-12 ***
Doctor Explaining Usually	0.31720	0.02764	11.476	< 2e-16 ***
Doctor Explaining Always	0.45181	0.02786	16.217	< 2e-16 ***
Overall Health Fair	0.05800	0.01063	5.458	4.82e-08 ***
Overall Health Good	0.03973	0.01020	3.895	9.83e-05 ***
Overall Health Very Good	0.06814	0.01036	6.577	4.82e-11 ***
Overall Health Excellent	0.18657	0.01134	16.453	< 2e-16 ***
Race White	-0.13256	0.01693	-7.829	4.91e-15 ***
Race Black	-0.21751	0.01779	-12.228	< 2e-16 ***
Race Asian	-0.13418	0.02129	-6.304	2.91e-10 ***
Race Pacific Islander	-0.17404	0.02999	-5.803	6.53e-09 ***
Race Native American	-0.13310	0.01844	-7.218	5.27e-13 ***
Language Spanish	0.50692	0.01423	35.623	< 2e-16 ***
Language Chinese	0.09072	0.02078	4.366	1.27e-05 ***

---Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.667 on 455379 degrees of freedom
(91981 observations deleted due to missingness)

Multiple R-squared: 0.4047, Adjusted R-squared: 0.4046

F-statistic: 1.067e+04 on 29 and 455379 DF, p-value: < 2.2e-16

The 2007 Model 1 found all variables to be significant. Nurse Courtesy, Nurse Listening, Nurse Explaining, Doctor Courtesy, Doctor Listening, Doctor Explaining,

Overall Health, Race, and Language were all significant for each rating within each question.

TABLE 21 - 2007 MODEL 2 RESULTS

Variables	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.04540	0.05844	0.777	0.437249
Nurse Courtesy Sometimes	0.34622	0.04913	7.047	1.83e-12 ***
Nurse Courtesy Usually	1.40788	0.05020	28.046	< 2e-16 ***
Nurse Courtesy Always	2.11950	0.05036	42.089	< 2e-16 ***
Nurse Listening Sometimes	0.95532	0.03530	27.065	< 2e-16 ***
Nurse Listening Usually	1.87305	0.03720	50.356	< 2e-16 ***
Nurse Listening Always	2.39765	0.03762	63.736	< 2e-16 ***
Nurse Explaining Sometimes	0.50054	0.02734	18.311	< 2e-16 ***
Nurse Explaining Usually	1.04860	0.02809	37.330	< 2e-16 ***
Nurse Explaining Always	1.43323	0.02840	50.466	< 2e-16 ***
Doctor Courtesy Sometimes	0.28959	0.04517	6.411	1.45e-10 ***
Doctor Courtesy Usually	0.58780	0.04667	12.594	< 2e-16 ***
Doctor Courtesy Always	0.79195	0.04690	16.884	< 2e-16 ***
Doctor Listening Sometimes	0.36146	0.03761	9.612	< 2e-16 ***
Doctor Listening Usually	0.62179	0.03947	15.754	< 2e-16 ***
Doctor Listening Always	0.79269	0.03993	19.853	< 2e-16 ***
Doctor Explaining Sometimes	0.17695	0.03203	5.525	3.30e-08 ***
Doctor Explaining Usually	0.28155	0.03272	8.604	< 2e-16 ***
Doctor Explaining Always	0.37677	0.03299	11.422	< 2e-16 ***
Overall Health Fair	0.01786	0.01266	1.410	0.158477
Overall Health Good	-0.03924	0.01209	-3.245	0.001175 **
Overall Health Very Good	-0.02501	0.01214	-2.060	0.039357 *
Overall Health Excellent	0.08321	0.01308	6.361	2.01e-10 ***
Race White	-0.12332	0.01922	-6.416	1.40e-10 ***
Race Black	-0.18354	0.02024	-9.069	< 2e-16 ***
Race Asian	-0.09306	0.02437	-3.819	0.000134 ***
Race Pacific Islander	-0.13574	0.03429	-3.959	7.53e-05 ***
Race Native American	-0.09578	0.02087	-4.590	4.43e-06 ***
Language Spanish	0.50693	0.01667	30.409	< 2e-16 ***
Language Chinese	0.12739	0.02391	5.327	9.98e-08 ***
Pain Control Sometimes	0.66944	0.02744	24.393	< 2e-16 ***
Pain Control Usually	1.14532	0.02688	42.611	< 2e-16 ***
Pain Control Always	1.49418	0.02691	55.520	< 2e-16 ***

---Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.638 on 321325 degrees of freedom
(226032 observations deleted due to missingness)

Multiple R-squared: 0.4402, Adjusted R-squared: 0.4402

F-statistic: 7897 on 32 and 321325 DF, p-value: < 2.2e-16

While 2007 Model 1 found all variables to be significant, Model 2 indicated that Overall Health Ratings of Fair and Very Good were not significant ($p < 0.01$). Adding the pain control variable appears to have influenced how health ratings can be utilized to determine overall hospital ratings by patients.

TABLE 22 - 2007 MODEL 3 RESULTS

Variable	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.34204	0.05902	-5.795	6.83e-09 ***
Minor Teaching	0.46183	0.01163	39.701	< 2e-16 ***
Non-teaching	0.40627	0.01015	40.019	< 2e-16 ***
Nurse Courtesy Sometimes	0.34090	0.04899	6.958	3.45e-12 ***
Nurse Courtesy Usually	1.39732	0.05006	27.912	< 2e-16 ***
Nurse Courtesy Always	2.10950	0.05022	42.006	< 2e-16 ***
Nurse Listening Sometimes	0.96096	0.03520	27.301	< 2e-16 ***
Nurse Listening Usually	1.88040	0.03709	50.693	< 2e-16 ***
Nurse Listening Always	2.40526	0.03751	64.115	< 2e-16 ***
Nurse Explaining Sometimes	0.50095	0.02726	18.377	< 2e-16 ***
Nurse Explaining Usually	1.05057	0.02801	37.504	< 2e-16 ***
Nurse Explaining Always	1.43562	0.02832	50.691	< 2e-16 ***
Doctor Courtesy Sometimes	0.29424	0.04504	6.532	6.49e-11 ***
Doctor Courtesy Usually	0.59251	0.04655	12.730	< 2e-16 ***
Doctor Courtesy Always	0.79714	0.04678	17.042	< 2e-16 ***
Doctor Listening Sometimes	0.35637	0.03750	9.503	< 2e-16 ***
Doctor Listening Usually	0.61431	0.03936	15.607	< 2e-16 ***
Doctor Listening Always	0.78390	0.03982	19.688	< 2e-16 ***
Doctor Explaining Sometimes	0.18800	0.03194	5.886	3.96e-09 ***
Doctor Explaining Usually	0.29316	0.03263	8.984	< 2e-16 ***
Doctor Explaining Always	0.38440	0.03290	11.685	< 2e-16 ***
Overall Health Fair	0.02244	0.01263	1.777	0.075649
Overall Health Good	-0.03380	0.01206	-2.802	0.005079 **
Overall Health Very Good	-0.02121	0.01211	-1.752	0.079796
Overall Health Excellent	0.08755	0.01305	6.709	1.96e-11 ***
Race White	-0.12249	0.01917	-6.390	1.66e-10 ***
Race Black	-0.14899	0.02020	-7.376	1.63e-13 ***
Race Asian	-0.08883	0.02431	-3.655	0.000257 ***
Race Pacific Islander	-0.13131	0.03420	-3.840	0.000123 ***
Race Native American	-0.08693	0.02081	-4.177	2.95e-05 ***
Language Spanish	0.51940	0.01663	31.233	< 2e-16 ***
Language Chinese	0.13936	0.02385	5.843	5.13e-09 ***
Pain Control Sometimes	0.66660	0.02737	24.357	< 2e-16 ***
Pain Control Usually	1.13946	0.02680	42.510	< 2e-16 ***
Pain Control Always	1.48735	0.02684	55.419	< 2e-16 ***

TABLE 22 - 2007 MODEL 3 RESULTS (CONTINUED)

---Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
 Residual standard error: 1.634 on 321323 degrees of freedom
 (226032 observations deleted due to missingness)
 Multiple R-squared: 0.4433, Adjusted R-squared: 0.4433
 F-statistic: 7526 on 34 and 321323 DF, p-value: < 2.2e-16

2007 Model 3 found insignificant variables identical to 2007 Model 2. Overall Health of Fair and Very Good were found to lack significance in the model. These findings indicate that adding the Variable Teach did not change the interaction of the other variables in the regression or add to the predictive value of the model.

An ANOVA analysis indicated that there was a significant difference between teaching hospitals and non-teaching hospitals in the 2007 data. Minor teaching hospital and non-teaching hospital factors indicate an increase in hospital ratings, relative to the reference Major Teaching hospital. However, none of the changes appear to be significant in the linear regression model.

		Analysis of Variance				
Source		SS	df	MS	F	Prob > F
Between groups		12081.822	2	6040.911	1236.85	0.0000
Within groups		2607157.08	533805	4.88410015		
Total		2619238.9	533807	4.90671517		
Bartlett's test for equal variances: chi2(2) = 1.2e+04 Prob>chi2 = 0.000						
Comparison of Q21_07 by FINAL_TEACHING (Bonferroni)						
Row	Mean-Col Mean	1	2			
2	.52636 0.000					
3	.501527 0.000	-.024834 0.005				

2005, 2006 and 2007 Model Comparisons

Qualitative analysis between results of linear regression models for 2005, 2006, and 2007 revealed that most of the differences were between the 2006 and the other two datasets. For example, Chinese language was a significant predictor for all models in 2005 and 2007, but not for 2006, even though the proportion of Chinese respondents is greater for 2006 than for other years. All findings for race were significant in the 2005 and 2007 data sets, but Black, Asian, Pacific Islander, and Native American were insignificant ($p>0.01$) for all models in the 2006 data. Self-report of Fair or Good health (item 23) was not found to be significantly ($p>0.01$) different from respondents reporting Poor health for all models in the 2005 dataset, and Excellent health was not significant in Models 2 and 3, while Very Good health was not significantly different from those responding having poor health in Model 1. In the 2006 data set, Good health was not significant in Model 1. Fair and Excellent health ratings were not significantly different from poor health in Models 2 and 3. In the 2007 dataset, Fair and Very Good health ratings were not significantly different from those responding poor health in Models 2 and 3, but all health ratings were otherwise significantly different. A rating of nurse treating the patient with courtesy and respect Sometimes was found not to be significantly different from those responding Never in all three models of the 2005 and 2007 datasets. Finally, doctor ratings of Sometimes treating patients with courtesy/respect and explaining to patients was not significantly different from those reporting Never for Models 2 and 3 for the 2005 data set, but these ratings were significantly different from those reporting Never for Model 1 in 2005 and all models in

2006 and 2007. The following are result tables for Models 1, 2 and 3 for 2005, 2006, and 2007 datasets:

TABLE 23- MODEL GOODNESS OF FIT RESULTS FOR 2005

2005 Data	R ²	Adjusted R ²	Standard Error	Degrees of Freedom
Model 1	0.4676	0.4674	1.303	76990
Model 2	0.5021	0.5018	1.277	55653
Model 3	0.5026	0.5023	1.276	55651

TABLE 24 – MODEL GOODNESS OF FIT RESULTS FOR 2006

2006 Data	R ²	Adjusted R ²	Standard Error	Degrees of Freedom
Model 1	0.4816	0.4815	1.41	153101
Model 2	0.523	0.5229	1.374	106831
Model 3	0.5233	0.5231	1.374	106829

TABLE 25: MODEL GOODNESS OF FIT RESULTS FOR 2007

2007 Data	R ²	Adjusted R ²	Standard Error	Degrees of Freedom
Model 1	0.4047	0.4046	1.667	455379
Model 2	0.4402	0.4402	1.638	321325
Model 3	0.4433	0.4433	1.634	321323

The above tables demonstrate evidence of an improvement in model fit with the addition of the pain variable in Model 2 and the Teach variable in Model 3 for each year of data examined.

NONPARAMETRIC ANALYSES

Analysis of 2005 Dataset

TABLE 26: ROBUST MEASURES OF CENTER AND DISPERSION, 2005

Rating	Teaching		
	Major	Minor	None
Mode	10	9	10
Median	9	9	9
IQR	2	2	2

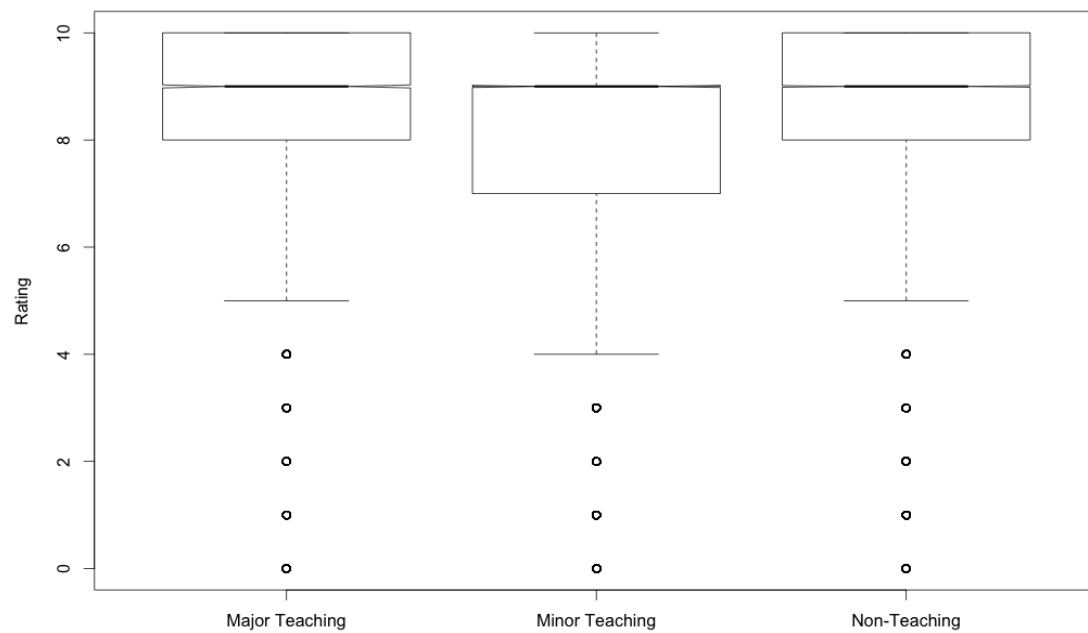


Figure 3: Comparison of Ratings for 2005

Figure 3 and Table 26 show that the typical rating for minor teaching hospitals is

slightly lower than the typical rating for the major teaching and non-teaching hospitals.

Kruskal-Wallis equality-of-populations rank test

teach	Obs	Rank Sum
1	12380	5.51e+08
2	24837	9.59e+08
3	46399	1.99e+09

chi-squared = 674.730 with 2 d.f.
probability = 0.0001

chi-squared with ties = 713.320 with 2 d.f.
probability = 0.0001

A non-parametric analysis of variance (Kruskal-Wallis) show statistical evidence of a difference among the median ratings for each type of hospital (p-value=0.0001), in 2005.

Table 26 and Figure 3 show that there is no pronounced difference in the shape of the distribution of ratings; the three distributions are negatively skewed. This supports the idea that the finding from the Kruskal-Wallis test for equality in median ratings is due to a difference in the median ratings and not due to a difference in the shape of the distributions.

Analysis of 2006 Dataset

**TABLE 27: ROBUST MEASURES OF
CENTER AND DISPERSION, 2006**

Rating	Teaching		
	Major	Minor	None
Mode	10	10	10
Median	9	9	9
IQR	2	2	2

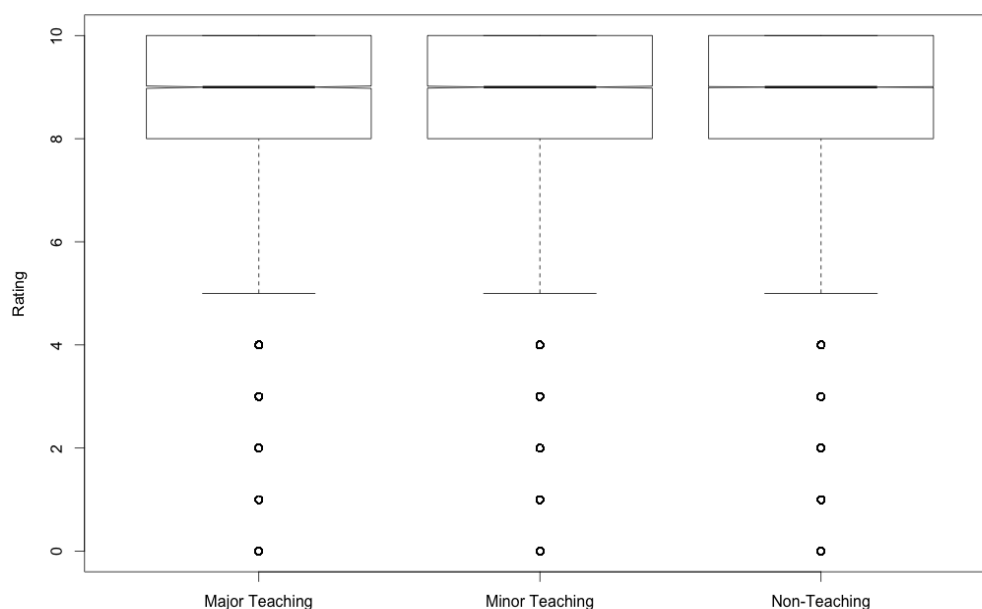


Figure 4: Comparison of Ratings for 2006

kruskal-wallis equality-of-populations rank test

final_~g	Obs	Rank Sum
1	17878	1.74e+09
2	27807	2.51e+09
3	140991	1.32e+10

chi-squared = 199.563 with 2 d.f.
probability = 0.0001

chi-squared with ties = 215.070 with 2 d.f.
probability = 0.0001

A non-parametric analysis of variance (Kruskal-Wallis) shows statistical evidence of a difference among the median ratings for each type of hospital (p-value=0.0001), in 2006. There is no pronounced difference in the shape of the distribution of ratings; the three distributions are negatively skewed. This supports the idea that the finding from the

Kruskal-Wallis was due to a difference in the median ratings and not due to a difference in the shape of the distributions.

Analysis of the 2007 Dataset

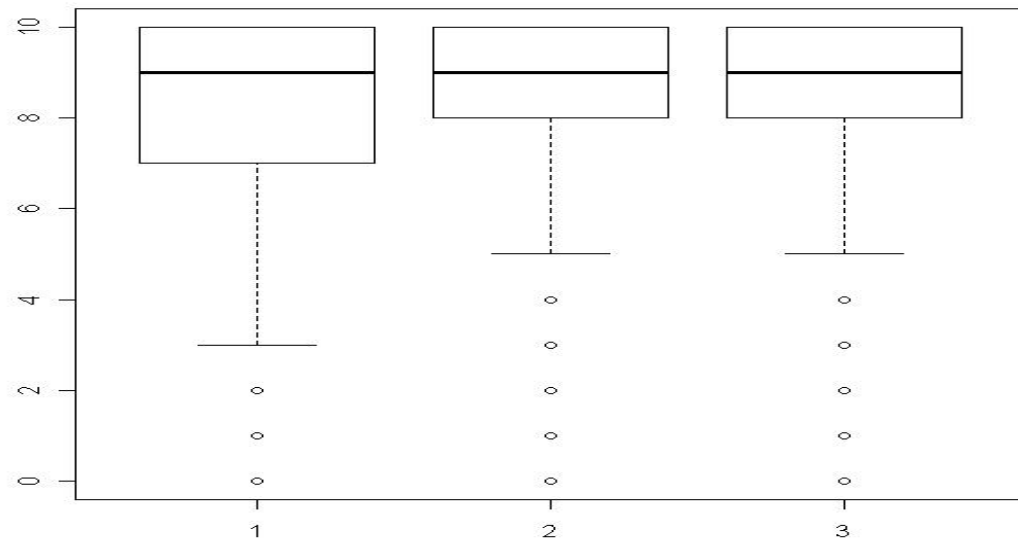


Figure 5: Comparison of Ratings for 2007

TABLE 28: ROBUST MEASURES OF CENTER AND DISPERSION, 2007

2007 Rating	Teaching		
	Major	Minor	None
Mode	10	10	10
Median	9	9	9
IQR	3	2	2

Kruskal-wallis equality-of-populations rank test

final_~g	Obs	Rank Sum
1	51915	1.35e+10
2	100457	2.67e+10
3	381436	1.02e+11

chi-squared = 136.584 with 2 d.f.
probability = 0.0001

chi-squared with ties = 148.029 with 2 d.f.
probability = 0.0001

A non-parametric analysis of variance (Kruskal-Wallis) showed statistical evidence of a difference among the median ratings for each type of hospital (p-value=0.0001), in 2007. There was no pronounced difference in the shape of the distribution of ratings; the three distributions were negatively skewed. This supports the idea that the finding from the Kruskal-Wallis was due to a difference in the median ratings and not due to a difference in the shape of the distributions.

These findings indicate that there was a significant difference between the median scores for Major Teaching hospitals, Minor Teaching hospitals, and Non-teaching hospitals for all three datasets. The next section shows a nonparametric analysis, which incorporated the covariates used in the previous regression analyses. Most of these covariates were the same ones that O'Malley (2005) study used to condition the quality rating responses.

Quantile Regression

Quantile regressions at the 25th, 50th, and 75th quantile were completed for Models 1, 2, and 3 for all datasets to attempt to condition the analysis due to the fact that the responses to the quality rating item appeared to be negatively skewed throughout all

samples. The teaching variable was not found to be a factor related to quality responses in any of the OLS (ordinary least squares) linear regression models, but since the quality ratings were not normally distributed, the findings may be misleading.

Utilizing quantile regression at the 25th, 50th, and 75th quantile for Models 1, 2, and 3 for 2005, 2006, and 2007 datasets revealed that analyzing the data at different quantiles did not affect the results of the linear regression in a manner that revealed the teaching variable to be associated with hospital satisfaction ratings. Tables 29, 31, and 33 summarize the coefficients for the years of 2005, 2006, and 2007.

TABLE 29: QUANTILE SUMMARY FOR 2005

2005 Comparison Covariate	Coefficients		
	25th quantile	50th quantile	75th quantile
Constant	-2.5000	-0.2500	4.0000
Pain Control Sometimes	0.6000	0.6250	0.7500
Pain Control Usually	1.1000	0.8750	1.0000
Pain Control Always	1.5000	1.5000	1.0000
Minor Teaching	0.0000	0.0000	0.0000
Non-teaching	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	0.2000	0.2500	-1.2500
Nurse Courtesy Usually	1.4000	1.2500	-0.5000
Nurse Courtesy Always	2.1000	1.8750	0.0000
Nurse Listening Sometimes	0.9000	1.0000	0.7500
Nurse Listening Usually	2.0000	1.7500	1.2500
Nurse Listening Always	2.6000	2.3750	1.7500
Nurse Explaining Sometimes	0.7000	0.7500	0.5000
Nurse Explaining Usually	1.3000	1.1250	0.7500
Nurse Explaining Always	1.7000	1.5000	1.0000
Doctor Courtesy Sometimes	0.5000	0.1250	0.0000
Doctor Courtesy Usually	0.7000	0.3750	0.0000
Doctor Courtesy Always	1.0000	0.5000	0.2500
Doctor Listening Sometimes	0.8000	0.6250	0.5000
Doctor Listening Usually	1.0000	0.8750	0.7500
Doctor Listening Always	1.2000	1.1250	1.0000
Doctor Explaining Sometimes	0.1000	0.1250	0.0000
Doctor Explaining Usually	0.3000	0.1250	0.0000
Doctor Explaining Always	0.4000	0.3750	0.0000
Overall Health Fair	0.0000	0.0000	0.0000
Overall Health Good	0.0000	0.0000	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000
Race White	1.0000	0.8750	1.0000
Race Black	1.0000	1.0000	1.0000
Race Asian	0.7000	0.5000	1.0000
Race Pacific Islander	0.4000	0.1250	1.0000
Race Native American	0.4000	0.1250	1.0000
Language Spanish	1.0000	1.0000	1.0000
Language Chinese	0.3000	0.1250	0.0000

The base case for all three data sets is a patient at a major teaching hospital who never had pain control, never had nurse or doctor courtesy, listening, or explaining, rated their overall health as poor, and spoke English. The 2005 findings indicate that the 50th quantile (median) falls below the linear regression (overall mean) for the base case, with significant variation noted at the 25th and 75th quantiles. Figure 6 below illustrates the variation observed with quantile regression.

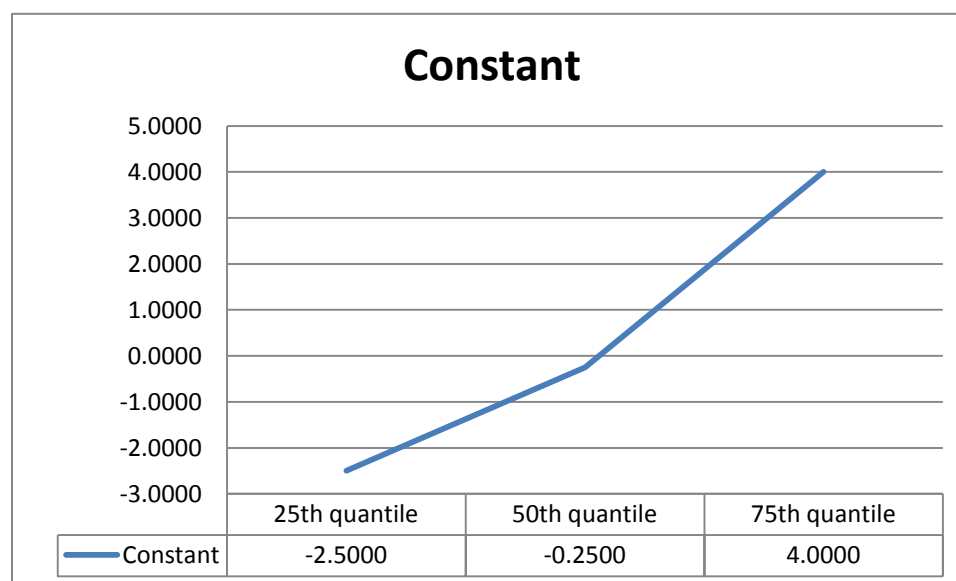


Figure 6: 2005 Base Case Quantile Comparison Chart

Analysis of the quantile regressions indicate that the variable Pain Control Sometimes changes minimally across the quantiles (and in the linear regression), but Pain Control Usually decreases at the 50th quantile, and Pain Control Always decreases significantly at the 75th quantile. Therefore, the influence of pain control diminishes towards the 75th quantile. The lower 25th and 50th quantiles of the respondents (low raters) are associated with Pain Control Always in a more significant and important way.

For people who rate Pain Control lower, having Pain Control Always increases their hospital satisfaction rating 1.6 points on average (see Figure 7 below) for this data set.

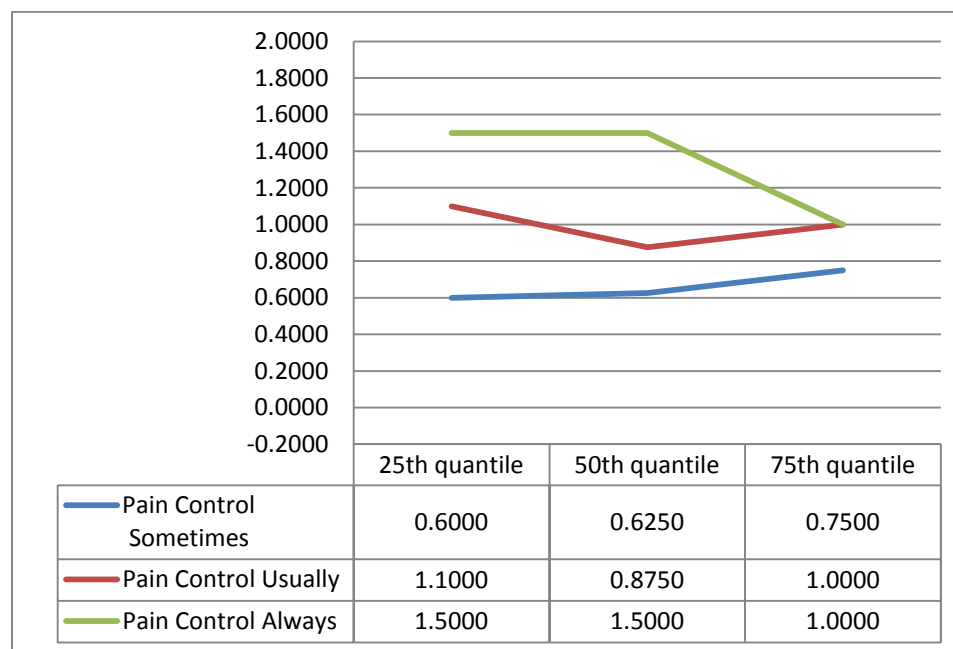


Figure 7: 2005 Pain Control Quantile Comparison Chart

TABLE 30: 2005 TEACHING QUANTILE REGRESSION COMPARISONS

Variable	Quantile Regressions			Linear Regression
	25th quantile	50th quantile	75th quantile	
Minor Teaching	0.0000	0.0000	0.0000	-0.11559
Non-Teaching	0.0000	0.0000	0.0000	-0.105607

No significant differences were noted between different quantile conditions and the original linear regression, indicating that there is no essential difference in patient satisfaction ratings between Major, Minor, and Non-teaching hospitals for the 2005 data.

TABLE 31: QUANTILE SUMMARY FOR 2006

2006 Comparison		Coefficients	
Covariate	25th quantile	50th quantile	75th quantile
Constant	-0.8750	0.7143	2.5000
Minor Teaching	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	0.6250	1.0000	1.5000
Nurse Courtesy Usually	2.1250	2.2857	2.5000
Nurse Courtesy Always	1.6250	2.2857	3.0000
Nurse Listening Sometimes	1.8750	1.7143	1.5000
Nurse Listening Usually	3.6250	3.1429	2.0000
Nurse Listening Always	-1.1250	-1.1429	2.0000
Nurse Explaining Sometimes	0.7500	0.8571	0.5000
Nurse Explaining Usually	1.2500	1.8571	1.0000
Nurse Explaining Always	1.2500	0.8571	1.0000
Doctor Courtesy Sometimes	0.5000	0.0000	0.5000
Doctor Courtesy Usually	0.7500	0.2857	1.0000
Doctor Courtesy Always	0.7500	0.4286	1.0000
Doctor Listening Sometimes	0.3750	0.2857	0.0000
Doctor Listening Usually	0.6250	0.7143	0.5000
Doctor Listening Always	0.3750	0.4286	0.5000
Doctor Explaining Sometimes	0.1250	0.0000	0.0000
Doctor Explaining Usually	0.1250	0.1429	0.0000
Doctor Explaining Always	0.1250	-0.5714	0.0000
Pain Control Sometimes	0.8750	1.0000	0.5000
Pain Control Usually	0.8750	1.7143	1.0000
Pain Control Always	0.8750	0.0000	1.0000
Overall Health Fair	0.0000	0.7143	0.0000
Overall Health Good	0.0000	0.1429	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000
Race White	0.0000	0.0000	0.0000
Race Black	0.0000	0.0000	0.0000
Race Asian	0.0000	0.4286	0.0000
Race Pacific Islander	0.0000	0.0000	0.0000
Race Native American	0.0000	0.0000	0.0000
Language Spanish	0.0000	0.0000	0.0000
Language Chinese	0.0000	0.2857	0.0000

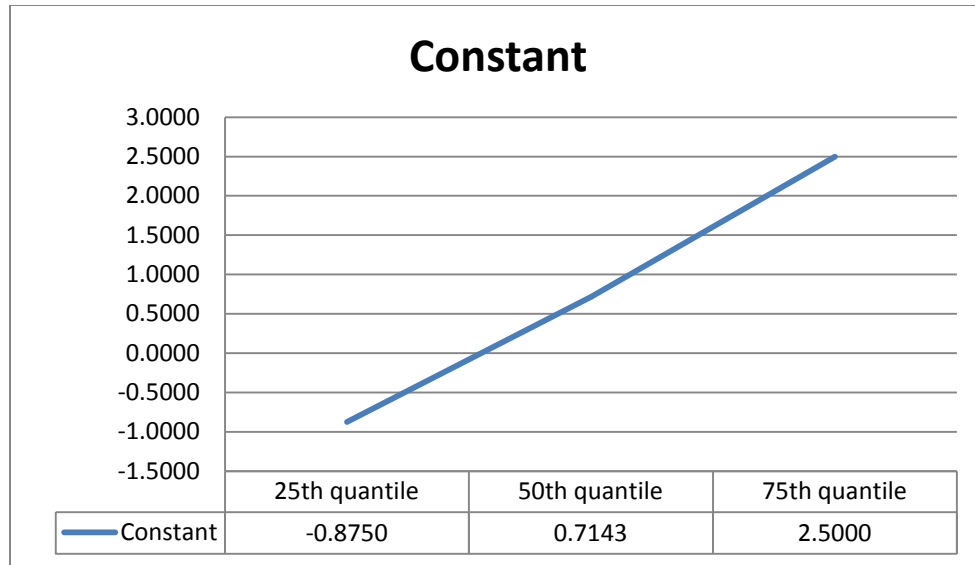


Figure 8: 2006 Base Case Quantile Comparison Chart

These findings (in Figure 8) indicate that the 50th quantile (median) falls above the linear regression (mean), with significant variation noted at the 25th and 75th quantiles. It should be noted that the differences for the base case in this data set are not extensive.

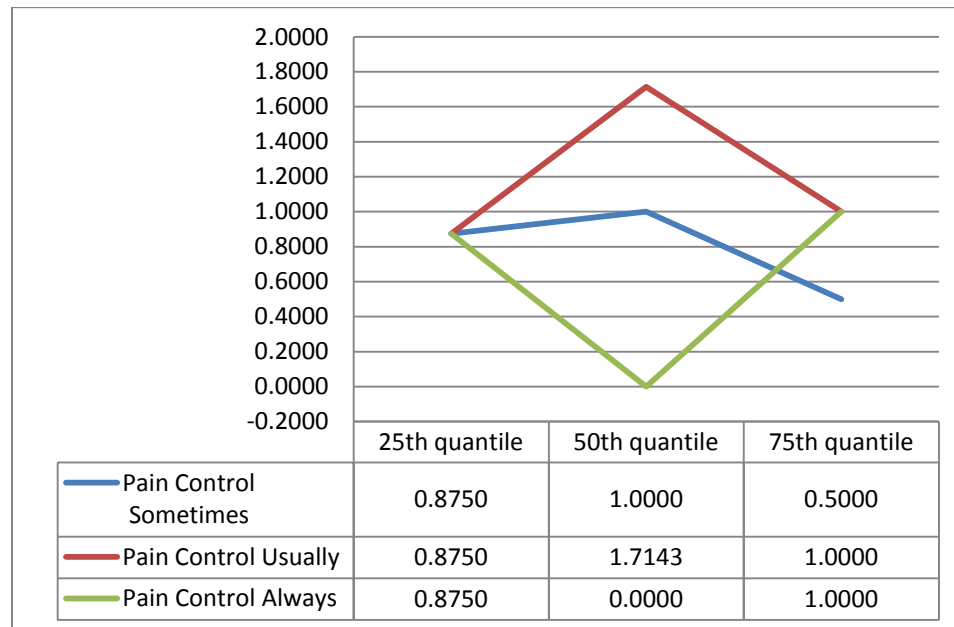


Figure 9: 2006 Pain Control Quantile Comparison Chart

Analysis of the quantile regressions indicate that the variable Pain Control Sometimes changes minimally across the quantiles (and in the linear regression), but Pain Control Usually increases substantially at the 50th quantile and is significantly different from Pain Control Sometimes and Pain Control Always. Pain Control Always decreases significantly at the 50th quantile. Therefore, the 50th quantile of the respondents are associated with Pain Control Usually in a more significant way for the 2006 data (see Figure 9 above).

TABLE 32: 2006 TEACHING QUANTILE REGRESSION COMPARISONS

Variable	Quantile Regressions			Linear Regression
	25th quantile	50th quantile	75th quantile	
Minor Teaching	0.0000	0.0000	0.0000	-0.114044
Non-Teaching	0.0000	0.0000	0.0000	-0.114991

No significant differences were noted between different quantile conditions and the linear regression.

TABLE 33: QUANTILE SUMMARY FOR 2007

2007 Comparison Covariate	Coefficients		
	25th quantile	50th quantile	75th quantile
Constant	-0.6667	1.0000	2.3142
Minor Teaching	0.0000	0.0000	0.2886
Non-Teaching	0.0000	0.0000	0.2455
Nurse Courtesy Sometimes	0.5000	0.8333	1.1447
Nurse Courtesy Usually	2.0000	2.0000	2.0390
Nurse Courtesy Always	1.0000	2.0000	2.4453
Nurse Listening Sometimes	1.6667	1.8333	1.5363
Nurse Listening Usually	3.5000	3.3333	2.2469
Nurse Listening Always	-0.5000	-1.3333	2.1098
Nurse Explaining Sometimes	0.6667	0.6667	0.6671
Nurse Explaining Usually	1.1667	1.6667	1.1525
Nurse Explaining Always	1.1667	0.6667	1.0850
Doctor Courtesy Sometimes	0.3333	0.1667	0.3586
Doctor Courtesy Usually	0.5000	0.3333	0.5434
Doctor Courtesy Always	0.5000	0.5000	0.7450
Doctor Listening Sometimes	0.5000	0.3333	0.3095
Doctor Listening Usually	0.5000	0.6667	0.5111
Doctor Listening Always	0.5000	0.3333	0.4582
Doctor Explaining Sometimes	0.1667	0.1667	0.1835
Doctor Explaining Usually	0.1667	0.5000	0.2824
Doctor Explaining Always	0.1667	-0.1667	0.2033
Pain Control Sometimes	0.8333	0.5000	0.5262
Pain Control Usually	0.8333	1.3333	1.0116
Pain Control Always	0.8333	0.0000	0.7954
Overall Health Fair	0.0000	0.1667	0.2886
Overall Health Good	0.0000	0.0000	0.0834
Overall Health Very Good	0.0000	0.0000	-0.0360
Overall Health Excellent	0.0000	0.0000	-0.0889
Race White	0.0000	0.0000	0.0260
Race Black	0.0000	0.0000	-0.2285
Race Asian	0.0000	0.5000	0.0935
Race Pacific Islander	0.0000	0.0000	-0.1375
Race Native American	0.0000	0.0000	-0.2420
Language Spanish	0.0000	0.0000	0.0056
Language Chinese	0.0000	0.1667	0.1056

These findings indicate that the 50th quantile (median) is significantly above the linear regression (mean) for the base case, with variation noted at the 25th and 75th quantiles.

Figure 10 below illustrates the variation observed with quantile regression.

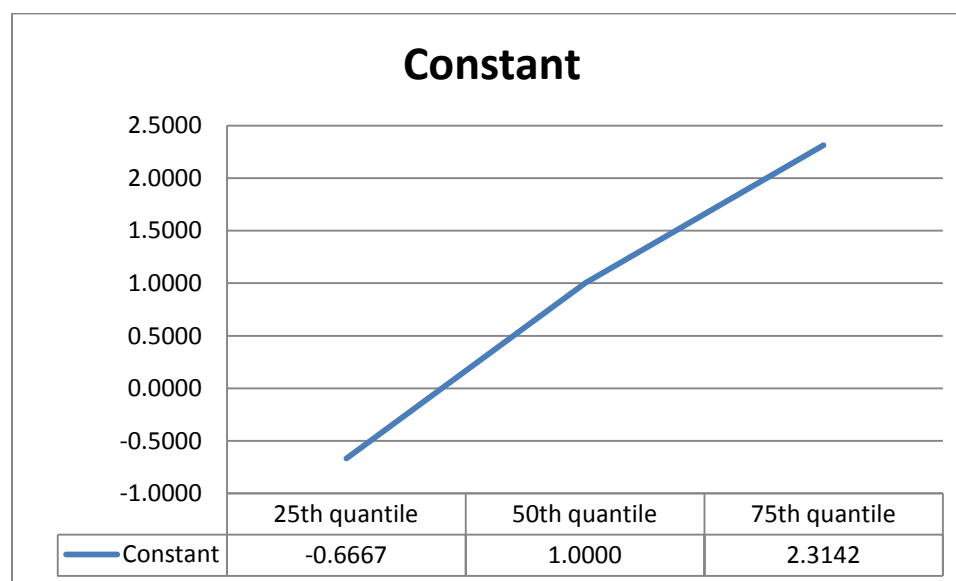


Figure 10: 2007 Base Case Quantile Comparison Chart

Analysis of the quantile regressions indicate that the variable Pain Control Sometimes changes minimally across the quantiles (and in the linear regression), but Pain Control Usually increases substantially at the 50th quantile and is significantly different from Pain Control Sometimes and Pain Control Always. Pain Control Always decreases at the 50th quantile. Therefore, 50th quantile of the respondents are associated with Pain Control Usually in a more significant way in the 2007 data (see Figure 11 below). These findings are similar to the findings of the 2006 data.

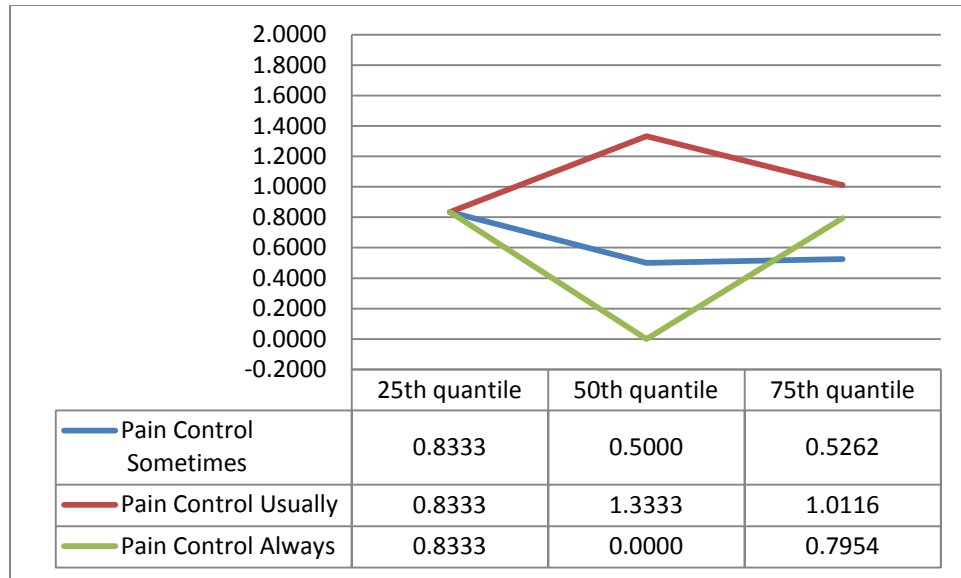


Figure 11: 2007 Pain Control Quantile Comparison Chart

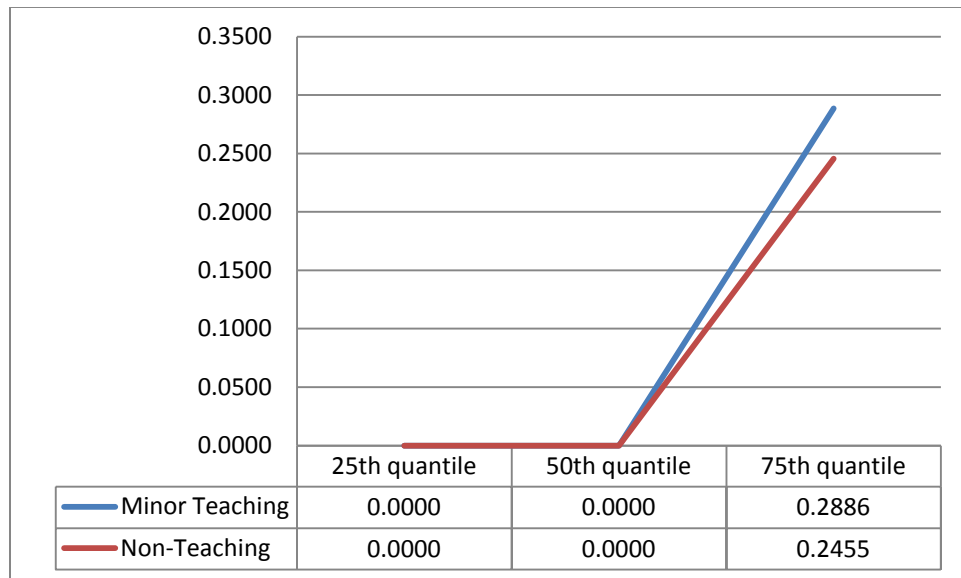


Figure 12: 2007 Teaching Quantile Comparison Chart

No significant differences were noted at the 25th and 50th quantile conditions between Major, Minor, and Non-teaching hospitals for the 2007 data, but findings at the 75th quantile approach the findings of the linear regression, indicating that high raters' scores were more consistent with the mean ratings for Minor and Non-teaching hospitals. At the 95% confidence interval, the differences are statistically different, but they represent no practical difference between the Teach conditions.

It should be noted that in the 2006-2007 data sets, Pain Control Usually leads to higher hospital ratings across all respondents. Pain Control Always leads to lower hospital ratings at the 25th and 50th quantiles. The reasons for this difference are unclear, but one possibility might be that patients whose pain was well managed were not as severely injured or ill as those whose pain could only be managed in most instances. The more severely injured or ill patients might rate hospitals more highly, given the dire medical situation in which they found themselves.

VIII. CONCLUSION

The purpose of this study was to examine differences in patient satisfaction scores between different types of hospitals (major teaching, minor teaching, and non-teaching) and other factors measured in the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, given that Medicare begins distributing and withholding funds based on this patient satisfaction survey in October 2012. An initial case-mix study by O'Malley (2005) indicated that type of hospital service, age, race, education, general health rating, speaking Spanish, and a circulatory disorder diagnosis affected patient satisfaction ratings. Medicare will make adjustments for these factors in an attempt to make fund distribution more equitable. Other factors that will be given consideration are survey method and whether the patient was admitted through the emergency room. Type of hospital, pain control, and nurse/physician interactions with patients have not yet been examined in detail and are the focus of the current investigation.

Although there is a statistically significant difference between hospital ratings by major teaching hospitals, minor teaching hospitals, and non-teaching hospitals, the difference appears to lose practical significance in relation to other variables, such as nurse and doctor patient interaction, overall health of the patient, pain control, race, and language. The findings do not contradict those of the original study by O'Malley (2005).

Therefore, HCAHPS ratings adjustments based on the O'Malley (2005) case-mix study appear to be appropriate. Addition of the teaching variable does not add value to the ratings adjustment, and no evidence of teaching hospitals being unjustly penalized by HCAHPS ratings was found.

All nurse interactions have more impact on hospital ratings than any patient interactions with physicians. It is hypothesized that nurses spend a greater percentage of time with patients than doctors do and would have a greater impact on patient satisfaction. There may be other explanations which have not been explored.

The pain control variable does appear to have a significant contribution to hospital ratings. By definition, patients in acute care hospitals are receiving short-term medical treatment for an acute illness or injury or are recovering from surgery. The patient's pain is likely to be the most intense and severe during that hospitalization, and pain management would likely influence the patient's perception of a hospital stay.

This study has limitations in the large volume of missing data and that the most recent data supplied is five years old. The 2005 data appear to be fundamentally different from the 2006 and 2007 data, in that it has larger hospitals and more teaching hospitals than the other two data sets. Also, most respondents did not code race in the 2005 data, whereas most respondents coded race in 2006 and 2007. In addition, the patient population surveyed across data sets is not representative of the majority of Medicare recipients, with 65% of the patients surveyed being younger than 65 years of age. Approximately 83.15% of Medicare recipients are older than 65, and only 16.85% of patients younger than 65 were receiving Medicare in 2010 due to disability.

Another limitation of the study is observed in the quantile regressions for pain management findings. The interpretations are made for point estimates, leading to statements about practical significance, as opposed to statistical significance. It is also unclear why respondents who indicate that their pain was Usually controlled rating hospitals more highly than respondents who indicated that their pain was Always controlled.

Further research based on these findings should be conducted with more current data than those obtained for 2007. Nurse interaction may be studied in more depth to determine what types of behavior lead patients to indicate that they have been treated courteously, were listened to, and had their treatment explained. Physician interaction with patients might be studied in a similar manner. Another factor that may be considered is the role of gender in patient interactions. Currently in the United States, the majority of nurses are female (90%) and the majority of physicians are male (68%) (Ulrich 2010). Separating interactions by gender, as well as by discipline, might yield additional information about gender-based communication styles as they relate to patient satisfaction.

Finally, pain control ratings might be examined based on pain location, mechanism of injury, and number of injuries. Specific types of injuries, location of injuries, or having multiple injuries at once (typically observed in trauma patients), may result in higher reports of pain and decreased pain management. Therefore, these proposed findings may lead to a better understanding of why patients rate hospitals more favorably when their pain is only Usually controlled.

IX. APPENDIX A – HCAHPS Survey

HCAHPS Survey

SURVEY INSTRUCTIONS

- ◆ You should only fill out this survey if you were the patient during the hospital stay named in the cover letter. Do not fill out this survey if you were not the patient.
- ◆ Answer all the questions by checking the box to the left of your answer.
- ◆ You are sometimes told to skip over some questions in this survey. When this happens you will see an arrow with a note that tells you what question to answer next, like this:

☐ Yes
☒ No → **If No, Go to Question 1**

You may notice a number on the survey. This number is ONLY used to let us know if you returned your survey so we don't have to send you reminders.

Please note: Questions 1-22 in this survey are part of a national initiative to measure the quality of care in hospitals. OMB #0938-0981

Please answer the questions in this survey about your stay at the hospital named on the cover letter. Do not include any other hospital stays in your answers.

YOUR CARE FROM NURSES

1. During this hospital stay, how often did nurses treat you with courtesy and respect?

☐ 1 Never
☐ 2 Sometimes
☐ 3 Usually
☐ 4 Always
2. During this hospital stay, how often did nurses listen carefully to you?

☐ 1 Never
☐ 2 Sometimes
☐ 3 Usually
☐ 4 Always

3. During this hospital stay, how often did nurses explain things in a way you could understand?

☐ 1 Never
☐ 2 Sometimes
☐ 3 Usually
☐ 4 Always

4. During this hospital stay, after you pressed the call button, how often did you get help as soon as you wanted it?

☐ 1 Never
☐ 2 Sometimes
☐ 3 Usually
☐ 4 Always
☐ 5 I never pressed the call button

YOUR CARE FROM DOCTORS

5. During this hospital stay, how often did doctors treat you with courtesy and respect?
- ¹ ☐ Never
² ☐ Sometimes
³ ☐ Usually
⁴ ☐ Always
6. During this hospital stay, how often did doctors listen carefully to you?
- ¹ ☐ Never
² ☐ Sometimes
³ ☐ Usually
⁴ ☐ Always
7. During this hospital stay, how often did doctors explain things in a way you could understand?
- ¹ ☐ Never
² ☐ Sometimes
³ ☐ Usually
⁴ ☐ Always

THE HOSPITAL ENVIRONMENT

8. During this hospital stay, how often were your room and bathroom kept clean?
- ¹ ☐ Never
² ☐ Sometimes
³ ☐ Usually
⁴ ☐ Always
9. During this hospital stay, how often was the area around your room quiet at night?
- ¹ ☐ Never
² ☐ Sometimes
³ ☐ Usually
⁴ ☐ Always

YOUR EXPERIENCES IN THIS HOSPITAL

10. During this hospital stay, did you need help from nurses or other hospital staff in getting to the bathroom or in using a bedpan?
- ¹ ☐ Yes
² ☐ No → If No, Go to Question 12
11. How often did you get help in getting to the bathroom or in using a bedpan as soon as you wanted?
- ¹ ☐ Never
² ☐ Sometimes
³ ☐ Usually
⁴ ☐ Always
12. During this hospital stay, did you need medicine for pain?
- ¹ ☐ Yes
² ☐ No → If No, Go to Question 15
13. During this hospital stay, how often was your pain well controlled?
- ¹ ☐ Never
² ☐ Sometimes
³ ☐ Usually
⁴ ☐ Always
14. During this hospital stay, how often did the hospital staff do everything they could to help you with your pain?
- ¹ ☐ Never
² ☐ Sometimes
³ ☐ Usually
⁴ ☐ Always

15. During this hospital stay, were you given any medicine that you had not taken before?

¹ ☐ Yes

² ☐ No → If No, Go to Question 18

16. Before giving you any new medicine, how often did hospital staff tell you what the medicine was for?

¹ ☐ Never

² ☐ Sometimes

³ ☐ Usually

⁴ ☐ Always

17. Before giving you any new medicine, how often did hospital staff describe possible side effects in a way you could understand?

¹ ☐ Never

² ☐ Sometimes

³ ☐ Usually

⁴ ☐ Always

WHEN YOU LEFT THE HOSPITAL

18. After you left the hospital, did you go directly to your own home, to someone else's home, or to another health facility?

¹ ☐ Own home

² ☐ Someone else's home

³ ☐ Another health facility → If Another, Go to Question 21

19. During this hospital stay, did doctors, nurses or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?

¹ ☐ Yes

² ☐ No

20. During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?

¹ ☐ Yes

² ☐ No

OVERALL RATING OF HOSPITAL

Please answer the following questions about your stay at the hospital named on the cover letter. Do not include any other hospital stays in your answers.

21. Using any number from 0 to 10, where 0 is the worst hospital possible and 10 is the best hospital possible, what number would you use to rate this hospital during your stay?

⁰ ☐ 0 Worst hospital possible

¹ ☐ 1

² ☐ 2

³ ☐ 3

⁴ ☐ 4

⁵ ☐ 5

⁶ ☐ 6

⁷ ☐ 7

⁸ ☐ 8

⁹ ☐ 9

¹⁰ ☐ 10 Best hospital possible

22. Would you recommend this hospital to your friends and family?

¹ ☐ Definitely no
² ☐ Probably no
³ ☐ Probably yes
⁴ ☐ Definitely yes

ABOUT YOU

There are only a few remaining items left.

23. In general, how would you rate your overall health?

¹ ☐ Excellent
² ☐ Very good
³ ☐ Good
⁴ ☐ Fair
⁵ ☐ Poor

24. What is the highest grade or level of school that you have completed?

¹ ☐ 8th grade or less
² ☐ Some high school, but did not graduate
³ ☐ High school graduate or GED
⁴ ☐ Some college or 2-year degree
⁵ ☐ 4-year college graduate
⁶ ☐ More than 4-year college degree

25. Are you of Spanish, Hispanic or Latino origin or descent?

¹ ☐ No, not Spanish/Hispanic/Latino
² ☐ Yes, Puerto Rican
³ ☐ Yes, Mexican, Mexican American, Chicano
⁴ ☐ Yes, Cuban
⁵ ☐ Yes, other Spanish/Hispanic/Latino

26. What is your race? Please choose one or more.

¹ ☐ White
² ☐ Black or African American
³ ☐ Asian
⁴ ☐ Native Hawaiian or other Pacific Islander
⁵ ☐ American Indian or Alaska Native

27. What language do you mainly speak at home?

¹ ☐ English
² ☐ Spanish
³ ☐ Chinese
⁴ ☐ Russian
⁵ ☐ Vietnamese
⁶ ☐ Some other language (please print): _____

THANK YOU

Please return the completed survey in the postage-paid envelope.

[NAME OF SURVEY VENDOR OR SELF-ADMINISTERING HOSPITAL]

[RETURN ADDRESS OF SURVEY VENDOR OR SELF-ADMINISTERING HOSPITAL]

X. APPENDIX B – Data Codes

Teaching Codes

- | | |
|---|-------------------------|
| 1 | Major Teaching Hospital |
| 2 | Minor Teaching Hospital |
| 3 | Non-teaching Hospital |

Bedsizes of Hospital

- | | |
|---|---------|
| 1 | 6-24 |
| 2 | 25-44 |
| 3 | 50-99 |
| 4 | 100-199 |
| 5 | 200-299 |
| 6 | 300-399 |
| 7 | 400-499 |
| 8 | 500+ |

Ownership of Hospital

- | | |
|---|------------------------|
| 1 | Not for Profit |
| 2 | For Profit |
| 3 | Non-federal Government |
| 4 | Federal Government |

Age Codes

- | | |
|---|-------|
| 1 | 18-24 |
| 2 | 25-29 |
| 3 | 30-34 |
| 4 | 35-39 |
| 5 | 40-44 |
| 6 | 45-49 |
| 7 | 50-54 |
| 8 | 55-59 |
| 9 | 60-64 |

Age Codes (Continued)

10	65-69
11	70-74
12	75-79
13	80-84
14	85-89
15	90+

Principal Reason for Admission

1	Obstetric
2	Medical
3	Surgical

Education

1	<8 th grade
2	Some High School
3	High School Graduate or G.E.D.
4	Some College or 2 year degree
5	4 year College Graduate
6	>4 year College Degree

Language Survey

1	English
2	Spanish
3	Chinese

Race

A.	White/Caucasian
B.	Black/African-American
C.	Asian
D.	Pacific Islander/Native Hawaiian
E.	Native American/Alaska Native
F.	Other

Ethnicity

- 1 Not Spanish/Hispanic/Latino
- 2 Puerto Rican
- 3 Mexican American/Chicano
- 4 Cuban
- 5 Other Spanish/Hispanic/Latino

XI. APPENDIX C: Quantile Analysis Results Tables

TABLE 34: 2005 50th QUANTILE REGRESSION RESULTS

q21	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
Pain Control Sometimes	0.6250	0.0000	0.0000	0.6250	0.6250
Pain Control Usually	0.8750	0.0000	0.0000	0.8750	0.8750
Pain Control Always	1.5000	0.0000	0.0000	1.5000	1.5000
Minor Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	0.2500	0.0000	0.0000	0.2500	0.2500
Nurse Courtesy Usually	1.2500	0.0000	0.0000	1.2500	1.2500
Nurse Courtesy Always	1.8750	0.0000	0.0000	1.8750	1.8750
Nurse Listening Sometimes	1.0000	0.0000	0.0000	1.0000	1.0000
Nurse Listening Usually	1.7500	0.0000	0.0000	1.7500	1.7500
Nurse Listening Always	2.3750	0.0000	0.0000	2.3750	2.3750
Nurse Explaining Sometimes	0.7500	0.0000	0.0000	0.7500	0.7500
Nurse Explaining Usually	1.1250	0.0000	0.0000	1.1250	1.1250
Nurse Explaining Always	1.5000	0.0000	0.0000	1.5000	1.5000
Doctor Courtesy Sometimes	0.1250	0.0000	0.0000	0.1250	0.1250
Doctor Courtesy Usually	0.3750	0.0000	0.0000	0.3750	0.3750
Doctor Courtesy Always	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Listening Sometimes	0.6250	0.0000	0.0000	0.6250	0.6250
Doctor Listening Usually	0.8750	0.0000	0.0000	0.8750	0.8750
Doctor Listening Always	1.1250	0.0000	0.0000	1.1250	1.1250
Doctor Explaining Sometimes	0.1250	0.0000	0.0000	0.1250	0.1250
Doctor Explaining Usually	0.1250	0.0000	0.0000	0.1250	0.1250
Doctor Explaining Always	0.3750	0.0000	0.0000	0.3750	0.3750
Overall Health Fair	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000	0.0000	0.0000
Race White	0.8750	0.0000	0.0000	0.8750	0.8750
Race Black	1.0000	0.0000	0.0000	1.0000	1.0000
Race Asian	0.5000	0.0000	0.0000	0.5000	0.5000
Race Pacific Islander	0.1250	0.0000	0.0000	0.1250	0.1250

TABLE 34: 2005 50th QUANTILE REGRESSION RESULTS (CONTINUED)

Race Native American	0.1250	0.0000	0.0000	0.1250	0.1250
Language Spanish	1.0000	0.0000	0.0000	1.0000	1.0000
Language Chinese	0.1250	0.0000	0.0000	0.1250	0.1250
_cons	-0.2500	0.0000	0.0000	-0.2500	-0.2500

TABLE 35: 2005 25th QUANTILE REGRESSION RESULTS

q21	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
Pain Control Sometimes	0.6000	0.0000	0.0000	0.6000	0.6000
Pain Control Usually	1.1000	0.0000	0.0000	1.1000	1.1000
Pain Control Always	1.5000	0.0000	0.0000	1.5000	1.5000
Minor Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	0.2000	0.0000	0.0000	0.2000	0.2000
Nurse Courtesy Usually	1.4000	0.0000	0.0000	1.4000	1.4000
Nurse Courtesy Always	2.1000	0.0000	0.0000	2.1000	2.1000
Nurse Listening Sometimes	0.9000	0.0000	0.0000	0.9000	0.9000
Nurse Listening Usually	2.0000	0.0000	0.0000	2.0000	2.0000
Nurse Listening Always	2.6000	0.0000	0.0000	2.6000	2.6000
Nurse Explaining Sometimes	0.7000	0.0000	0.0000	0.7000	0.7000
Nurse Explaining Usually	1.3000	0.0000	0.0000	1.3000	1.3000
Nurse Explaining Always	1.7000	0.0000	0.0000	1.7000	1.7000
Doctor Courtesy Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Courtesy Usually	0.7000	0.0000	0.0000	0.7000	0.7000
Doctor Courtesy Always	1.0000	0.0000	0.0000	1.0000	1.0000
Doctor Listening Sometimes	0.8000	0.0000	0.0000	0.8000	0.8000
Doctor Listening Usually	1.0000	0.0000	0.0000	1.0000	1.0000
Doctor Listening Always	1.2000	0.0000	0.0000	1.2000	1.2000
Doctor Explaining Sometimes	0.1000	0.0000	0.0000	0.1000	0.1000
Doctor Explaining Usually	0.3000	0.0000	0.0000	0.3000	0.3000
Doctor Explaining Always	0.4000	0.0000	0.0000	0.4000	0.4000
Overall Health Fair	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000	0.0000	0.0000
Race White	1.0000	0.0000	0.0000	1.0000	1.0000
Race Black	1.0000	0.0000	0.0000	1.0000	1.0000
Race Asian	0.7000	0.0000	0.0000	0.7000	0.7000
Race Pacific Islander	0.4000	0.0000	0.0000	0.4000	0.4000
Race Native American	0.4000	0.0000	0.0000	0.4000	0.4000
Language Spanish	1.0000	0.0000	0.0000	1.0000	1.0000
Language Chinese	0.3000	0.0000	0.0000	0.3000	0.3000
_cons	-2.5000	0.0000	0.0000	-2.5000	-2.5000

TABLE 36: 2005 75th QUANTILE REGRESSION RESULTS

q21	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
Pain Control Sometimes	0.7500	0.0000	0.0000	0.7500	0.7500
Pain Control Usually	1.0000	0.0000	0.0000	1.0000	1.0000
Pain Control Always	1.0000	0.0000	0.0000	1.0000	1.0000
Minor Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	-1.2500	0.0000	0.0000	-1.2500	-1.2500
Nurse Courtesy Usually	-0.5000	0.0000	0.0000	-0.5000	-0.5000
Nurse Courtesy Always	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Listening Sometimes	0.7500	0.0000	0.0000	0.7500	0.7500
Nurse Listening Usually	1.2500	0.0000	0.0000	1.2500	1.2500
Nurse Listening Always	1.7500	0.0000	0.0000	1.7500	1.7500
Nurse Explaining Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Nurse Explaining Usually	0.7500	0.0000	0.0000	0.7500	0.7500
Nurse Explaining Always	1.0000	0.0000	0.0000	1.0000	1.0000
Doctor Courtesy Sometimes	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Courtesy Usually	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Courtesy Always	0.2500	0.0000	0.0000	0.2500	0.2500
Doctor Listening Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Listening Usually	0.7500	0.0000	0.0000	0.7500	0.7500
Doctor Listening Always	1.0000	0.0000	0.0000	1.0000	1.0000
Doctor Explaining Sometimes	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Explaining Usually	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Explaining Always	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Fair	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000	0.0000	0.0000
Race White	1.0000	0.0000	0.0000	1.0000	1.0000
Race Black	1.0000	0.0000	0.0000	1.0000	1.0000
Race Asian	1.0000	0.0000	0.0000	1.0000	1.0000
Race Pacific Islander	1.0000	0.0000	0.0000	1.0000	1.0000
Race Native American	1.0000	0.0000	0.0000	1.0000	1.0000
Language Spanish	1.0000	0.0000	0.0000	1.0000	1.0000
Language Chinese	0.0000	0.0000	0.0000	0.0000	0.0000
_cons	4.0000	0.0000	0.0000	4.0000	4.0000

TABLE 37: 2006 50th QUANTILE REGRESSION RESULTS

q21_06a	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
Minor Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	1.0000	0.0000	0.0000	1.0000	1.0000
Nurse Courtesy Usually	2.2857	0.0000	0.0000	2.2857	2.2857
Nurse Courtesy Always	2.2857	0.0000	0.0000	2.2857	2.2857
Nurse Listening Sometimes	1.7143	0.0000	0.0000	1.7143	1.7143
Nurse Listening Usually	3.1429	0.0000	0.0000	3.1429	3.1429
Nurse Listening Always	-1.1429	0.0000	0.0000	-1.1429	-1.1429
Nurse Explaining Sometimes	0.8571	0.0000	0.0000	0.8571	0.8571
Nurse Explaining Usually	1.8571	0.0000	0.0000	1.8571	1.8571
Nurse Explaining Always	0.8571	0.0000	0.0000	0.8571	0.8571
Doctor Courtesy Sometimes	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Courtesy Usually	0.2857	0.0000	0.0000	0.2857	0.2857
Doctor Courtesy Always	0.4286	0.0000	0.0000	0.4286	0.4286
Doctor Listening Sometimes	0.2857	0.0000	0.0000	0.2857	0.2857
Doctor Listening Usually	0.7143	0.0000	0.0000	0.7143	0.7143
Doctor Listening Always	0.4286	0.0000	0.0000	0.4286	0.4286
Doctor Explaining Sometimes	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Explaining Usually	0.1429	0.0000	0.0000	0.1429	0.1429
Doctor Explaining Always	-0.5714	0.0000	0.0000	-0.5714	-0.5714
Pain Control Sometimes	1.0000	0.0000	0.0000	1.0000	1.0000
Pain Control Usually	1.7143	0.0000	0.0000	1.7143	1.7143
Pain Control Always	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Fair	0.7143	0.0000	0.0000	0.7143	0.7143
Overall Health Good	0.1429	0.0000	0.0000	0.1429	0.1429
Overall Health Very Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000	0.0000	0.0000
Race White	0.0000	0.0000	0.0000	0.0000	0.0000
Race Black	0.0000	0.0000	0.0000	0.0000	0.0000
Race Asian	0.4286	0.0000	0.0000	0.4286	0.4286
Race Pacific Islander	0.0000	0.0000	0.0000	0.0000	0.0000
Race Native American	0.0000	0.0000	0.0000	0.0000	0.0000
Language Spanish	0.0000	0.0000	0.0000	0.0000	0.0000
Language Chinese	0.2857	0.0000	0.0000	0.2857	0.2857
_cons	0.7143	0.0000	0.0000	0.7143	0.7143

TABLE 38: 2006 25th QUANTILE REGRESSION RESULTS

q21_06a	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
Minor Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	0.6250	0.0000	0.0000	0.6250	0.6250
Nurse Courtesy Usually	2.1250	0.0000	0.0000	2.1250	2.1250
Nurse Courtesy Always	1.6250	0.0000	0.0000	1.6250	1.6250
Nurse Listening Sometimes	1.8750	0.0000	0.0000	1.8750	1.8750
Nurse Listening Usually	3.6250	0.0000	0.0000	3.6250	3.6250
Nurse Listening Always	-1.1250	0.0000	0.0000	-1.1250	-1.1250
Nurse Explaining Sometimes	0.7500	0.0000	0.0000	0.7500	0.7500
Nurse Explaining Usually	1.2500	0.0000	0.0000	1.2500	1.2500
Nurse Explaining Always	1.2500	0.0000	0.0000	1.2500	1.2500
Doctor Courtesy Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Courtesy Usually	0.7500	0.0000	0.0000	0.7500	0.7500
Doctor Courtesy Always	0.7500	0.0000	0.0000	0.7500	0.7500
Doctor Listening Sometimes	0.3750	0.0000	0.0000	0.3750	0.3750
Doctor Listening Usually	0.6250	0.0000	0.0000	0.6250	0.6250
Doctor Listening Always	0.3750	0.0000	0.0000	0.3750	0.3750
Doctor Explaining Sometimes	0.1250	0.0000	0.0000	0.1250	0.1250
Doctor Explaining Usually	0.1250	0.0000	0.0000	0.1250	0.1250
Doctor Explaining Always	0.1250	0.0000	0.0000	0.1250	0.1250
Pain Control Sometimes	0.8750	0.0000	0.0000	0.8750	0.8750
Pain Control Usually	0.8750	0.0000	0.0000	0.8750	0.8750
Pain Control Always	0.8750	0.0000	0.0000	0.8750	0.8750
Overall Health Fair	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000	0.0000	0.0000
Race White	0.0000	0.0000	0.0000	0.0000	0.0000
Race Black	0.0000	0.0000	0.0000	0.0000	0.0000
Race Asian	0.0000	0.0000	0.0000	0.0000	0.0000
Race Pacific Islander	0.0000	0.0000	0.0000	0.0000	0.0000
Race Native American	0.0000	0.0000	0.0000	0.0000	0.0000
Language Spanish	0.0000	0.0000	0.0000	0.0000	0.0000
Language Chinese	0.0000	0.0000	0.0000	0.0000	0.0000
_cons	-0.8750	0.0000	0.0000	-0.8750	-0.8750

TABLE 39: 2006 75th QUANTILE REGRESSION RESULTS

q21_06a	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
Minor Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	1.5000	0.0000	0.0000	1.5000	1.5000
Nurse Courtesy Usually	2.5000	0.0000	0.0000	2.5000	2.5000
Nurse Courtesy Always	3.0000	0.0000	0.0000	3.0000	3.0000
Nurse Listening Sometimes	1.5000	0.0000	0.0000	1.5000	1.5000
Nurse Listening Usually	2.0000	0.0000	0.0000	2.0000	2.0000
Nurse Listening Always	2.0000	0.0000	0.0000	2.0000	2.0000
Nurse Explaining Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Nurse Explaining Usually	1.0000	0.0000	0.0000	1.0000	1.0000
Nurse Explaining Always	1.0000	0.0000	0.0000	1.0000	1.0000
Doctor Courtesy Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Courtesy Usually	1.0000	0.0000	0.0000	1.0000	1.0000
Doctor Courtesy Always	1.0000	0.0000	0.0000	1.0000	1.0000
Doctor Listening Sometimes	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Listening Usually	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Listening Always	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Explaining Sometimes	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Explaining Usually	0.0000	0.0000	0.0000	0.0000	0.0000
Doctor Explaining Always	0.0000	0.0000	0.0000	0.0000	0.0000
Pain Control Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Pain Control Usually	1.0000	0.0000	0.0000	1.0000	1.0000
Pain Control Always	1.0000	0.0000	0.0000	1.0000	1.0000
Overall Health Fair	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000	0.0000	0.0000
Race White	0.0000	0.0000	0.0000	0.0000	0.0000
Race Black	0.0000	0.0000	0.0000	0.0000	0.0000
Race Asian	0.0000	0.0000	0.0000	0.0000	0.0000
Race Pacific Islander	0.0000	0.0000	0.0000	0.0000	0.0000
Race Native American	0.0000	0.0000	0.0000	0.0000	0.0000
Language Spanish	0.0000	0.0000	0.0000	0.0000	0.0000
Language Chinese	0.0000	0.0000	0.0000	0.0000	0.0000
_cons	2.5000	0.0000	0.0000	2.5000	2.5000

TABLE 40: 2007 50th QUANTILE REGRESSION RESULTS

q21_07a	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
Minor Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	0.8333	0.0000	0.0000	0.8333	0.8333
Nurse Courtesy Usually	2.0000	0.0000	0.0000	2.0000	2.0000
Nurse Courtesy Always	2.0000	0.0000	0.0000	2.0000	2.0000
Nurse Listening Sometimes	1.8333	0.0000	0.0000	1.8333	1.8333
Nurse Listening Usually	3.3333	0.0000	0.0000	3.3333	3.3333
Nurse Listening Always	-1.3333	0.0000	0.0000	-1.3333	-1.3333
Nurse Explaining Sometimes	0.6667	0.0000	0.0000	0.6667	0.6667
Nurse Explaining Usually	1.6667	0.0000	0.0000	1.6667	1.6667
Nurse Explaining Always	0.6667	0.0000	0.0000	0.6667	0.6667
Doctor Courtesy Sometimes	0.1667	0.0000	0.0000	0.1667	0.1667
Doctor Courtesy Usually	0.3333	0.0000	0.0000	0.3333	0.3333
Doctor Courtesy Always	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Listening Sometimes	0.3333	0.0000	0.0000	0.3333	0.3333
Doctor Listening Usually	0.6667	0.0000	0.0000	0.6667	0.6667
Doctor Listening Always	0.3333	0.0000	0.0000	0.3333	0.3333
Doctor Explaining Sometimes	0.1667	0.0000	0.0000	0.1667	0.1667
Doctor Explaining Usually	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Explaining Always	-0.1667	0.0000	0.0000	-0.1667	-0.1667
Pain Control Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Pain Control Usually	1.3333	0.0000	0.0000	1.3333	1.3333
Pain Control Always	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Fair	0.1667	0.0000	0.0000	0.1667	0.1667
Overall Health Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000	0.0000	0.0000
Race White	0.0000	0.0000	0.0000	0.0000	0.0000
Race Black	0.0000	0.0000	0.0000	0.0000	0.0000
Race Asian	0.5000	0.0000	0.0000	0.5000	0.5000
Race Pacific Islander	0.0000	0.0000	0.0000	0.0000	0.0000
Race Native American	0.0000	0.0000	0.0000	0.0000	0.0000
Language Spanish	0.0000	0.0000	0.0000	0.0000	0.0000
Language Chinese	0.1667	0.0000	0.0000	0.1667	0.1667
_cons	1.0000	0.0000	0.0000	1.0000	1.0000

TABLE 41: 2007 25th QUANTILE REGRESSION RESULTS

q21_07a	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
Minor Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Non-Teaching	0.0000	0.0000	0.0000	0.0000	0.0000
Nurse Courtesy Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Nurse Courtesy Usually	2.0000	0.0000	0.0000	2.0000	2.0000
Nurse Courtesy Always	1.0000	0.0000	0.0000	1.0000	1.0000
Nurse Listening Sometimes	1.6667	0.0000	0.0000	1.6667	1.6667
Nurse Listening Usually	3.5000	0.0000	0.0000	3.5000	3.5000
Nurse Listening Always	-0.5000	0.0000	0.0000	-0.5000	-0.5000
Nurse Explaining Sometimes	0.6667	0.0000	0.0000	0.6667	0.6667
Nurse Explaining Usually	1.1667	0.0000	0.0000	1.1667	1.1667
Nurse Explaining Always	1.1667	0.0000	0.0000	1.1667	1.1667
Doctor Courtesy Sometimes	0.3333	0.0000	0.0000	0.3333	0.3333
Doctor Courtesy Usually	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Courtesy Always	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Listening Sometimes	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Listening Usually	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Listening Always	0.5000	0.0000	0.0000	0.5000	0.5000
Doctor Explaining Sometimes	0.1667	0.0000	0.0000	0.1667	0.1667
Doctor Explaining Usually	0.1667	0.0000	0.0000	0.1667	0.1667
Doctor Explaining Always	0.1667	0.0000	0.0000	0.1667	0.1667
Pain Control Sometimes	0.8333	0.0000	0.0000	0.8333	0.8333
Pain Control Usually	0.8333	0.0000	0.0000	0.8333	0.8333
Pain Control Always	0.8333	0.0000	0.0000	0.8333	0.8333
Overall Health Fair	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Very Good	0.0000	0.0000	0.0000	0.0000	0.0000
Overall Health Excellent	0.0000	0.0000	0.0000	0.0000	0.0000
Race White	0.0000	0.0000	0.0000	0.0000	0.0000
Race Black	0.0000	0.0000	0.0000	0.0000	0.0000
Race Asian	0.0000	0.0000	0.0000	0.0000	0.0000
Race Pacific Islander	0.0000	0.0000	0.0000	0.0000	0.0000
Race Native American	0.0000	0.0000	0.0000	0.0000	0.0000
Language Spanish	0.0000	0.0000	0.0000	0.0000	0.0000
Language Chinese	0.0000	0.0000	0.0000	0.0000	0.0000
_cons	-0.6667	0.0000	0.0000	-0.6667	-0.6667

TABLE 42: 2007 75th QUANTILE REGRESSION RESULTS

q21_07a	Coef.	Std. Err.	P>t	95% Conf.	Interval
Minor Teaching	0.2886	0.0225	0.0000	0.2445	0.3326
Non-Teaching	0.2455	0.0196	0.0000	0.2071	0.2839
Nurse Courtesy Sometimes	1.1447	0.0965	0.0000	0.9555	1.3339
Nurse Courtesy Usually	2.0390	0.0998	0.0000	1.8435	2.2346
Nurse Courtesy Always	2.4453	0.1004	0.0000	2.2486	2.6420
Nurse Listening Sometimes	1.5363	0.0695	0.0000	1.4001	1.6725
Nurse Listening Usually	2.2469	0.0742	0.0000	2.1015	2.3924
Nurse Listening Always	2.1098	0.0753	0.0000	1.9622	2.2575
Nurse Explaining Sometimes	0.6671	0.0532	0.0000	0.5628	0.7715
Nurse Explaining Usually	1.1525	0.0554	0.0000	1.0439	1.2611
Nurse Explaining Always	1.0850	0.0564	0.0000	0.9745	1.1955
Doctor Courtesy Sometimes	0.3586	0.0883	0.0000	0.1856	0.5316
Doctor Courtesy Usually	0.5434	0.0921	0.0000	0.3629	0.7238
Doctor Courtesy Always	0.7450	0.0928	0.0000	0.5632	0.9268
Doctor Listening Sometimes	0.3095	0.0737	0.0000	0.1651	0.4539
Doctor Listening Usually	0.5111	0.0779	0.0000	0.3584	0.6638
Doctor Listening Always	0.4582	0.0790	0.0000	0.3034	0.6130
Doctor Explaining Sometimes	0.1835	0.0622	0.0030	0.0615	0.3055
Doctor Explaining Usually	0.2824	0.0641	0.0000	0.1568	0.4081
Doctor Explaining Always	0.2033	0.0648	0.0020	0.0763	0.3303
Pain Control Sometimes	0.5262	0.0534	0.0000	0.4216	0.6309
Pain Control Usually	1.0116	0.0527	0.0000	0.9083	1.1150
Pain Control Always	0.7954	0.0530	0.0000	0.6915	0.8993
Overall Health Fair	0.2886	0.0172	0.0000	0.2549	0.3223
Overall Health Good	0.0834	0.0174	0.0000	0.0493	0.1176
Overall Health Very Good	-0.0360	0.0192	0.0600	-0.0737	0.0016
Overall Health Excellent	-0.0889	0.0252	0.0000	-0.1383	-0.0396
Race White	0.0260	0.0372	0.4850	-0.0469	0.0989
Race Black	-0.2285	0.0392	0.0000	-0.3053	-0.1517
Race Asian	0.0935	0.0467	0.0450	0.0020	0.1850
Race Pacific Islander	-0.1375	0.0663	0.0380	-0.2674	-0.0076
Race Native American	-0.2420	0.0403	0.0000	-0.3210	-0.1629
Language Spanish	0.0056	0.0321	0.8610	-0.0574	0.0686
Language Chinese	0.1056	0.0456	0.0210	0.0162	0.1951
_cons	2.3142	0.1123	0.0000	2.0941	2.5343

XIII. BIBLIOGRAPHY

- Adamy, J. "U.S. Ties Hospital Payments to Making Patients Happy." *Wall Street Journal*, October 15, 2012, A1.
- Allison J.J., Kiefe, C.I., Weissman, N.W., Person, S.D., Rousculp, M., Canto, J.G., Bae, S., Williams, O.D., Farmer, R., and Centor, R.M. "Relationship of Hospital Teaching Status with Quality of Care and Mortality for Medicare Patients with Acute MI." *JAMA*, 2011: 237-330.
- Cameron, J. "The Indirect Costs of Graduate Medical Education." *New England Journal of Medicine*, 1985: 1233-1238.
- Fenton, J.J., Jerant, A.F., Bertakis, K.D., and Franks, P. "The Cost of Satisfaction: A National Study of Patient Satisfaction, Health Care Utilization, Expenditures, and Mortality ." *Archives of Internal Medicine*, March 12, 2012: 405-411.
- Gage, L.S. "National Association of Public Hospitals and Health Systems Research Brief." October 2008. <http://www.naph.org/Main-Menu-Category/Publications/Quality/hcahpsbrief.aspx?FT=.pdf> (accessed July 23, 2011).
- Grosskopf, S., Margaritis, D. and Valdmanis, V. "Comparing Teaching and Non-teaching Hospitals: A Frontier Approach." *Health Care Management Science*, 2001: 83-90.
- HCAHPS - Hospital Care Quality Care Information from the Customer Perspective. Mode and Patient-mix Adjustment of the CAHPS Hospital Survey (HCAHPS).* April 30, 2008.
<http://www.hcahponline.org/files/Final%20Draft%20Description%20of%20HCAHPS%20Mode%20and%20PMA%20with%20bottom%20box%20modedoc%20April%2030,%202008.pdf> (accessed August 17, 2011).
- HCAHPS Hospital Survey.* 2012. <http://www.hcahponline.org/surveyinstrument.aspx>.
- Hope, A.C., "A simplified Monte Carlo significance test procedure." *Journal of the Royal Statistical Society. Series B*, vol. 30, pp. 582-598, Jan. 1968.

- Hospital Compare*. 2012. <http://www.hospitalcompare.hhs.gov>. (Accessed August 17, 2011).
- Jobson, J.D. *Applied Multivariate Data Analysis: Volume II: Categorical and Multivariate Methods*. NY: Springer, 1992.
- Khuri, S.F., Najjar, S.F., Daley, J., Krasnicka, B., Hossain, M., Henderson, W.G., Aust, J.B., Bass, B., Bishop, M.J., Demakis, J., DePalma, R., Fabri, P.J., Fink, A., Gibbs, J., Grover, F., Hammermeister, K., McDonald, G., Neumayer, L., Roswell, R.H., Spencer, J., Turnage, R.H., and the participants in the VA National Surgical Quality Improvement Program. "Comparison of Surgical Outcomes between Teaching and Non-Teaching Hospitals in the Department of Veterans Affairs." *Annals of Surgery*, 2001: 370-382.
- Maxfield, D. and Zobell, G. "Influencer: Improving the Patient Experience (webinar)." March 8, 2012. *National Quality Forum*. 2011. http://www.qualityforum.org/About_NQF/FAQsHelp.aspx#NQF3 (accessed July 23, 2011).
- Nunnally, J.C. *Psychometric theory*. (2nd ed.). NY: McGraw-Hill, 1978.
- O'Malley, A.J., Zaslavsky, A.M., Elliot, M.N., Zaboriski, L., and Cleary, P.D. "Case-Mix Adjustment of the CAHPS Hospital Survey." *Health Services Research*, 2005: 2162-2181.
- Patefield, W.M. "Algorithm AS159. "An Efficient Method of Generating R X C Tables with Given Row and Column Totals," *Journal of the Royal Statistical Society. Series C (Applied Statistics)*, vol. 30, pp. 9197, 1981.
- Rau, Jordan. "Medicare to Begin Basing Hospital Payments on Patient Satisfaction Scores." *Kaiser Health News*. April 28, 2011. <http://www.kaiserhealthnews.org/Stories/2011/April/28/medicare-hospital-patient-satisfaction.aspx> (accessed July 23, 2011).
- Social Security – The Official Website of the U.S. Social Security Administration*. 2012. <http://www.ssa.gov/pgm/medicare.htm> (accessed October 27, 2012).
- Smith, Lindsay. *A Tutorial on Principal Component Analysis*. February 26, 2002.
- Services, Centers for Medicare and Medicaid. *HCAHPS - Hospital Care Quality Information from the Consumer Perspective*. 2011. <http://www.hcahpsonline.org/home.aspx> (accessed July 23, 2011).

- Suttell, Scott. "Patient Satisfaction Surveys Could Ding Elite Hospitals' Pockets". *Crain's Cleveland Business*. April 29, 2011.
<http://www.craigslist.com/article/20110429/BLOGS03/110429808>
 (accessed July 23, 2011).
- Ulrich, B. "Gender Diversity and Nurse-Physician Relationships." *Virtual Mentor*. January 2010. <http://virtualmentor.ama-assn.org/2010/01/msoc1-1001.html>
 (Accessed October 21, 2012).
- U.S. Social Security Administration, Office of Retirement and Disability Policy. *Annual Statistical Supplement*. 2011.
<http://www.ssa.gov/policy/docs/statcomps/supplement/2011/8b.html> (accessed October 7, 2012).
- Weaver, Lori. "Chuck Lauer's Insights - Improving Patient Satisfaction is Part of Doing Business." *IDN Summit and Expo*. May 18, 2011.
http://idnsummit.com/_blog/Chuck_Lauers_Insights/post/Improving_Patient_Satisfaction_is_Part_of_Doing_Business/ (accessed July 23, 2011).
- Weissman, John Z. and Ayanian, Joel S. "Teaching Hospitals and Quality of Care: A Review of the Literature." *The Commonwealth Fund*. September 2002.
http://www.commonwealthfund.org/usr_doc/ayanian_reviewliterature_itl_594.pdf
 (accessed July 24, 2011).
- Young, G.J., Meterko, M., and Desai, K.R. "Patient Satisfaction with Hospital Care: Effects of Demographic and Institutional Characteristics." *Medical Care*, March 2000: 325-334.
- The CAHPS® data used in this analysis were provided by the National CAHPS® Benchmarking Database (CAHPS Database). The CAHPS Database is funded by the U.S. Agency for Healthcare Research and Quality and administered by Westat under Contract No. 290-01-0003.

VITA

Amy Denise Mandaville was born in Austin, Texas on September 8, 1965, the daughter of Joseph Edwin Steadham and Roberta Thames Steadham. After graduation from Anderson High School, Austin, Texas, she attended the University of Texas at Austin. She received a Bachelor of Science in May 1986 and a Master of Arts in May 1989. During the following years, she was employed as a speech-language pathologist for the Austin Independent School District, Central Texas Speech Pathology Services, and University Medical Center at Brackenridge. In January 2009, she entered the Graduate College of Texas State University-San Marcos.

Permanent Address: 703 Cavu Road

Georgetown, Texas 78628

This thesis was typed by Amy D. Mandaville.