HCAHPS Three-State Pilot Study Analysis Results

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Center for Beneficiary Choices
Centers for Medicare and Medicaid Services
7500 Security Boulevard
Baltimore, Maryland 21244

Submitted by:

The CAHPS® II Investigators and
The Agency for Healthcare Research and Quality (AHRQ)
540 Gaither Road
Rockville, Maryland 20850
Contact: Chuck Darby, MA
(301) 427-1324

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EXECUTIVE SUMMARY OF PILOT STUDY

The Centers for Medicare & Medicaid Services (CMS) has begun efforts to make comparative performance information on hospitals publicly available. Such information can help consumers make more informed choices when selecting a hospital and can create incentives for hospitals to improve the care they provide. As part of this effort, CMS has been working with the Agency for Healthcare Research and Quality (AHRQ) to develop a standard survey instrument that can be used to collect and report information on hospital patients' perspectives on the care they receive. Many hospitals already work with survey vendors to design and administer a patient satisfaction survey as part of their own internal quality improvement efforts, and some hospitals administer their own surveys. However, the questions and methodologies are customized and do not allow comparison across hospitals. The instrument that has been developed to meet the need for publicly reporting patient perspectives on care information is called Hospital CAHPS, or HCAHPS.

AHRQ published a Federal Register notice on July 24, 2002, soliciting the submission of existing instruments measuring patients' perspectives on care. The notice of request for measures closed on September 23, 2002. The seven submissions received, were reviewed rigorously by the CAHPS II Grantees (AIR, Rand, and Harvard). Three criteria were considered in reviewing the submissions: 1) does the instrument capture the patients' perspectives on care in acute care and/or hospital settings; 2) does the instrument demonstrate a high degree of reliability and validity; and 3) has the instrument been widely used, not just in one or two research studies or local hospital settings.

In January 2003, AHRQ submitted to CMS a draft HCAHPS instrument that consisted of 66 questions. AHRQ drew upon the seven surveys submitted by vendors, a comprehensive literature review, and earlier CAHPS work to develop the draft HCAHPS instrument. In instances when AHRQ drew upon items in existing surveys from vendors, it made material changes modifying wording and changing the response sets. The draft instrument reflects the CAHPS design principles and closely resembles other CAHPS surveys developed over the years. In cooperation with AHRQ, CMS designed a pilot test for the draft instrument. This instrument was tested as part of the CMS hospital three-state pilot project in Arizona, Maryland, and New York.

This report presents results of the HCAHPS three-state pilot test of adult medical, surgical, and obstetric patients who had an overnight hospital stay and were discharged between December 2002 and January 2003. Participating hospitals included a core group of 24 and a noncore group of 85 for most of the analyses reported here. An additional 23 noncore hospitals participated at a later stage but data from them were not obtained until after these analyses were begun. Certain categories of patients were excluded from this study, including psychiatric, pediatric (under age 18) patients, and OB/GYN patients who had delivered stillborn babies or had miscarriages.

The pilot study was implemented by the CMS Quality Improvement Organizations (QIOs) in the three states—Delmarva Foundation for Medical Care (DFMC) for Maryland, Health Services Advisory Group (HSAG) for Arizona, and IPRO for New York—with DFMC serving as the coordinating center. Data collection commenced for the core sample of hospitals on June 2, 2003, and ended for most core sample members on August 18, 2003. Data for the noncore sample began on June 9, 2003, and ended on October 10, 2003. The response rate was 47 percent among core hospitals and 36 percent among noncore hospitals.

We performed an empirical analysis of the HCAHPS pilot data of hospital patients' perspectives of care to evaluate the degree to which these experiences corresponded with the Institute of Medicine's (IOM's) nine domains of care: respect for patient's values; preferences and expressed needs; coordination and integration of care; information, communication and education; physical comfort; emotional support; involvement of family and friends; transition and continuity; access to care. While some of the survey items correlated strongly with this hypothesized domain or composite, it was clear that the general hypothesized structure was inconsistent with the observed data. Exploratory factor analyses at the individual and hospital level were used to help guide refinements to the initially hypothesized structure. The revised structure was evaluated using a series of analyses that included item-scale correlations, internal consistency reliability, hospital-level reliability, and correlations with global ratings. Based on analyses of the data and stakeholder suggestions, a revised HCAHPS survey (see Appendix B) was produced that consists of 32 questions assessing seven internally developed domains of care: (1) nurse communication (items 1-3); (2) nursing services (items 4, 13); (3) doctor communication (items 6-8); (4) physical environment (items 10-11); (5) pain control (items 15-16); (6) communication about medicines (items 17, 19); and (7) discharge information (items 21-22). The revised survey also includes global rating items for nursing care (item 5), doctor care (item 9), and hospital care (item 23). A single item is also included that assesses whether or not the patient would recommend the hospital to family and friends (item 24). The seven composites had a median internal consistency reliability of 0.69 and a

median hospital-level reliability of 0.74 in the pilot study. In addition, these reporting composites were significantly associated with global ratings of the hospital and willingness of patients to recommend the hospital to family and friends.

This report also provides the results of case-mix analyses that were performed in order to identify variables associated with reports and ratings of care, as well as variance components analysis performed to estimate how much of the variation in reports and ratings of care are attributable to regions, hospitals, service category, and patients. These analyses suggest that hospital service (medical, surgical, obstetrics), self-reported global health status, age, and education and an interaction term representing different effects of age in different services should be controlled for when comparing hospital scores. Language of respondent and race should be evaluated further when data from a more complete sample of regions in the country are available. Analyses of variability across hospitals and states suggests that there is substantial variability among hospitals after state effects have been taken into account. In addition, we evaluate predictors of unit and item nonresponse, evaluate responses to open-ended questions, and compare English and Spanish language survey responses.

This report, first provides a brief review of the literature on patient evaluations of hospital care that preceded the drafting of the HCAHPS survey instrument. The design and results of the field test follow.

1. LITERATURE REVIEW

Most reviewed studies of hospital patient satisfaction used institution-specific measures rather than a standard instrument. The instruments reviewed included the HCA Patient Judgments System Questionnaire/Nashville Consulting Group Survey (Barkley & Furse, 1996; Hays, et al., 1991 Meterko, et al., 1990; Rosenthal & Harper, 1994; Thi, et al., 2002; Ware & Berwick, 1990), the Carey and Seibert (1993) instrument (Bell, et al., 1997), Press Ganey Survey (Press, 2002, Patient satisfaction: Defining, measuring, and improving the experience of care), Comprehensive Assessment of Satisfaction with Care Instrument (Brédart, et al., 1999, 2002), the Picker survey (Bruster, et al., 1994; Burstin, et al., 1999; Charles, et al., 1994; Cleary, et al., 1989; Coulter & Cleary, 2001; Hargraves, et al., 2001; Hoff, et al., 1999; Jenkinson, et al., 2002a & b; Lanford, et al., 2001; Rogers & Smith, 1999; Rosencheck, et al., 1997; Simon, et al., 1998; Wilson, et al., 2002), the SERVQUAL (Camilleri, et al., 1998; John, 1992b), Spri Survey (Ehnfors & Smedby, 1993), and several privately prepared instruments (Abramowitz, et al., 1987; Arnetz & Arnetz, 1996; Burroughs, et al., 1999; Candish, et al., 1998; Chou & Boldy, 1999; Cohen, et al., 1996; Conover, et al., 1999; Covinsky, et al., 1998; Coyle & Williams, 2001; Deeks & Byatt, 2000; Dozier, et al., 2001; Duff, et al., 2001; Dull, et al., 1994; Eisen et al, 2002; Gasquet, et al., 2001; Goupy, et al., 1991; Grimmer & Moss, 2001; Gustafson, et al., 2001; Guzman, et al., 1988; Hall, 1995; Harding, et al., 1994; Hickey, et al., 1996; Hiidenhovi, et al., 2001, 2002; Horne, et al., 2001; Hoskins, et al., 1994; Howard, et al., 2001; Jamison, et al., 1997; John, 1992a; Ketefian, et al., 1997; Larsson, 1998, 1999; Lehmann, et al., 1997; Longo, et al., 1997; Marino & Marino, 2000; McNeill, et al., 2001; Merakou, et al., 2001; Mishra, et al., 1991; Mokhtar, et al., 1991; Oz, et al., 2001; Shannon, et al., 2002; Sower, et al., 2001; Stamps & Lapriore, 1987; Weaver, et al., 1993; Welton & Parker, 1999; Woodbury, et al., 1998; Woodside & Shinn, 1988; Zifko-Baliga & Krampf, 1997).

Below we note what the literature reveals about timing of patient evaluations of hospital care, mode of data collection and response rates, nonresponse adjustment, and case-mix adjustment.

- Timing of patient evaluations of hospital care

  Patients have been asked to evaluate hospital care as early as during the hospital stay and as late as 6 months after the hospitalization. Most studies assessed experiences with the hospital stay about 2-4 weeks post-discharge. The specific timing of evaluation for each study reviewed is listed below.

  - The day before discharge (Goupy, et al., 1991).

- Evening before or hour before discharge nurse delivers the survey and asks patient to complete it and leave in a box in the unit (Guzman, et al., 1988).

- Just prior to discharge (Camilleri & O'Callaghan, 1998).

- Interviews conducted at discharge for patients on the general medical service (Covinsky, et al., 1998).

- Questionnaires were distributed by staff in the hospital upon admission and returned to boxes in each department after completion or mailed from home (Arnetz, et al., 1996).

- Ward staff distributed questionnaires to patients upon discharge and asked them to complete and return them within 1 week (Coyle & Williams, 2001).

- Nursing staff gave a questionnaire to patients prior to discharge and asked them to complete it at home and return it to an independent university researcher within 2 weeks (Deeks & Byatt, 2000).

- Nurse responsible for care gave them patients' questionnaire on day of or day before their discharge (Larsson, 1999).

- Day of discharge (Jamison, et al., 1997).

- Within 48 hours of discharge—30 percent random sample of discharged acute-care patients (Bell, et al., 1997).

- Face-to-face interviews conducted within 24 to 72 hours of discharge with patients at a mental health hospital (Howard, et al., 2001).

- Mailed survey to patients hospitalized in the prior week (Grimmer & Moss, 2001).

- Mailed survey 2 to 16 days after discharge (Sun, et al., 2001).

- One week postdischarge (Hall, 1995).

- Two weeks after discharge (Thi, et al., 2002).

- Two weeks versus 3 months after discharge—110 patients with breast cancer randomized to one or the other followup interval (Brédart, et al., 2002). Patients who failed to mail back the questionnaire within 1 week were given a reminder call the following week. Completing the questionnaire took significantly longer and missing data was higher for those who completed it at 2 weeks than at 3 months.

- Two weeks postdischarge for patients discharged from adult acute care units (Dozier, et al., 2001).

- Two weeks after discharge (Dull, et al., 1994).

- Two weeks and eight weeks postdischarge (Gustafson, et al., 2001).

- Two to three weeks postdischarge—random sample of patients mailed a questionnaire (Burroughs, et al., 1999).

- Two to three weeks postdischarge—medical, surgical, and obstetric patients (Cleary, et al., 1989).

- Ten to 21 days after discharge (Woodbury, et al., 1998).

- Two to four weeks postdischarge--Bruster, et al. (1994) interviewed an average of 143 patients from 36 hospitals.

- Two to four weeks after discharge (Welton & Parker, 1999).

- Within a month of discharge (Jenkinson, et al., 2002a & b).

- Four to six weeks postdischarge (Ketefian, et al., 1997).

- Six to 14 weeks postdischarge—random samples of 100 to 1,400 patients from each hospital (Barkley & Furse, 1996).

- One to two months after discharge patients hospitalized for acute MI, CHF, pneumonia, CABG, childbirth, hysterectomy, or PTCA were contacted (Hargraves, et al., 2001).

- Two months after giving birth women were interviews (Duff, et al., 2001).

- One day to 168 days postdischarge, 87 percent within 2 months of discharge (Ware & Berwick, 1990).

- Four and six months post MI-Roberts & Tugwell, (1987).

- Last hospitalization in the prior 6 months (Wilson, et al., 2002).

■ Mode of data collection and response rates

Response rates tend to be higher for telephone administration than mail administration. Response rates ranged from 17 percent to 92 percent across both modes. However, comparing response rates across studies should be done with caution because most published articles do not provide enough information to verify how the denominator was constructed in calculating the response rate.

- Telephone interviews with 12,726 patients from 22 hospitals yielded a 92 percent response rate (Hargraves, et al., 2001).

- Telephone survey with 91 percent (n=841 patients) response rate (Abramowitz, et al., 1987).

- Telephone survey with 85 percent response rate (Stamps & Lapriore, 1987).

- Telephone survey (up to 10 calls per patient) with a response rate of 69 percent (n = 4,599) (Charles, et al., 1994).

- Telephone survey with 62 percent response rate (Ware & Berwick, 1990).

- Telephone survey with 52 percent response rate (Woodside & Shinn, 1988).

- Telephone interview with 51 percent response rate (Woodbury, et al., 1998).

- Mail survey with response rates significantly higher for those randomized to 2-week postdischarge initial contact (87%) versus those randomized to 3-month postdischarge initial contact (66%) (Brédart, et al., 2002).

- Mail survey with 67 percent response rate (Ware & Berwick, 1990).

- Mail survey with 65 percent response rate (Jenkinson, et al., 2002b).

- Mail survey with response rates of 68 percent for surgical, 65 percent for obstetric, and 57 percent for medical patients (Cleary, et al., 1989).

- Mail survey with response rate of 58 percent across 76 hospitals and n = 19,556 patients (Barkley & Furse, 1996).

- Mail survey of 38,789 VA patients (response rate = 58%) (Hoff, et al., 1999).

- Mail survey of patients of 31 hospitals found a response rate of 56 percent for medical/surgical and 58 percent for obstetric patients (Rosenthal & Harper, 1994).

- Mail survey with response rate exceeding 50 percent (Bell, et al., 1997).

- Mail survey with 48 to 52 percent response rates across five hospitals (Dozier, et al., 2001).

- Mail survey with response rates of 46 percent (USA), 52 percent (Switzerland), 63 percent (Sweden), 65 percent (UK), and 74 percent (Germany) (Jenkinson, et al., 2002a).

- Mail survey with 45 percent response rate (Zifko-Baliga & Krampf, 1997).

- Mail survey with 42 percent (n = 7,083) response rate (Burroughs, et al., 1999).

- Mail survey with 42 percent (n = 346) response rate (Chou & Boldy, 1999).

- Mail survey response rates ranged from 28 percent to 59 percent across hospitals (Hargraves, et al., 2001).

- Mail survey of VA hospital patients with a psychiatric diagnosis yielded a 37 percent response rate (Rosencheck, et al., 1997).

- Mail survey with response rates of 36 percent (wave 2) and 46 percent (wave 1) (Ketefian, et al., 1997).

- Mail survey with 24 percent response rate (John, 1992a & b).

- Mail survey with 23 percent response rate (Sun, et al., 2001).

- Mail survey with 17 percent response rate (Mishra, et al., 1991; Woodside & Shinn, 1988).

- Women randomized to telephone interview (49% response rate) or mail mode (41% response rate) of administration (n=406 survey participants) (Hall, 1995). Those completing the telephone survey tended to report more positive experiences with care than those in the mail arm of the study.

- Patients were randomized to received a mail questionnaire or in the hospital during discharge. All 600 patients were asked to complete the questionnaire at home and return it by mail. There were multiple followups including phone call contact as the last step. The response rate was 80 percent, which did not differ between the two groups (Gasquet, et al., 2001).

- Interviews with patients at home or their place of discharge yielded an 86 percent response rate (Bruster, et al., 1994).

- Interviews conducted at discharge with 445 patients on the general medical service yielded a 75 percent response rate (Covinsky, et al., 1998).

- Questionnaires distributed by staff upon admission and returned to boxes in each department after completion or mailed in from home. Fifty percent response rate for a baseline survey (n = 1834) and 57 percent response rate for a followup survey (n = 2499) (Arnetz, et al., 1996).

- Response rates of 66 percent and 68 percent in Sweden were obtained when nurse responsible for care handed patients questionnaires on the day of or the day before their discharge (Larsson, 1999; Larsson, et al., 1998).

- Ward staff distributed questionnaires to patients upon discharge and asked them to complete and return them within 1 week. The response rate was 43 percent (n = 97 patients from general medical, surgical, and otolaryngology wards in a hospital in Scotland) (Coyle & Williams, 2001).

- Nursing staff distributes questionnaire night before or hour before discharge and asked patient to complete and leave in a box in the unit. Response rate was 27 percent (n = 2,156) (Guzman, et al., 1988).

■ Nonresponse adjustment

The limited available information suggests that nonrespondents may have less favorable perceptions of care than respondents. For example, in a review of the literature, Rubin (1990) noted two studies with nonrespondents being less satisfied with care. Similarly, results based on the first 30 percent of respondents in one study tended to be more positive than results based on all respondents, but the pattern varied depending on the hospital (Barkley & Furse, 1996). The range of differences within hospitals between the first 30 percent and all respondents was between 0.29 SD units (admissions and food) to 0.44 SD units for billing. For 9 out of 13 scales, more hospitals had significant differences in mean scores than would be expected by chance alone.

Nonrespondents have been found to be younger and male than respondents (Barkley & Furse, 1996). Similarly, a study of 32 acute care hospitals located in five different states reported that nonrespondents were more likely to be younger, male, and unmarried than were respondents (Hays, et al., 1991). Consistent with the above, two other studies found that nonrespondents tended to be more likely male than respondents, but these studies found that nonrespondents were more likely to be older (Burroughs, et al., 1999; Ware & Berwick, 1990). Burroughs, et al. (1999) also found that response rates were higher for Medicare than commercial and Medicaid patients. Hoff, et al. (1999) reported significantly lower response rates for those with a psychiatric diagnosis than for those without one in a study of VA patients. Finally, research has also shown that those with multiple hospitalizations are the earliest to respond to the survey (Gasquet at al., 2001).

■ Case-mix adjustment

The literature suggests similar patterns of important case-mix variables in the hospital setting as in ambulatory CAHPS. In particular, greater satisfaction has been found among older patients, those with better self-perceived health, and, to some extent, those with less education. In addition, there is some limited evidence that males, those who are married, and people with higher income may report more positive assessments of care. Significant associations of other variables (e.g., length of stay, number of previous admissions) with hospital ratings and reports of care have not been consistently demonstrated.

Older patients and those with better perceived health status have been found to provide more positive ratings of hospital care (Arnetz, & Arnetz, 1996; Charles, et al., 1994; Cleary, et al., 1989; Ehnfors & Smedby, 1993; Hargraves, et al., 2001; Hoff, et al., 1999; Jenkinson, et al., 2002b; McNeil, et al., 2001; Rosencheck, et al., 1997; Thi, et al., 2002; Ware & Berwick, 1990; Wilson, et al., 2002; Woodbury, et al., 1998).

Positive, but weak correlations between SF-12 physical and mental health summary scores and overall satisfaction with care were reported in a study of 944 patients in a

mid-Atlantic academic medical center (Welton & Parker, 1999). Positive change in health status from admission to discharge was related to better patient satisfaction at discharge in a study of 445 patients of the University Hospitals of Cleveland (Covinsky, et al., 1998). When discharge health status was controlled for in the analysis, the change in health variable became nonsignificant.

Women tended to rate their care more negatively than men in some studies (Charles, et al., 1994; Ehnfors & Smedby, 1993; Hoff, et al., 1999; Rosencheck, et al., 1997; Thi, et al., 2002).

Lower income, more education, and being single were related to greater number of reported problems with hospital care (Charles, et al., 1994). A study of 38,789 hospitalized VA patients also found that those with higher income and married respondents were more positive in their assessment of care (Hoff, et al., 1999). Income was not asassociated with a single-item measure of overall satisfaction in another study (Cleary, et al., 1989). More education was associated with less satisfaction with care in a study of 189 patients at a psychiatric hospital (Howard, et al., 2001).

Reason for admission was a consistent correlate of satisfaction in a study of more than 3,000 patients discharged from a tertiary care facility of a hospital (Woodbury, et al., 1998). Type of admission (emergency versus nonemergency) was not associated with a single-item measure of overall satisfaction (Cleary, et al., 1989).

Length of stay was associated with higher satisfaction in a study of 4,948 veterans discharged from VA medical centers with a diagnosis of psychiatric or substance abuse disorder (Rosencheck, et al., 1997) but negatively associated with satisfaction in a study of 38,789 hospitalized VA patients (Hoff, et al., 1999). In addition, several other studies have not found a significant association between length of stay and ratings of care (Charles, et al., 1994; Cleary, et al., 1989; Dozier, et al., 2001; Ehnfors & Smedby, 1993).

Time lag between discharge and completing a survey had minimal association with favorableness of ratings of care (Ware & Berwick, 1990). In addition, there was no association between ratings and mode of administration.

Charles, et al. (1994) found that number of previous admissions was unrelated to number of reported problems, but Gasquet, et al., (2001) reported that patients with two or more prior hospitalizations were more satisfied with care than those with no or only one prior hospitalization. A study of 148 patients admitted to the hospital as a result of CHF revealed that satisfaction was similar for those who had one or more readmissions over a 12-month interval following data collection compared to those who did not (Candish, et al., 1998).

2. PILOT STUDY METHODS

The chief purpose of the HCAHPS pilot study was to field test the original 66-item survey developed by the CAHPS grantees through the Agency for Healthcare Research and Quality (AHRQ) and reduce its size. Hospitals that volunteered to participate in the HCAHPS pilot study were divided into a core group of 24 (7 in Arizona, 6 in Maryland, 11 in New York) and a noncore group of 85. Twenty-three additional noncore hospitals participated at a later stage and were not included in most of the analyses reported here. The target number of completions in each core hospital was 450, divided equally among medical, surgical, and obstetric services (150 per service). The target for noncore hospitals was 150 for all three services combined.

Medical and surgical patients with an overnight stay discharged between December 2002 and January 2003 were eligible to participate. Obstetric patients discharged between November 2002 and January 2003 were eligible. Excluded from the pilot test were patients under 18 years old, those admitted for psychiatric or substance abuse treatment or for purely observation purposes, those who died or whose baby died, and patients discharged to a setting other than home.

Core sample members were mailed an advance notification letter, followed 1 week later by a cover letter and a mail questionnaire. Ten days later, a reminder/thank you postcard was mailed. Telephone followup for nonrespondents began about 4 weeks after the mailing of the postcard. Noncore sample members received a second mailed questionnaire in place of the telephone followup.

State-specific letterhead and signatures were used for the advance letters and cover letters. A maximum of five followup phone calls were attempted for core mail nonrespondents.

Hospital Recruitment

All three Quality Improvement Organizations (QIOs) informed hospitals that participation in the HCAHPS pilot was part of the broader pilot project entailing public reporting of clinical measures and piloting of the survey instrument. In Maryland and Arizona, hospital group meetings were held to inform prospective hospital participants of the pilot details. All three QIOs used email and conference calls with pilot project contacts in each facility to disseminate information about the background, goals and

objectives of the HCAHPS pilot, the content of the survey, the survey schedule, and the patient data specifications for the sampling frames to be provided by the hospitals.

In Maryland, hospitals were required to participate in the HCAHPS pilot by the Maryland Health Care Commission. This was consistent with the state's legislative mandate, which requires a uniform satisfaction survey for all Maryland hospitals in 2003. In Arizona and New York, participation was voluntary. In each state, 10 to 15 percent of the hospitals that originally agreed to participate withdrew by the time the pilot began. Some Maryland facilities objected to linking participation in the HCAHPS pilot with public reporting of clinical measures required under the Centers for Medicare and Medicaid Services (CMS) Hospital Quality Initiative. Ultimately, it was decided by CMS that the HCAHPS pilot data would not be reported publicly.

Volunteers who could not provide the sampling frame data and pediatric and other specialty hospitals (e.g., cancer facilities) were excluded from the HCAHPS pilot.

Selection of Core Hospitals

A Hospital Pilot Steering Committee in each state selected six or seven hospitals to be core hospitals from among those that volunteered to participate. Volunteers who were not selected to be core hospitals were classified as noncore. In selecting core hospitals, the steering committees attempted to achieve variation on bed size, average length of stay by service, location, and teaching status.

To ensure that we obtained a mix of different types of hospitals, the core set of hospitals in each state included at least:

- One academic medical center;
- One urban nonacademic medical center;
- One large suburban hospital;
- One rural hospital; and
- One smaller size (<250 beds) suburban hospital.

HCAHPS Pilot Data Management Procedure

Hospitals uniformly found it difficult to produce the discharge data needed to construct the sampling frame, primarily because of the relatively short (~3 weeks) turnaround time and misunderstanding of the data specifications. QIO staff provided one-on-one technical assistance to clarify the data specifications and advise on the potential sources of the data within a given hospital. Between one and five hospitals in each state were asked to re-submit data because of corrupt, incorrect, or incomplete data files.

The following procedures were used to transmit and process hospital discharge lists:

1. Facilities were provided with a list of data elements to submit that included only those necessary to create the representative sample of discharges.

2. Maryland facilities were instructed to send the data via diskette or CD-ROM, using a traceable delivery method such as certified mail or FedEx, to the Delmarva Foundation Data Manager. New York and Arizona facilities sent their data to IPRO and the Health Services Advisory Group (HSAG), respectively.

3. IPRO and HSAG merged data from facilities in their states into one file that met the specifications and sent the data to DFMC via CD-ROM, using a traceable delivery method. In New York and Arizona, multiple disks were sent to Delmarva over a period of a few weeks because some hospitals needed to replace data files that did not meet specifications.

4. All data received from Maryland facilities and the Arizona and New York QIOs were placed in a secured directory on the DFMC private network. Access to this directory was limited to the data manager, the health analyst, and the senior scientist. The physical CDs and diskettes were stored, clearly labeled, in the secured data vault as per International Organization for Standards (ISO) procedures. Access to this vault is limited to the data manager.

5. Each state's dataset was processed in a separate file. A unique, system-generated record identifier was assigned to each record. The sample was selected according to the specifications described below under *HCAHPS Pilot Sampling Approach.*

6. The sample files (one for each of the three participating states) containing only the fields required to distribute the survey and the unique record identifier were sent to the survey administration contractor, the National Opinion Research Center (NORC). These files were sent to the contractor on CD-ROM using a traceable delivery method.

7. Upon completion of the survey process, the contractor (NORC) returned the survey data (again, one file per state) to DFMC on CD-ROM, using a traceable delivery

method. DFMC removed all identifiers from the survey data file, except the unique record identifier, before sending the file to the CAHPS team.

HCAHPS Pilot Sampling Approach

Each state's data were separately imported as a SAS dataset and were then formatted for analytic sampling. Before sampling, the following patient records were excluded as ineligible:

1. Patients with any diagnosis codes associated with deaths or a psychiatric diagnosis;
2. Patients under 18 years of age at the time of their admission;
3. OB/GYN patients who had stillborn babies or miscarriages;
4. Any discharge status code in categories other than "to home;" and
5. Missing data for any fields required for efficient identification and surveying.

The current survey instrument does not address the behavioral health issues pertinent to psychiatric patients, nor does it address the situation of pediatric patients and their families. We decided to exclude OB/GYN patients who had stillborn babies or miscarriages because of the very sensitive nature of those events.

Each state's dataset was then parsed into core and noncore affiliation and a flag was set for survey-vendor cataloging. The data were merged with a diagnosis related group (DRG) listing to establish the appropriate service groups (i.e., medical, surgical, or obstetric diagnosis groups). Patients with multiple hospital stays in their files were identified and only the most recent stay was retained. Due to volume, data maturity, and timing issues, the following time frames were selected for the noted topics:

1. Medical and surgical discharge dates were from December 1, 2002, thru January 30, 2003; and
2. Obstetric discharge dates were from November 1, 2002, thru January 30, 2003.

The sampling protocol called for a fixed, total sample size per hospital. The counts for each service per hospital were determined such that maximum coverage would be obtained. To do so, the data were ordered to first select the maximum count from the smallest service group, by hospital. In this way, lower than optimal counts for any group within a hospital could be adjusted by increasing the selected

size of the other groups. This process was next extended to the middle size group, again by hospital. Lastly, the hospital's largest grouping filled the remainder of each hospital's sample.

A random variable was then generated to create the random sample without replacement by topic and hospital, using a countvariable created in relation to each group size. The sample sizes of nobservations were then selected using the countvariable for all hospitals within each respective state. The target sample for core hospitals was 300 discharges in each service to yield 150 completions or a total of 450 completions per core hospital. The target sample for noncore hospitals was 300 discharges across all three services combined to yield an average of 150 completions.

Survey Operations

The HCAHPS field test began with a letter informing sample members that the questionnaire would arrive shortly. The questionnaire was mailed about a week later and a reminder/thank you postcard was mailed about 1 week after the questionnaire. About a month after the postcards were mailed, core sample members began receiving reminder phone calls and phone interview requests, and noncore sample members began receiving a second questionnaire by mail. Due to time constraints (we needed a data file ready for analysis by the first week in September), we followed core nonrespondents by telephone rather than mail because telephone followup is generally quicker. By contrast, there was not a tight deadline for the noncore response (these patients did not have to be included in the pilot data analysis). Thus, mail followup was used for the noncore nonrespondents because this would ultimately ensure a higher response rate (given no time constraints) due to the fact that we could afford to contact more nonrespondents by mail than telephone (telephone surveying is more expensive due to interviewer labor costs).

Data collection by NORC commenced for the core sample on June 2, 2003, and ended for almost all core sample members on August 18, 2003. Data collection for the noncore sample began on June 9, 2003, and ended for the noncore sample and for a few residual mail returns from the core sample on October 10, 2003. Thus, except for a few stragglers that arrived by mail after August 18, 2003, medical and surgical sample members in the core hospital sample were surveyed between 199 days and 261 days after discharge. Obstetric sample members from the core sample were surveyed between 230 and 291 days after discharge. Medical and surgical patients from the noncore sample were surveyed between 252 days and 314 days after discharge. Obstetric patients in the noncore sample were surveyed

between 282 days and 344 days after discharge. Figures 1 and 2 present the survey operations schedules for the core and noncore samples (cell numbers are dates).

3. ANALYSIS PLAN

We evaluated item-missing data rates, skip pattern errors, item-scale correlations (convergence and discrimination) and internal consistency reliability for hypothesized multi-item composites, and correlations of items and composites with the global ratings (hospital, doctor, nurses) and whether the patient would recommend the hospital to family and friends. We began with an *a priori* specification of how survey items cluster in accord with the Institute of Medicine (IOM) dimensions of care and make revisions based in part on exploratory factor analyses at the individual level and the hospital level of analysis. We estimated the reliability of global rating items and multi-item composites at the hospital level. In addition, we conducted case-mix analyses to identify variables that are significantly associated with reports and ratings of care and variance components analysis to estimate how much of the variation in reports and ratings of care are attributable to regions, hospitals, service category, and patients. Furthermore, we conducted analyses that examined predictors of unit and item nonresponse as well as characteristics of early versus later respondents. We also evaluated responses to open-ended questions and compared the English and Spanish language survey responses. This report concludes with recommendations for revising the original HCAHPS survey instrument.

4. FINDINGS

The findings and conclusions presented here are based primarily on the 24 core hospitals and those noncore hospitals (n = 85) for which data were returned before September 2, 2003. (A second group of 23 noncore hospitals was added at a later stage but data from them are not included in the present analysis). The primary analytic sample contained an average of 391 responses per core hospital and 85 responses per noncore hospital. A total of 12,929 mail completes and 3,690 phone completes were obtained (n = 16,619 overall). The first item in the HCAHPS pilot test instrument (Q1 to denote question 1) asked the respondent to confirm that the hospital name and discharge date information was correct. A few respondents (n = 29) indicated that they did not know if this information was correct and a small number of others responded that the information was incorrect (n = 56 responded "no"). A larger group of respondents (n = 324) left Q1 blank. Exploration of frequency distributions indicated that many of the respondents who left this item blank answered subsequent items (e.g., 269 of 324 answered Q2).

The number of missing items was evaluated based on the 16,534 people who answered either "yes" (n = 16,210) or left Q1 blank (n = 324). There were 44 items asked of everyone in the remainder of the instrument (Q2-Q8, Q10-Q19, Q21, Q23, Q25-Q26, Q28-Q30, Q32-Q34, Q36, Q42-Q45, Q52-Q53, and Q56-Q65). Very few had missing data for all of these items (n = 32) compared to 7,747 respondents with complete data (44 nonmissing items). Ninety-nine percent of the sample answered more than half (23 or more) of the 44 items (n = 16,466).

Exploration of frequency distributions also indicated that there were several occasions in which a respondent did not answer a screening item, but answered the followup item. Table 1 provides the responses of individuals who did not answer the corresponding screening item. As an example, of the people who did not answer Q8, ("During this hospital stay, did you press the call button?" n = 341), a proportion answered Q9 ("After you pressed the call button, how often did you get help as soon as you wanted it?"): seven selected "Never," 18 selected "Sometimes," 37 selected "Usually," and 41 selected "Always."

A change to the pilot instrument implemented shortly before the field test led to a difference in one skip pattern between respondents by mail and phone. An earlier version of the instrument asked respondents who answered "no" to Q29 to skip to Q34. This skip was later dropped from the mail

questionnaire, but the change was not made for the telephone interviews. Telephone responders who answered “no” to Q29 were skipped to Q34.

HCAHPS Domains: Draft Assignment of Items to Domains

The HCAHPS field test instrument (Appendix B) was initially designed to assess multiple domains of health care derived from the domains of care identified by the Institute of Medicine: (1) respect for patient’s values; (2) preferences and expressed needs; (3) coordination and integration of care; (4) information, communication and education; (5) physical comfort; (6) emotional support; (7) involvement of family and friends; (8) transition and continuity; and (9) access to care.

The analyses described here essentially include all items other than sample confirmation items, patient characteristics, screener items, and criterion for patient experiences of hospital care/hospital quality items. There are a total of 33 items of which 27 have a 1-4 ordinal scale and 6 have a 1-2 dichotomous scale. We reversed the coding of: Q44, Q47, Q48, Q49, and Q51, so that a higher rating reflects higher perceived quality for all items. This also has the effect of shifting the means towards the maximum possible rating for the scale upon which the item is measured. All types of missing data (skipped item, errant response, other) were simply lumped together and treated as if a legitimate skip occurred. Because the majority of missing responses were due to a forced skip, a small bias could be introduced by not accounting for randomly missing data.

Field test survey items were sorted into composites designed to assess the hypothesized domains listed above. In some cases items were initially assigned to more than one composite. The initial sorting was reviewed and items assigned to more than one composite were revised so that each item was assigned to a single composite. Draft assignments were shared with the HCAHPS instrument team and minor changes to item assignment were made (i.e., Q49 and Q51 reassigned).

Table 2 provides the item assignments for each of the nine hypothesized domains. For each item, the strongest anticipated domain loading is represented by a “$.” The domain of “physical comfort” included two types of items: physical environment and pain. Items marked with a “$” represent the physical environment (temperature, cleanliness, noise level). Items marked with an “&” represent pain items (pain control, freedom from pain). While these two types of items are distinct, they were both included in the “physical comfort” domain because it was hypothesized that they represented two

different aspects of physical comfort. Further, both item types were inappropriate to assign to other hypothesized domains. One domain, "coordination," did not receive any item assignments, thereby leaving eight hypothesized domains.

Data from the HCAHPS pilot were used to evaluate the adequacy of the draft item assignments and to propose alternative domains based on the structural relationships among the items. The adequacy of the hypothesized eight-domain structure was evaluated using an item-scale correlation matrix (Table 3). Correlations between items and hypothesized composites (corrected for overlap) are indicated by bold type. These results raised concerns about the hypothesized item clusters. In more than half of the estimated item-scale correlations, the item did not correlate highest with its hypothesized composite. Further, several of the items had similar correlations with multiple composites. While some items correlated strongly with their hypothesized composite, it was clear that the general hypothesized structure of the instrument was inconsistent with the observed data.

Exploratory factor analyses (individual-level) were then used to provide empirical information about possible alternative item clusters. We used SAS to examine the number and make-up of possible factors. The principle factor method with SMC priors and Promax rotation with Kaiser normalization was used. We identified six empirically determined item clusters supporting the following domain names: (1) physical comfort (7 items); (2) communication with doctors (5 items); (3) communication about medication (5 items); (4) communication with nurses (5 items); (5) pain control (4 items); and (6) discharge information (4 items). Three items did not appear to fit well within this factor structure: Q28 (introduce self), Q43 (delays in admission), and Q44 (living will).

Table 4 provides the item-scale correlation matrix for the revised six composites. Note that the three items not loading distinctly on these six composites were included as single items in the matrix. The item-scale correlations provided support for the revised structure. Item-scale correlations (corrected for overlap) tended to be substantial (exceeding 0.40) and items tended to correlate most highly with the composite (scale) they were supposed to represent.

The only items with item-scale correlations for hypothesized scales below 0.40 were Q48 (discharge information about needing help at home) and Q51 (discharge information on how to take medications). Item-total correlations revealed four items that were nearly as strongly or more strongly related to a composite other than the one to which they were assigned (Q22, Q27, Q25, and Q35). Q22 (help in getting to the bathroom) and Q27 (help given to visitors) had correlations with the

"communication with nurses" composite that were almost as strong as their relationships with the "physical comfort" composite. Both Q25 (involvement in treatment decisions) and Q35 (performing tests without pain) were highly related to the "physical comfort" and the "communication with nurses" domains as well as the "communication with doctors" and "pain control" composites, respectively. Column 3 in Table 5 denotes the correlations between these four items and the other scales (denoted by a number 1 for "physical comfort" and 4 for "communication with nurses").

Reliability of Revised Composites and Global Rating Items

Internal consistency reliability coefficients (Cronbach's alpha) are displayed for each of the six composites in the cell adjacent to the composite name in the fourth column of Table 5. Five of six composites had internal consistency reliability estimates of 0.80 or higher and one composite had a reliability of 0.68 (discharge information).

Sensitivity analyses were conducted to evaluate whether eliminating complex or weakly related items from a composite would increase the internal consistency reliability. To that end, Q22 (help in getting to the bathroom) and Q27 (help for visitors) were eliminated one at a time from the "physical comfort" composite and the reliability of the resulting composite recalculated. When Q22 was eliminated, alpha decreased to 0.77; and when Q27 was eliminated, alpha decreased to 0.78. The elimination of Q25 (patient involved in treatment decisions) from the "communication with doctors" composite did not change the reliability coefficient, suggesting that that item could be deleted from the survey without impacting the precision of the scale score. By contrast, the elimination of Q51 from the "discharge information" composite decreased alpha for that scale to 0.67.

Of particular interest is the increase in alpha (to 0.87) that occurred when Q35 (tests without pain) was eliminated from the "pain control" composite. This item would be a candidate for deletion for a number of additional reasons. It is not clearly related to a single composite (it is strongly related to the "physical comfort" and "communication with nurses" domains as well) and it does not have a significant relationship to patients' global rating of the hospital once the other 32 items are taken into account (i.e., it does not contain unique information useful to explaining the patient's global impression of the care received in the hospital, see section below for more information on this type of analysis [see Table 5, column 6, row Q35]).

Construct Validity

The last four columns of Table 5 display the relationships of items and composites to both the global rating of the hospital and whether the patient would recommend the hospital to family and friends. Composite scores were calculated as the average of the item scores for that composite. The adjusted R-square (aR2; columns 5 and 7) was the amount of variance in hospital ratings or recommendations accounted for by the corresponding composite items, taking into account the number of items (without adjustment, R2 will automatically increase as the number of predictors increases). The rankings of composites in terms of their relationships to both the global hospital rating (Q52) and the tendency to recommend the hospital (Q53) were (from most to least related): "communication with nurses," "physical comfort," "pain control," "communication with doctors, "communication about medication," and "discharge information." Multivariate analyses were conducted to determine the unique relationship of each composite, net of the other five, and the unique relationship of each item, net of the other 32, to both criteria. T-values for the regression parameters are displayed in columns 6 and 8 of Table 5. Because the power of these analyses is so great owing to the large sample size, we present the t-values so that the reader can observe the magnitude of the effect. We denote those effects that have a probability of chance occurrence greater than 0.01.

The relationship of items to each criterion was consistent. Within "communication with nurses," the most highly related items had to do with nurses listening to patients and treating them with courtesy and respect. Within "physical comfort," the most highly related items had to do with whether the hospital room was kept clean and whether patients' visitors were helped. Within "pain control," the most highly related items had to do with hospital staff doing all they could to help and whether pain was controlled.

Table 6 displays the correlations of composites with the three global ratings and patients' reported likelihood of recommending the hospital. These correlations are ordered from highest to lowest. Not surprisingly, the "communications with nurses" composite had the strongest relationship to the global nurse's rating, while the "communications with doctors" composite had the strongest relationship to the global doctor's rating. The two composites most highly related to the global ratings of the hospital and nursing care as well as the probability of recommending the hospital were the "communications with nurses" and the "physical comfort" composites. The two composites with the weakest relationships to the

global ratings and the hospital recommendation were “communication about medication” and “discharge information.”

The results summarized above focus on internal consistency reliability and correlations with global ratings and willingness to recommend to family and friends. These analyses were conducted to evaluate the items and composites in case composite score algorithms are created at the individual patient level. The main purpose of these analyses was to aid the HCAHPS Analysis Team in their charge to identify items that could be deleted from the pilot study questionnaire for the purpose of shortening the HCAHPS survey before it is implemented nationally. Below are results of a hospital-level factor analysis to identify those composites indicated by hospital-level data. Data accumulated across patients within a hospital provides information about the reliability of the items and composites with regard to measuring care at the hospital level (how well items and composites differentiate between hospitals) and the extent to which items vary by service type.

Despite the fact that the sample was stratified by service type (surgery, childbirth, or other medical service), we were concerned about the accuracy of the discharge record data. There was sometimes a discrepancy between the patient-reported information and that on the hospital’s discharge record. We found that among the 6,562 patients classified as “surgical” by the discharge record, 758 (12%) did not report “surgery” as the reason that best described their hospital stay (Q2). Among the 3,856 categorized as “childbirth patients” by the discharge record, 181 (5%) actually reported another reason for the stay. And, of the 5,881 discharge record medical patients, 743 (13%) reported some other reason for their hospitalization. We decided to base our analyses of service type (surgery, childbirth, or other medical service) on patients responses to the HCAHPS pilot survey (Q2).

Hospital Level Factor Analysis

Much of the variation among respondents’ HCAHPS scores is due to individual variation, reflecting characteristics and particular experiences of individual respondents, rather than systematic differences among hospitals. The way these individual characteristics and experiences are related across items is not necessarily the same as the way that different aspects of hospital quality are related. Because only a fraction of the variation in an individual’s responses is attributable to the hospital, removing individual-level variability can yield a clearer picture of the relationship between different aspects of quality.

However, to model hospital-level correlations among items it is necessary to account for variation in the data due to sampling. This is done by fitting models relating the sample mean to the sample variance or covariance for each pair of items. Independent models were fitted for each service, yielding service specific hospital-level covariance matrices. In addition, we pooled the data across services and then fit the same series of models to obtain a consensus hospital-level covariance matrix. Details of both steps of this modeling process are described in Appendix A.

We investigated the structure underlying the between-hospital covariance matrices and estimated the number and structure of possible factors. The principle factor method with squared multiple correlations as initial estimates of communalities and Promax rotation with Kaiser normalization were used to examine the structure of each covariance matrix.

It appeared that four factors were appropriate for each service. The pattern coefficients and patterns of the highest coefficients for each factor for each service are displayed in Table 7. The factors are not necessarily ordered by the variance explained by each (magnitude of the corresponding eigenvalues) because they were re-arranged to allow for easy comparison across service types.

The hospital-level factor structures for the "surgery" and "childbirth" services are very similar with the highlighted composite items containing almost the same groups of items. However, the structure for "medical service" is clearly very different; there only appears to be one dimension of quality (Factor 2) that is consistent with those for "surgery" and "childbirth." Therefore, one might consider grouping the "surgery" and "childbirth" services together for multivariate analysis, and treating "medical service" separately. This would make sense as "surgery" and "childbirth" both involve treatments with a discrete objective, typically leading to a positive outcome; patient experiences on those services might be very different from those for patients on a medical service—that is, to be related to a chronic or emergent condition.

We compared possible hospital-level composite item groupings to the composites found in the individual-level factor analysis. The names of individual-level composites are enclosed in quotes in the following. Factor 2, common to the three services, is the individual-level composite "communication about medication" factor; Factor 3 of "surgery" and "childbirth" is the "communication with doctors" factor; Factor 4 of "surgery" and "childbirth" is close to the "discharge information" factor; and Factor 3 of "other medical service" partly resembles the "pain control" factor. The "physical comfort" factor is

subsumed in Factor 1 of “surgery” and “childbirth,” and split over Factors 3 and 4 of “other medical service.”

We estimated three solutions with five, six, and seven factors, respectively, as the best candidates for the structure of the hospital-level covariance matrix. These five-, six-, and seven-factor solutions are displayed in Tables 8-10. Additional statistics for the seven-factor solution are presented in Tables 11-13.

The factor analysis with five factors has very high eigenvalues for each of the five factors (after rotation), while the magnitude of the eigenvalues for the 6th and 7th factors in the six and seven factor solutions are much lower (indicating that these additional factors explain less variance). The six-factor solution extracts Q17 (room clean) and Q16 (temperature) items from Factor 1 of the five-factor solution to form, together with Q18 (room quiet), a “physical environment” factor. The seven-factor solution additionally extracts Q32 (pain controlled) and Q33 (MD pain help) to form a shortened version of the “pain control” factor. The hospital-level factor analyses separate Q20 (how often bathing) and Q22 (how often bathroom) from the “physical comfort” factor and combine these with Q9 (call for help), to form a “nursing services” factor. The “housekeeping” and “nursing services” factors are both contained in the individual level “physical comfort” factor.

Referring exclusively to the seven-factor solution, Factor 1 might be thought of as a “concern for patient/communication with nurses” factor, Factor 2 as “communication with doctor,” Factor 3 as “communication about medication,” Factor 4 as “nursing services,” Factor 5 as “discharge information,” Factor 6 as “pain control” and Factor 7 as “physical environment.”

Hospital-Level Reliability Analyses

For each of the items, we estimated the proportion of responses and ratio of between- to within-hospital variation. From these statistics we computed the reliability assuming that 100, 200, or 300 patients are sampled in each hospital. For a sample size of 100, we considered reliability less than 0.2 to indicate poor reliability of an item relative to other items, and reliability in excess of 0.5 as indicative of high reliability relative to other items. Attention was paid to the proportion of respondents to a given item and the variance ratio, as both terms impact reliability. In particular, some items had low reliability because relatively few respondents answered them. The models used to compute reliability are similar to

those for the variance components analysis of the 0-10 criterion variables (specified in Appendix A). A random effect for service within hospital was not included, although we still included a fixed effect for service and service by case-mix interactions as fixed effects. The reliabilities for each item are presented in Table 14.

We compared hospital-level reliabilities of items and the constituent terms to evaluate items for inclusion in the final version of the questionnaire. Recall that comparisons of reliabilities for different items take into account both the ratio of between- to within-hospital variation and the fraction of respondents who answer the item.

Case-Mix Analysis

The purpose of case-mix adjustment is to account for the part of the differences among hospital scores that is due to characteristics of patients treated, rather than the quality of the care provided by the hospitals. Case-mix adjustment is important when the case-mix variables are predictive of the outcomes but differ in their distribution across hospitals. In this section, we describe the methods we used for determining which variables appear to be important to use as case-mix variables; later we report the variables that appear to be the most important to use for case-mix adjustment.

In previous analyses of patient surveys about hospital care, the variables with the strongest and most consistent associations with patient-reported problems were age and self-reported health status. Patient gender and education level also sometimes predicted reports and/or ratings. Models including these variables explained only between 3 percent and 8 percent of the variation in reports and ratings.

The primary objective of this analysis is to determine how case-mix variables impact the "rate nurse" (Q10), "rate doctor" (Q15), and "rate hospital" (Q52) criterion variables. Patient characteristics were evaluated to determine if each covariate: (1) is predictive of the outcome, and (2) varies in distribution across domains of interest, that is, across hospitals. The variables that we evaluated as potential case-mix adjustors include type of condition (medical, surgical, obstetric) as represented by service to which the patient was admitted, general health status, mental health status, age, gender, education, Spanish language, and race. Hospital service type was obtained from the HCAHPS survey (Q2). Potential case-mix adjustors that we have not yet considered include medical diagnosis, admission source, and time since discharge. Additional analyses are being undertaken to determine if

these variables, particularly medical diagnosis, need to be included in case-mix adjustments. In the analyses presented here, cases are omitted if any of the case-mix variables are missing.

Case-Mix Models

We fit separate models for each service (surgery, childbirth, medical service). In all models, we included the hospital indicator variables as fixed effects, thus removing hospital effects when evaluating potential case-mix variables. (See Appendix A).

Variable Selection

The statistical criteria for usefulness of a variable for case-mix adjustment include both its predictive power in the pooled within-hospital regression model and the magnitude of between-hospital variability in the variable relative to its within-hospital variability (heterogeneity). An overall summary of the impact of the variable on adjustment was obtained by combining information about predictive power and between-hospital variability.

For each service, an initial selection of candidate case-mix adjustors was made using stepwise regression. We required variables to be significant at the 0.005 level of significance to remain in the model. (This stringent criterion of significance was used because the sample is very large and variables with only small effects on the outcomes were significant at the usual 0.05 and 0.01 levels.)

For each variable in the model we computed: (1) the predictive power of the variable, and (2) the heterogeneity of the variable across hospitals. Predictive power is defined as the increase in R2 owing to the inclusion of the variable in the model. Heterogeneity across hospitals is measured by the ratio of the between- to within-hospital variance component of the variable. The explanatory power of a variable is defined as the product of the predictive power and the heterogeneity across hospitals of that variable, and is approximately proportional to the variance of the adjustments that would result due to adding that variable to the model.

The explanatory power for categorical variables was computed as the average of the explanatory power scores of their constituent dummy variables. For example, the explanatory power of

race is the average of the explanatory power for Hispanic, nonHispanic black, nonHispanic white, and other race contrasts. The criteria for final inclusion required explanatory power in excess of 0.0001. The process was repeated for the three outcome measures. A variable only had to meet the explanatory power criterion for one outcome to become a member of the set of case-mix variables.

For each of the 0-10 criterion ratings, the predictive power, heterogeneity, and explanatory power of each variable that satisfied the statistical significance criterion in the stepwise regression phase of model building for any of the services are shown in Tables 15, 16, and 17, respectively. The explanatory power values of the variables satisfying the criterion to be case-mix adjustors and the names of variables found to be case-mix adjustors for any of the services are shaded gray (Table 17).

The analyses suggest that general health status, age, education, Spanish language, and race should be considered as case-mix adjustors in analyses that stratify by service type. Mental health status only mattered for childbirth patients, and even then only for the rating of the doctor. For analyses only involving childbirth, age and race may not be needed, while for analyses specific to "other medical service," general (and mental) health status and Spanish language may not be needed. Proxy and gender do not need to be used as case-mix adjustors.

For a model that is common for all services, service type should be included as a case-mix adjustor. The set of potential case-mix adjustors includes service type, general health status, age, education, Spanish language, and race. However, the effects of both language and race may have very different effects in other geographic regions. For example, the relationship between language and reported experiences may vary greatly depending on the predominant ethnic group represented by persons who speak Spanish. Thus, until testing has been conducted in a more diverse and representative set of geographical areas, we recommend that the case mix model not include race or language. The variance components analyses reported in the next section indicate that a service by age interaction may have some impact on the fitted model and thus be considered for use as a case-mix adjustor. This interaction had a significant effect on the "rate nurse" (Q10) and "rate doctor" (Q15) criterion variables (0.01 level), and on the "rate hospital" (Q52) criterion variable (0.05 level). However, compared to the main effects, the impact of the service and age interaction is relatively minor. Overall, the impact of other case-mix by service interactions was negligible.

The interactions of case-mix variables within region (corresponding to the three states that the sample for the pilot study was obtained from) will be evaluated in future work. We do not anticipate

case-mix by state interactions to have a major effect. Based on previous work, interactions between region and a linear effect of age, education, and self-rated health are the most likely variables to further enhance the overall impact of the adjustment for case-mix heterogeneity across hospitals. The form of interaction effects with region should also be investigated. Instead of estimating a regional interaction effect for each category of an ordinal case-mix variable, the regional interaction can be with a linear effect (i.e., the case-mix variable is treated as continuous for the purpose of constructing the interaction).

Variance Components Analysis

The objective of the variance components analysis is to attribute variation to the various levels of units that categorize the data: the regions (corresponding to the states in which the pilot survey was tested), the hospitals within states, the services within hospitals, and the patients that receive treatment at the hospitals. To facilitate this we treat hospital and service within hospital as random effects, in addition to the random error of the observations. The rationale for considering service to be a within-hospital random effect is that each service could potentially have been offered at each hospital, and the relative scores of the services will vary across hospitals.

The case-mix variables derived in the previous analysis are retained for this analysis. Because the influence of the case-mix variables varies by service, we allow different case-mix regression coefficients for each service.

We first focus on the variation in the mean outcomes across the domains defined by service, hospital, and region. The estimates and associated standard errors of the variance components for state, hospitals within state, service within hospitals, and pure error are displayed in Table 18. For all ratings, the variance component of state is very small compared to the other variance components. This suggests that factors specific to the hospital are almost exclusively attributable to the variance between hospitals. The ratio of the variance component for hospital within state to the variance component for service within hospital is about 3 for “rate nurse” (Q10) and “rate hospital” (Q52), but only about 1 for “rate doctor” (Q15). This indicates that differences among hospitals were fairly consistent across the services for the hospital and nursing items, but there was more service-specific variation for reports on doctors, who are more likely than nurses or other staff to form groups with somewhat distinct administrations across services. The largest component of variance is at the patient level, reflecting variation among individual

patients' reports that is attributable to their specific experiences and characteristics rather than to systematic differences among hospitals.

Table 19 presents the results of significance tests for each of the fixed effects. The vast majority of variation explained by the model is due to the main effects, with only a few of the interactions with service being statistically significant at the 0.05 level.

The variance component analysis described above was subsequently performed for all of the items. The results are displayed in Table 20. For brevity, only the variance components are reported in this table (also see Appendix A).

We were also interested in whether the case-mix coefficients vary substantially across services or regions. To examine this, we fit a model that contains interaction effects between the case-mix variables and service and the case-mix variables and regions (data arise from three different states). This model is presented in Appendix A.

Several diagonal elements of the covariance matrices for the variation in the case-mix variables across services had estimates of 0. This implies that the variation in these coefficients across services was less than that predicted by the pooled within-service standard error of these coefficients. This does not imply that the coefficients of the case-mix variables are exactly equal, rather that they do not vary much over services.

The mean response for each service within each hospital varied significantly across hospitals and services, but not so much across region. The lack of variation across regions may be due to the fact that with only three states the sample size is too small for a significant effect to be noticed or that there was not sufficient variability in those states. The conclusion is that there is substantial variation among services within hospitals, as well as among hospitals. Consequently, stratified reporting by service would provide information above and beyond that provided by combined reporting for each hospital, even in the presence of case-mix adjustment for service. The value of such stratified reporting must be considered in light of the substantially more complex reports that would be entailed and the larger sample sizes that would be required to produce sufficiently precise stratified reports.

Response Rate Analysis

As noted previously, a mixed mode of survey administration was used for core hospitals whereas only mail mode was used for noncore hospitals. Because the field period for the noncore hospitals lagged the core hospitals, all followups had not been completed when the majority of analyses were conducted.

At the time of the majority of these analyses, a total of 12,929 mail completes and 3,690 phone completes were obtained. Of these, a total of 233 mail completes and 338 phone completes were collected in Spanish. The response rate was 45 percent (n = 9,383 completes) and 25 percent (n = 7,236) for the core and noncore hospitals, respectively (n = 16,619 overall). Final response rates are presented in Table 22 and discussed below.

Among the respondents, 76 percent were white, 9 percent were black, 10 percent were Hispanic, and 4 percent were Other (Asian, Native American, Hawaiian, and Pacific Islander were recoded into "Other" since respondents in these race categories comprised a very small proportion of the overall sample). The education breakdown of the sample was as follows: 6 percent had an 8th grade education or less; 10 percent had some high school education; 28 percent obtained a high school diploma or GED equivalent; 29 percent attended some college or possessed a two-year degree; 12 percent completed four years of college; and 15 percent completed more than four years of college.

Response Rates by Hospital and Service Line

Further analyses of survey response rates were conducted to determine the acceptability of the survey and data collection strategy used in the pilot test. Response rates for core hospitals ranged from 39 percent to 50 percent in Arizona, 30 percent to 51 percent in Maryland, and 34 percent to 56 percent in New York.

Looking at all 132 hospitals (including the 33 noncore hospitals that were not included in the initial pilot analyses), Table 21 shows that more than half of the core hospitals had response rates that exceeded 40 percent, while most of the noncore hospitals (94%) achieved a response rate of less than 40 percent.

According to the discharge data, 19,706 patients were sampled from the medical service, 17,022 from surgical, and 13,084 from childbirth. Discharge data also indicate that, among the 16,619 survey respondents, 6,059 were medical service, 6,677 surgical, and 3,883 childbirth.

Analyses indicated that 23 percent of the respondents were admitted through the "childbirth" service line, while 40 and 37 percent belonged in the "surgical" and "other medical service" lines, respectively. This distribution held true even in separate analyses of core and noncore hospital data (see Figure 3). Thus, the three-state pilot fell short of its goal to obtain an equal proportion of respondents from each service line.

Response Rate Analysis: Final Data

The majority of analyses in this document are based on available data as of September 2, 2003 (including the response rate analyses above). This section, however, provides updated response rate analyses for the complete data. Table 22 provides information on response rates, response mode, and response language. While previous sections provided unadjusted response rates, this section adjusts the denominator to remove patients who were deceased (n = 750), incapacitated (n = 221), or incarcerated (n = 18). The response rate was 47 percent (n = 9,504) and 36 percent (n = 10,216) for the core and noncore, respectively (n = 19,720 overall). Response rates for core hospitals ranged from 40 percent to 54 percent in Arizona, 31 percent to 53 percent in Maryland, and 36 percent to 59 percent in New York. Core hospitals provided an average of 396 responses per hospital, while noncore hospitals provided an average of 95 responses per hospital.

A total of 16,045 mail completes and 3,675 phone completes were obtained. A mixed mode approach (mail with phone followup) was used by the core hospitals. For the core hospitals, the response rate for mail only was 29 percent. The addition of the phone followup for the core hospitals increased the response rate to 47 percent. The noncore hospitals used mail only and achieved a response rate of 36 percent. Approximately 3 percent (n = 586) of the respondents completed the survey in Spanish. Distribution of respondents admitted through each service line did not change in the final data. Twenty-three percent of respondents were admitted through the "childbirth" service line, while 40 and 37 percent were admitted through the "surgical" and "other medical service" lines, respectively (based on patient report).

Characteristics of Mail Versus Phone Responders

Differences between mail and phone responders were based on data from only the core hospitals. It is important to caution that these data are sub-optimal for a mode comparison and a randomized mode experiment is to be conducted separately with funding by CMS. Analyses of the characteristics of mail versus phone respondents indicated that socio-demographic differences influenced the manner in which data were collected for the individual. Figure 4 shows that individuals with a high school degree or less education were more likely to have completed a phone survey, whereas those with at least some college education or a 2-year degree were more likely to have completed a mail survey. Whites were also more likely to complete a mail survey compared to individuals belonging to other race categories (see Figure 5).

Differences also existed in the distribution of mail and phone respondents across the three service lines (see Figure 6). The percentage of mail and phone respondents that fell into the "other medical service" line category mirrored each other closely. However, the mail survey captured a greater proportion of respondents in the "surgical" service line category than did the phone survey, while the phone survey captured a greater proportion of respondents in the "childbirth" service line than did the mail survey.

Furthermore, survey mode differences in the ratings of the various HCAHPS dimensions also existed. Analyses were conducted using both the individual-level and the hospital-level structures identified by the analysis team. (Note that though the same labels may be used for individual-level and hospital-level composites—for example, "doctor communication"—different items may constitute the composites from the two levels.) Mail and phone respondents differed in their ratings of four out of the six original HCAHPS dimensions. Table 23 shows differences between the mean ratings given by mail and phone responders on the three global ratings, the patient's reported likelihood of recommending the hospital, the six individual-level HCAHPS domains, and the seven hospital-level domains. The mean ratings are adjusted to control for education, race, gender, language, and service line. Due to large sample sizes, these tests were sensitive to small differences. Thus, we note only those effects with $p < 0.005$. (Previous studies suggest that early respondents tend to be more positive in their evaluations of care than late respondents. However, delay in response was confounded with mode in this study because telephone was only used to follow up core hospital participants who failed to return the mail survey.)

The results of the analysis of the individual-level structure indicate that those who completed a phone survey were significantly more likely to give positive ratings on "physical comfort" and "communication with nurses" than respondents who completed a mail survey. On the other hand, mail respondents were significantly more likely to give positive "pain control" reports. With the alternative structure, analyses revealed differences between mail and phone respondents in three HCAHPS domains: "doctor communication," "nursing services," and "physical environment." Mail respondents had more favorable perceptions of "doctor communication" whereas telephone respondents tended to have more positive perceptions of "nursing services" and "physical environment" than mail respondents.

Separate item response theory (IRT) analyses were also conducted on the original and alternative structures. While the IRT analyses showed no survey mode differences, these results do not necessarily conflict with the findings described above. The IRT analyses were conducted at the item level, while the above comparisons were analyzed at the composite level. Furthermore, the IRT analyses did not control for other factors, such as race, education, gender, language, and service line, which were all accounted for here using analysis of covariance procedures.

Characteristics of Early Versus Late Responders

The minimum and maximum response times for the survey were 7 and 82 days, respectively, with a mean of 32 days. Analyses of response times indicated that whites were more likely to respond early to the survey than were respondents in the black, Hispanic, and other race categories. Furthermore, higher levels of education tended to correspond with shorter survey response times (see Table 24).

Further analyses were conducted on the data from mail respondents to determine the independent effects of the survey response time on the global ratings, likelihood of recommending the hospital, and composite scores. However, since phone respondents were called, it is difficult to determine whether these individuals would have responded to a mail survey at all. Thus, phone respondents were excluded from this analysis.

On the whole, the length of time elapsed between the initial mailing and the receipt of the survey accounted for about 1 to 3 percent of the variation in the various HCAHPS ratings. Using the original structure, the results indicate that early mail responders were more likely to provide positive ratings on all of the HCAHPS dimensions, with the exception of "discharge information" (see Table 25).

In analyses of the alternative structure, early responders were still more likely to provide positive ratings on most of the HCAHPS dimensions. The dimensions that were not affected by the length of time it took to mail back the survey were "communication about medication," "discharge information," and "physical environment."

Predictors of Unit Nonresponse

Response rates were 40 percent overall at the end of data collection. We have an acceptable nonresponse model, a multiple logistic regression with 65 percent concordance, which would produce a small design effect of 1.15 if weights were used. This model, as well as the model of delays in response and the two models of rates of item nonresponse used a set of predictors that included patients' characteristics (age, gender, race/ethnicity, language, length of stay, DRG, admit source, and response to previous surveys) and institutional characteristics (state, service line, and core versus noncore hospitals). The variables used in this analysis were obtained from hospital administration data because survey data are only available from respondents. The variables associated with nonresponse are summarized below.

Patient Characteristics

- Whites were most likely to respond (all other groups OR = 0.48 to 0.81 relative to whites).
- Females were more likely to respond than males (OR = 1.23).
- Response rates increased with age through 65-74 (age 18-24 OR = 0.65; age 25-34 OR = 1.00; age 35-44 OR = 1.14; age 45-54 OR = 1.65; age 55-64 OR = 2.15; age 65-74 OR = 2.44) then declined, reaching the 45-54 level for those 80+ (age 75-79 OR = 2.29; age 80+ OR = 1.66).
- Response rates were highest among Spanish speakers (OR = 1.43 relative to English) and slightly lower than English speakers for speakers of other languages (OR = 0.95), controlling for race/ethnicity.
- Having responded to a previous survey was associated with higher response probabilities (OR = 1.12).

- Those discharged sick were a little less likely to respond (OR = 0.88 relative to standard discharge); those who walked out against medical advice were much less likely to respond (OR = 0.43).

- Those in the hospital 2 to 7 nights were most likely to respond (2-3 nights OR = 1.15; 4-7 nights OR = 1.1), more so than those with 1 night (OR = 1.00) , 8-14 nights(OR = 0.92), or 15+ nights (OR = 0.82).

- Response rates varied significantly by DRG (OR = 0.77-1.00).

Other Variables

- Response rates were highest in Maryland (OR = 1.13, relative to New York).

- Response rates were much higher in core hospitals (OR = 1.48).

- Those admitted through the Emergency Room (OR = 0.81) were less likely to respond.

Impact of Weights

There were 23 outcomes in which weights were significantly correlated ($p < 0.05$); of these 23 correlations, 19 were negative. Three of the 23 correlations had absolute magnitudes greater than 0.10: Q44 (living will, r = 0.20), Q14 (MD enough time, r = -0.11), and Q35 (tests without pain, r = -0.11). All three of these items were slated for elimination. These results suggest that nonresponse weights would correct for the small bias that result from under-representation of patients whose experiences are generally less positive than average. High variability in response rate by hospital (see Table 21) suggests the potential for nontrivial adjustments to hospital-level estimates from nonresponse weighting.

Delays in Response

We had an overall R-squared of 7 percent in predicting response time (OLS linear regression). This model was not very similar to the nonresponse model. Ideally, the same factors associated with higher probabilities of response would be also associated with quicker responses, so that late responders could be up weighted to represent nonresponders. These models do not support such an approach, but rather a standard inverse-probability nonresponse weighting.

Of the 11 sets of independent variables, three functioned as described above, three were a mixture (some parts like the above, others not), and five functioned quite differently from the above. Twelve of 20 items correlated with lag time (11 positively), but all but one had absolute magnitudes less than 0.05 (and that one was 0.07). This suggests a very small, unimportant tendency for late responders to be more positive in ratings/reports. (The effect of delay in response differs from that reported in the prior section because the present analyses were conducted on the total sample, including telephone respondents.) These analyses may have been particularly affected by a restriction of range in the outcome, namely, the true late responders (about 25% of all responders) who are not yet included in the analysis.

Note that there is an inherent confound in these data between delays in response (often associated with patients with less positive experiences) and positive causal effects of phone mode on response (usually obtained under randomization to mode) that probably result in an underestimate of both effects.

Item Nonresponse

The proportion of inappropriate missing for the 30 report items (Q4-Q7, Q9, Q11-Q14, Q16-Q18, Q20, Q22, Q24-Q25, Q27-Q28, Q35, Q37-Q41, Q43-Q44, Q47-Q49, Q51) was 2 percent. The proportion of missing for the 42 items asked of everyone (Q1-Q4, Q8, Q10, Q11-Q19, Q21, Q23, Q25-Q26, Q28-Q29, Q34, Q36, Q42-Q45, Q52, Q53, Q56-Q65) was about 4 percent. (We excluded the pain items because phone participants had a skip while mail respondents did not.)

Table 26 summarizes the individual-level rates of item nonresponse. Because the rate of item nonresponse (measured in the two ways described above) was skewed, we used ordered logistic regression to model these outcomes. The rates of item missingness for the two types of items were correlated at r = 0.56.

Odds ratios for predicting missing on the 42 items asked of everyone are given in parentheses below. The most important predictor of item response was respondent age. For both types of items, rates of item missingness increased steadily after age 55 (55-64 OR = 1.25; 65-74 OR = 1.47; 75-79 OR = 1.91; 80+ OR = 2.50, all relative to 25-34 for general items). For report items, the odds rations

were similar and there was also some evidence of a small increase in missingness with age at ages less than 55. Other statistically significant effects are summarized below:

Patient Characteristics

- Whites had the lowest rates of item missingness by far for general items (OR = 1.15 for unknown ethnicity; OR = 1.59 to 1.96 for all other groups relative to whites); race/ethnic effects were smaller for report items, with missingness highest for Asians and blacks (OR = 1.31 and 1.22 relative to whites).
- Females had higher rates of item missingness than males (OR = 1.14 for general items, 1.27 for report items).
- Missingness rates for general items varied somewhat by DRG.
- Those in the hospital one night (reference category) or 15 or more nights (OR = 0.99 for general items) had higher rates of missingness than those in the hospital 2 to 14 nights (2-3 nights OR = 0.86; 4-7 nights OR = 0.82; 8-14 OR = 0.83 for general items); for report items, missingness was highest with stays of 4 to 14 days (OR = 0.69 for 4-7 days; OR = 0.65 for 8-14 days).

Other Variables

- General item missingness rates were somewhat higher in New York than in the other two states (AZ OR = 0.88; MD OR = 0.90).
- Item missingness was higher in core hospitals, especially for general items (OR = 1.92 for general items, 1.30 for report items).
- Those admitted through the Emergency Room (OR = 1.12 for general items, 1.22 for report items) had somewhat higher rates of item missingness.

Analyses of Open-Ended Responses

The HCAHPS pilot survey contained two open-ended questions designed to elicit content regarding a patient's experience that was not covered by the close-ended questionnaire items. Namely, Q54 and Q55 asked, "What did you like most about the care you received during this hospital stay?" (Like Most) and "If you could change one thing about the care you received during this hospital stay, what would it be?" (Would Change), respectively. We sought to evaluate whether these open-ended responses would suggest changes to the survey, including content that should be deleted or added.

A sample of responses to these two questions was coded and analyzed to identify patterns in the responses, as well as emerging themes that did not fit in the established HCAHPS domains. Two hundred cases were randomly sampled and coded from the 16,048 surveys that were conducted in English. One hundred of the 571 Spanish surveys were also randomly sampled, translated, and then coded. Thus, Spanish-speaking respondents' comments were over-sampled (17.5% of total) relative to English-speaking respondents' comments (1.3% of total).

To the extent possible, responses to both open-ended questions were coded to specific HCAHPS questionnaire items. In many cases, more than one code was applied to the individual response. The largest number of codes applied to any one response was five. Table 27 summarizes the results of these analyses.

In general, we found very little information in the open-ended responses. A large percentage of respondents either did not answer the open-ended questions, gave answers that were redundant with the questionnaire content, or indicated that there was nothing they would change about their care. Aspects of care that were mentioned by sampled patients but were not covered by the HCAHPS items fell into the following categories:

- Staff—general comments about staff friendliness, helpfulness, or treatment that could not be attributed specifically to nursing or physician staff.
- Care coordination—comments regarding coordinating care with doctors, nurses, and other staff within the hospital, or with the patient's primary care physician or other providers outside the hospital.
- Food—comments regarding the taste and quality of the food served in the hospital.
- Timeliness—comments regarding delays in care outside of the admissions process and delays in discharge.
- Language—comments made regarding the ability of hospital staff to speak the patient's language.

It should be noted that content **not** included in the questionnaire was mentioned fairly infrequently. Moreover, it is not entirely accurate to say that questions referring to care delivered by hospital staff, other than nurses or doctors, were absent from the questionnaire. While hospital staff do not form a separate composite measure, items that mention hospital staff are part of several other composites including "nursing services," "pain control," "communication about medicine," and "discharge information."

In summary, the results of the analyses indicated that the current HCAHPS questionnaire seems to tap into most aspects of care that patients care about. Most responses to the open-ended questions mapped to existing questionnaire items or were missing. Missing responses are perhaps an indicator that respondents felt it was unnecessary to add anything more.

5. RECOMMENDATIONS

The analysis team looked for convergence among results from a variety of analyses, including the assessment of English and Spanish open-ended responses discussed earlier, before making recommendations about deleting items from the HCAHPS survey. Recommendations were not entirely data driven because team members also drew on their substantive understanding of health care and on their understanding of CAHPS survey principles in interpreting the findings of the analyses. In addition, decisions regarding the inclusion, deletion, or re-wording of particular items were influenced by responses to the February 5 and June 27, 2003, notices published in the Federal Register that requested comment on the draft HCAHPS instrument and its implementation.

Several "composite-level" analyses were conducted in order to evaluate whether there was a data argument for deleting an entire composite. While some evidence suggested that the "communication about medication" and "discharge information" composites might be weaker than the others, the analysis team recommended keeping these composites on theoretical grounds—they were deemed to be important aspects of hospital health care. Another example concerns the choice between the six-factor (Table 9) and seven-factor (Table 10) hospital-level factor structure. As indicated earlier, the six-factor structure was superior to a lesser number of factors for a variety of reasons; however, the seven-factor structure did not represent a statistical improvement over the six-factor structure and, on the basis of parsimony, one would normally recommend the six-factor structure. However, the advantage of the seven-factor structure over the six-factor was that it enabled the scoring of a distinct "pain control" composite, which was deemed to be an important domain in hospital care. Thus, the analysis team recommended the seven-factor structure. Recommendations were also heavily influenced by the needs of CAHPS stakeholders obtained through responses to the Federal Register notices regarding HCAHPS or solicited through interviews with sample respondents. For example, there was a consensus among users and stakeholders that the Hospital CAHPS survey should be much shorter, perhaps half the size of the pilot test survey. Therefore, although analyses of the open-ended responses suggested that items regarding language and staff behavior might be added to the survey, we did not do so in order to decrease the survey length. Yet, we will continue to investigate the value of such items in additional tests that will be conducted during this coming year.

Tables 28 and 29 summarize the results of a variety of statistical analyses that we took into account in coming up with final recommendations for shortening the HCAHPS questionnaire. The analyses presented in these tables were conducted on the seven-factor hospital-level structure (see Table

10), minus ten items. The seven-factor, hospital-level solution did not support the inclusion of five items (Q25, Q31, Q24, Q35, Q43) in composites (see Table 10, last five rows). These were not included in the analyses. Also not included were items that had lower hospital-level reliability within those composites that were less related to patients' overall experience of care (i.e., "communication about medication" and "discharge information;" see Table 5, column five). Thus, Q37-Q39, Q47 and Q51 (see Table 14, column 9) were not included.

Internal consistency reliability coefficients (Cronbach's alpha) are displayed for each of the seven revised composites in the cell adjacent to that composite in the fourth column of Table 28. Five of seven composites had internal consistency reliability estimates of 0.80 or higher. Columns five through eight of Table 28 display the relationship of items and composites to both the global rating of the hospital and whether the patient would recommend the hospital to family and friends. Column nine repeats the z-values for the item hospital-level reliability (these are repeated from Table 14). Composite scores were calculated as the average of the item scores for that composite. The adjusted R-square (a$\mathbf{R}^2$) (columns five and seven) was the amount of variance in hospital ratings or recommendations accounted for by the corresponding composite content, taking into account the number of items. The rankings of composites in terms of their relationships to both the overall hospital rating and the tendency to recommend the hospital were (from most to least related): "concern for patient/communication with nurses," "nursing services," "pain control," "physical environment," "communication with doctors," "communication about medication," and "discharge information."

Multivariate analyses were conducted to determine the unique relationship of each composite and each item to two criteria: patients' overall ratings of their care and patients' stated probability of recommending the hospital to family or friends." T-values for the regression parameters are displayed in columns six and eight of Table 28. For the most part, the relationship of items to each criterion was consistent. Within the "concern for patient" composite, the most highly related items had to do with nurses listening to patients, treating them with courtesy and respect, and helping their visitors. "Listening" and "respect" were also the most highly related items within the "communication with doctors" composite. Results for the "communication about medication" composite were inconsistent. Whether or not patients received help as soon as they wanted was the most highly related item in the "nursing services" composite. Results were inconsistent for the "discharge information" composite. Whether staff did everything they could to help with pain and whether the hospital room was clean were the items most related to the criteria for the "pain control" and "physical environment" composites, respectively.

Table 29 displays the correlations of composites with the three global ratings and patients' reported likelihood of recommending the hospital. These correlations are ordered from highest to lowest. "Concern for Patient" and "Pain Control" composites were among the top three in terms of the strength of their relationship to all four criteria while "discharge information" and "communication about medication" were among the bottom three across all four criteria. In addition, "nursing services" was the second most important scale for three of four criteria.

A number of considerations were relevant to the decision whether to retain an item in the survey instrument. Among these were whether the item: discriminated among hospitals; was judged to be relevant to quality of care; was important to patients; was not redundant with other content in the survey; fit conceptually with existing composites; demonstrated variability in response; was not available from administrative records; was easy to understand and answer; and was associated with critical indicators such as global rating of the hospital and willingness to recommend the hospital to family and friends. Items were also deleted when they were necessarily paired with (were filter questions for) items that were deleted, or when deletion was necessary to maintain parallel content in the survey (for example, when the "enough time" item in the "doctor communication" composite was deleted, the parallel item in the "nurse communication" composite was also deleted).

Table 30 summarizes the results of our analysis of the questionnaire items for the purpose of shortening the form. The rows of Table 30 are denoted by questions from the three-state pilot questionnaire in the order that they appear on that questionnaire. Columns 3 through 12 of the table list the factors that were considered in rendering a judgment to delete or retain an item. To the greatest degree possible, we sought to be responsive to stakeholder input and responses to the Federal Register announcements that called for a much shorter questionnaire with far fewer filter questions.

Below is a detailed explanation of why items were deleted or retained from the three-state pilot questionnaire. When items were retained, the item number on the revised questionnaire is provided in brackets. The three-state pilot and revised questionnaires are presented in the Appendixes B and C.

Questions 1 through 3, which asked for **sample verification information**, were deleted because this information is available from administrative records. In addition, we received feedback from those who administered the survey to suggest that these data may not be reliably reported by patients. For example, patients sometimes knew the hospital by a different name than that which appeared on the front

of the survey. There was confusion about Question 2, which asked patients to indicate whether they were in the hospital for "surgery," "childbirth," or "other medical reason:" patients didn't know how to answer this when more than one category applied. Finally, Question 3 asked patients to recall the exact number of nights that they were in the hospital and this was difficult for some patients; especially those with long hospital stays who were transferred between units and who had entered through the emergency or trauma units.

Questions 4 through 6, which asked about **communication with nurses**, were retained because covariance statistics supported their use as a composite, they discriminated among hospitals and they were highly related to patients' ratings of overall care in the hospital. [Revised Questions 1 through 3]

Question 7, which asked whether the **nurse spent enough time** with the patient, was deleted because the version of this question that was used in the "doctor communication" composite (Question 14) was deleted (see reasons below) and we sought to maintain parallel content between the "nurse communication" and the "doctor communication" composites.

Question 8, which asked patients whether they **pressed the call button** while in the hospital, was a filter question for Question 9, which asked patients to indicate whether they were helped quickly when they pressed the call button. *Question 8* was deleted due to lack of variability. The vast majority of patients indicated that they had in fact pressed a call button.

Question 9: For the small number who might not have **pressed a call button**, this question was modified to include the tailored inapplicable response: "I never pressed the call button." [Revised Question 4]

Question 10, which asked patients to give a **rating of the overall nursing care** they received while in the hospital, was retained because it discriminated among hospitals and was highly related to patients' ratings of overall care in the hospital. [Revised Question 5]

Questions 11 through 13, which asked about **communication with doctors**, were retained because covariation statistics supported their use as a composite and they were related to patients' ratings of overall care in the hospital. However, they did not discriminate among hospitals as much as some of the other content on the questionnaire. [Revised Questions 6 through 8]

Question 14, which asked whether the **doctor spent enough time** with the patient, was deleted because, in addition to only weakly discriminating among hospitals, this item was not related to patients' ratings of overall care in the hospital.

Question 15, which asked patients to give a **rating of the overall care from doctors** that they received while in the hospital, was retained because while it did not discriminate highly among hospitals, it was related to patients' ratings of overall care in the hospital and it is parallel to the rating of overall care from nurses. [Revised Question 9]

Question 16, which asked about **room temperature**, was deleted because we sought to create a much shorter version of the questionnaire and this item, unlike those of the other items in the "hospital environment" composite, was only weakly discriminating among hospitals.

Questions 17 and 18, which asked patients about the **comfort of the hospital environment**, were retained because they discriminated among hospitals and they were highly related to patients' ratings of overall care in the hospital. In addition, covariation statistics indicated further study regarding the possibility that they might be scored as a composite measure of hospital environment. [Revised Questions 10 and 11]

Questions 19 and 20, which asked patients whether they **needed help bathing** while in the hospital and, if so, whether they **got the help they needed** when they wanted it, were deleted. We sought to create a much shorter version of the questionnaire and Item 20 (the substantive item of the pair) was somewhat weakly discriminating among hospitals and less discriminating than other items (referring to obtaining help when toileting and after pressing the call button) in the "nursing service" composite. In addition, focus groups we conducted with patients indicated that obtaining help with bathing was less of a concern for patients than obtaining help with toileting. Question 19 was the filter question for Question 20 and so it was deleted as well.

Questions 21 and 22, which asked patients whether they **needed help toileting** while in the hospital and, if so, whether they **got the help they needed**, were retained. Question 22, which was the substantive item, was found to reliably discriminate among hospitals and was judged by patients to be one of the more important items in the "Nursing Services" composite. Question 21 is the screener for Question 22 and was retained because there was some variability in response; we decided that a filter

question would be preferable to adding a "tailored inapplicable" response choice to Question 22. [Revised Questions 12 and 13, respectively]

Questions 23 and 24, which asked patients about whether hospital staff **protected their privacy**, were deleted. Question 23 was the screener for Question 24, which was deleted because covariance statistics did not support its use in a composite and it did not discriminate among hospitals. In addition, our focus group results showed that patients interpreted the meaning of this item as having to do with whether or not the patient had a private room and this was not the intention of the item.

Question 25, which asked patients to indicate how often they were **involved in decisions** about which treatment they wanted, was deleted. Covariance statistics did not support the scoring of this item as part of a composite. Moreover, cognitive interviews we conducted indicated that respondents had a difficult time determining what was meant by this item.

Questions 26 and 27, which asked respondents whether they **had visitors** while in the hospital and whether the **visitors received help** from staff when calling or visiting, were deleted. Question 26 was the screener for Question 27, which was deleted because covariance statistics provided only weak support for its use in a composite and further consideration of the item revealed conceptual problems. In Question 27, patients were being asked to report on the experience of others in contradiction to the CAHPS design principle that respondents should be asked to restrict reporting to their *own personal experience*. Second, in an era of acute concern for patients' privacy including regulation of such, it is difficult to know how to interpret responses to this question. A good hospital might well refuse to provide visitors with information in order to protect the privacy of patients and in this sense, assisting family might be interpreted as an example of poor patient care.

Question 28, which asked patients whether **staff introduced themselves**, was deleted. We sought to shorten the questionnaire and this item had a weaker relationship to its composite than other items in the composite and did not discriminate among hospitals as well as the other items in the composite.

Question 29, which asked patients whether they **had pain** while in the hospital, was deleted because we sought to shorten the questionnaire and the purpose of this item was redundant with the item that followed it.

Question 30 was retained but reworded. The original text said, "…did you have to **ask for pain medicine**?" In recognition of the fact that patients often receive such medication without asking for it, the text was changed to "…did you need medicine for pain?" [Revised Question 14]

Question 31, which asked patients how often **staff responded quickly** to their request for pain medication, was deleted because we sought to shorten the questionnaire and there were three other items in the "pain control" composite which could be used to measure that concept. Moreover, this item was not significantly related to patients' willingness to recommend the hospital to family and friends.

Questions 32 and 33 were two other items from the "**pain control**" composite that were retained because covariance statistics supported scoring them as a composite measure and they were significantly related to patients' ratings of their overall care. It should be noted that the pain items were not highly discriminating among hospitals; however, the concept of pain control was retained because of its importance to patients. [Revised Questions 15 and 16]

Questions 34 and 35, which asked patients about **unnecessary pain** during procedures and tests, were deleted. Question 34 was a filter for Question 35, which asked, "How often were these tests and procedures done without causing you too much pain?" This item was problematic for several reasons: covariance statistics did not support its scoring into a composite measure; it was not significantly related to patients' ratings of their overall care; and it did not discriminate among hospitals. Moreover, cognitive testing had revealed that the item was difficult to understand.

Question 36, which asked patients about whether they were given any **new medicine** that they had not taken before, was retained because it was a screener for some subsequent items that were also retained. [Revised Question 18]

Questions 37 through 39, which asked patients whether hospital staff told them the **name and purpose of the medications** they were given and whether they were asked about other medicines or supplements they might be taking, were deleted. We sought to shorten the questionnaire and these three items were not strongly related to patients' overall experience of their care.

Questions 40 and 41 asked patients whether hospital staff found out whether they were **allergic to any medicines** or whether they described possible **side effects** before giving them new medicines. While none of the four original items in the "communication about medicine" composite

discriminated among hospitals, this composite was deemed to be theoretically important to patient care, especially patient safety, and so the HCAHPS instrument team decided to retain it for further study. Questions 40 and 41 were those most highly related to patients' overall evaluations of hospital care and so they were retained as measures of this composite. [Revised Questions 17 and 19, respectively]

Questions 42 through 44 asked patients to report on experiences related to their **admission** to the hospital, whether it was **delayed** (Question 43), and whether they were asked about a **living will** (Question 44). We considered Question 43 for deletion because few patients (approximately 15%) reported delays in admission, this item did not discriminate well among hospitals, and covariance statistics did not support its scoring into a composite. Further, cross-tabulations calculated between this item and whether the patient was admitted through the emergency room (ER) indicated that delays in admission primarily occurred for those patients entering through the ER. Therefore, it was decided to remove this item (as well as the item asking whether the patient entered through the ER—Question 42) from the HCAHPS core. Question 44 was deleted because it was not related to patients' overall ratings of hospital care and covariance statistics did not support its use in a composite. Moreover, cognitive testing showed that many patients did not understand the concept of a living will and information about this topic should be available from administrative records.

Question 45, which asked patients for their **discharge destination**, was retained for analytic purposes. The protocol for the three-state pilot test data collection called for eliminating from the sample, those patients who might have had an intervening stay in another facility. Thus, for the pilot study, this question was a check on the effectiveness of the sample definition procedures. However, in subsequent data collections, this question will allow us to study the effect of intervening stays on CAHPS scores. Current procedures for gathering reports of patient's hospital experience often restrict the sample to those who have *not* had an intervening stay. This may bias the sample by excluding those patients who were impaired enough to require post-acute care (e.g., those who required rehabilitation therapy or additional time to stabilize in a skilled nursing facility). [Revised Question 20]

Question 46, which asked patients whether their **health condition limited** what they were able to do in *any* way after they left the hospital, was designed as a screener for subsequent questions which asked patients whether or not they received discharge instructions. However, further consideration of this question, led the instrument team to delete it as unnecessary.

Questions 47 through 51 asked patients about the **discharge process**, specifically whether they had received particular instructions regarding how to care for themselves at home. In an effort to reduce the size of the questionnaire, we sought to identify items from this composite that could be deleted. Questions 47 (did you receive instructions about what you could and could not do?) and 51 (did you receive instructions about how to take your medicines?) were the weakest in the composite and were eliminated. Neither of these items was related to patients' overall evaluations of their hospital care and neither discriminated very well among hospitals. Question 50 was the screener for Question 51 and so was also eliminated. On the other hand, Questions 48 (which asked patients about getting the assistance they needed at home) and 49 (symptoms of trouble to look for) were retained because both were related to overall evaluations of care and both discriminated among hospitals. [Revised Questions 21 and 22, respectively]

Questions 52 and 53, which asked patients for their **overall evaluations of their care** and whether they would **recommend this hospital**, were retained because they discriminated among hospitals and were considered summary measures of overall care. [Revised Questions 23 and 24, respectively]

Questions 54 and 55 were "**open-ended**" invitations to the patient to list what they "**liked most**" during their hospital stay and what they "**would change**," respectively. These questions were deleted from the revised questionnaire because few patients responded to them and a content analysis of a random sample of these questions revealed little additional information (most responses were redundant with previous items).

Questions 56 through 64 assess **patient characteristics**. These variables have two potential uses. One is to characterize the care of particular subsets of patients. For example, one might want to compare the experiences of men and women. In addition, some of these variables are needed for case mix adjustment of scores for inter-hospital comparisons. Of these, only age and gender could be reliably obtained from administrative records; the rest had to be obtained from patient reports and so those items had to be retained in the revised questionnaire. Question 64, which asked about the number of hospital stays in the past year did not contribute information over and above that contributed by self reports of health and so this item was deleted. [The items retained are revised Items 25 through 30, respectively]

Questions 65 and 66, which asked patients whether someone **helped them complete the survey** and, if so, how? are standard in all CAHPS questionnaires and check that the CAHPS design

principle stating that responses should be ***self*** reports has been accomplished. These were retained in the revised questionnaire. [Revised Questions 31 and 32]

Tables 31 and 32 provide a summary of the properties of the final seven composite structure with the items recommended for deletion removed. The seven composites had median reliability estimates of 0.69 (internal consistency) and 0.74 (hospital-level reliability).

In summary, the revised HCAHPS survey consists of 32 questions: 24 questions about patients' experiences in the hospital, and eight about their personal characteristics. The first category consists of seven composites: (1) nurse communication (Questions 1 through 3); (2) nursing services (Questions 4 and 13); (3) doctor communication (Questions 6 through 8); (4) physical environment (Questions 10 through 11); (5) pain control (Questions 15 and 16); (6) communication about medicines (Questions 17 and 19); and (7) discharge information (Questions 21 through 22). There are also single global rating items for nursing care (Question 5), doctor care (Question 9), and hospital (Question 23). Finally, there is a single item for assessing whether or not the patient would recommend the hospital to friends and family (Question 24).

In the second category, for descriptive and case-mix adjustment purposes, the survey includes eight items which assess the respondent's general health, mental health, education, race/ethnicity, language spoken at home, and whether anyone helped the respondent complete this survey. Age and gender will be obtained using administrative data.

6. CONCLUSIONS

Analyses of the three-state pilot study made it possible to reduce the size of the 66-item pilot survey by more than 50 percent to a revised 32-item survey. The pilot study analyses provides initial support for the reliability and construct validity of the HCAHPS survey and provided important information about potential case-mix variables, variables associated with unit and item nonresponse, and logistic information for evaluating patient perceptions of hospital care. The revised survey will be used in a series of pilot studies to be conducted early in 2004 that will provide the basis of finalizing the HCAHPS survey instrument for future applications.

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8. TABLES

Table 1: Item Responses for Respondents with Corresponding Missing Screening Items

Item Pair	Never	Sometimes	Usually	Always
Q8/Q9	7	18	37	41
Q19/Q20	37	26	42	60
Q21/Q22	26	25	31	56
Q23/Q24	6	11	29	75
Q26/Q27	3	5	10	26
Q30/Q31	4	3	28	42
Q34/Q35	5	8	17	25
Q36/Q37	17	10	23	55
Q36/Q38	11	15	24	69
Q36/Q39	13	11	27	77
Q36/Q40	8	8	18	108
Q36/Q41	27	19	31	58
Q50/Q51	66 responded “Yes”	15 responded “No”		

Table 2: Hypothesized Composites for HCAHPS Items

Item	IOM Dimensions								
	Respect	Prefs Needs	Coord	Info	Phys Comfort	Emotional Support	Family Friends	Trans	Access
Q1. Hospital name, discharge date									
Q2. Reason in Hosp.									
Q3. Number of nights									
NURSES									
Q4. Courtesy-nurses	$								
Q5. Listen-nurses				$					
Q6. Explain-nurses				$					
Q7. Enough time-nurses						$			
Q8. Call button									
Q9. Help soon as wanted									$
Q10.Global Nurses									
DOCTORS									
Q11.Courtesy-docs	$								
Q12.Listen-docs				$					
Q13.Explain-docs				$					
Q14.Enough time-docs						$			
Q15.Global Docs									
HOSPITAL ENVIRN									
Q16.Temperature					$				
Q17.Clean					$				
Q18.Quiet					$				
YOUR EXPERIENCES									
Q19.Need help bathing, etc.									
Q20. Get help bathing soon									$
Q21.Need help bathroom, etc.									
Q22. Get help bathroom soon									$
Q23. Share room									
Q24. Privacy	$								
Q25.Decisions-You		$							
Q26. Family or friends visit or call									

Table 2: Hypothesized Composites for HCAHPS Items

Item	IOM Dimensions								
	Respect	Prefs Needs	Coord	Info	Phys Comfort	Emotional Support	Family Friends	Trans	Access
Q1. Hospital name, discharge date									
Q2. Reason in Hosp.									
Q3. Number of nights									
NURSES									
Q4. Courtesy-nurses	$								
Q5. Listen-nurses				$					
Q6. Explain-nurses				$					
Q7. Enough time-nurses						$			
Q8. Call button									
Q9. Help soon as wanted									$
Q10.Global Nurses									
DOCTORS									
Q11.Courtesy-docs	$								
Q12.Listen-docs				$					
Q13.Explain-docs				$					
Q14.Enough time-docs						$			
Q15.Global Docs									
HOSPITAL ENVIRN									
Q16.Temperature					$				
Q17.Clean					$				
Q18.Quiet					$				
YOUR EXPERIENCES									
Q19.Need help bathing, etc.									
Q20. Get help bathing soon									$
Q21.Need help bathroom, etc.									
Q22. Get help bathroom soon									$
Q23. Share room									
Q24. Privacy	$								
Q25.Decisions-You		$							
Q26. Family or friends visit or call									

Table 2: Hypothesized Composites for HCAHPS Items—Cont.

Item	IOM Dimensions								
	Respect	Prefs Needs	Coord	Info	Phys Comfort	Emotional Support	Family Friends	Trans	Access
Q27.Help Family							$		
Q28.Introduce self	$								
Q29.Pain									
Q30.Pain meds									
Q31.Pain quickly					&				
Q32.Pain controlled					&				
Q33.Pain-everything could do					&				
Q34.Tests									
Q35.Test w/o pain					&				
Q36.New med									
Q37.Name of med				$					
Q38.What med for				$					
Q39.Taking other meds				$					
Q40.Allergic to med				$					
Q41.Med side-effect				$					
ADMISSIONS									
Q42.ER									
Q43.Delays									$
Q44.Living will		$							
DISCHARGE									
Q45.Discharge destination									
Q46.Health limit when									
Q47.Activity instructions				$					
Q48.Help after								$	
Q49.Problems to look for								$	
Q50.Take new med at home									
Q51.Med instructions								$	
HOSPITAL OVERALL									
Q52. Global hospital rating									
Q53.Recommend									

Note: $ indicates the domain the item is hypothesized to represent; & indicates subset of pain items within the physical comfort domain.

Table 3: Item-Scale Correlations, Hypothesized Composites (n = 14,691, pairwise correlations)

Item	Respect	Pref Needs	Info	Phys Comfort	Emot Support	Family Friends	Trans	Access
Q4	**0.55**	0.27	0.58	0.55	0.54	0.47	0.20	0.45
Q11	**0.48**	0.28	0.56	0.40	0.55	0.36	0.18	0.30
Q24	**0.50**	0.31	0.48	0.52	0.45	0.44	0.19	0.39
Q28	**0.51**	0.26	0.48	0.43	0.41	0.38	0.20	0.31
Q25	0.54	**0.12**	0.59	0.49	0.55	0.46	0.27	0.39
Q44	0.09	**0.10**	0.08	0.04	0.08	0.08	0.14	0.05
Q5	0.65	0.28	**0.60**	0.58	0.59	0.48	0.21	0.47
Q6	0.60	0.30	**0.63**	0.52	0.58	0.47	0.24	0.43
Q12	0.60	0.28	**0.58**	0.42	0.61	0.38	0.21	0.33
Q13	0.55	0.29	**0.59**	0.40	0.59	0.37	0.22	0.32
Q37	0.47	0.29	**0.64**	0.43	0.41	0.35	0.29	0.34
Q38	0.48	0.29	**0.68**	0.45	0.43	0.37	0.31	0.37
Q39	0.42	0.26	**0.60**	0.40	0.36	0.31	0.26	0.30
Q40	0.41	0.25	**0.57**	0.38	0.33	0.31	0.26	0.29
Q41	0.46	0.29	**0.63**	0.44	0.44	0.34	0.34	0.38
Q47	0.21	0.18	**0.31**	0.18	0.22	0.16	0.52	0.17
Q16	0.33	0.15	0.31	**0.45**	0.29	0.31	0.10	0.28
Q17	0.43	0.19	0.40	**0.49**	0.37	0.36	0.16	0.36
Q18	0.35	0.13	0.33	**0.44**	0.32	0.30	0.11	0.32
Q31	0.57	0.29	0.57	**0.68**	0.53	0.48	0.26	0.52
Q32	0.49	0.25	0.46	**0.62**	0.44	0.42	0.18	0.39
Q33	0.59	0.30	0.55	**0.67**	0.51	0.49	0.23	0.45
Q35	0.33	0.20	0.33	**0.39**	0.34	0.30	0.13	0.26
Q7	0.58	0.29	0.58	0.56	**0.47**	0.48	0.22	0.48
Q14	0.54	0.32	0.58	0.42	**0.47**	0.38	0.22	0.35
Q27	0.55	0.31	0.51	0.54	0.50	----	0.21	0.41
Q48	0.27	0.26	0.34	0.23	0.25	0.22	**0.54**	0.20
Q49	0.21	0.19	0.36	0.18	0.21	0.16	**0.63**	0.17
Q51	0.20	0.18	0.29	0.19	0.19	0.14	**0.46**	0.15
Q9	0.55	0.25	0.55	0.58	0.56	0.46	0.20	**0.55**
Q20	0.56	0.28	0.54	0.59	0.55	0.51	0.27	**0.62**
Q22	0.55	0.29	0.54	0.59	0.54	0.49	0.25	**0.65**
Q43	0.22	0.13	0.22	0.23	0.21	0.17	0.11	**0.51**

Bolded entries are item-scale correlations for hypothesized composites (corrected for item overlap). Dash entry is single item composite.

Table 4: Item-Scale Correlations, Revised Composites

Item	Mean	SD	Physical Comfort	Comm w/ Doctor	Medication	Comm w/ Nurse	Pain Control	Discharge Info	Introd	Delays	Living
Q20	3.18	.88	**.66**	.46	.43	.60	.50	.22	.38	.20	.00
Q22	3.28	.83	**.66**	.47	.46	.64←	.53	.21	.39	.21	.03
Q17	3.47	.80	**.59**	.38	.40	.50	.43	.14	.35	.19	.01
Q18	3.21	.89	**.49**	.34	.31	.42	.38	.10	.28	.19	-.04
Q16	3.40	.78	**.48**	.34	.31	.41	.40	.09	.27	.18	.00
Q24	3.48	.75	**.58**	.49	.44	.53	.50	.18	.43	.23	.07
Q27	3.51	.73	**.61**	.54	.45	.61←	.57	.20	.44	.22	.06
Q12	3.53	.75	.50	**.81**	.44	.52	.48	.23	.40	.23	.02
Q11	3.65	.66	.50	**.76**	.40	.50	.47	.19	.39	.23	.04
Q13	3.52	.75	.49	**.78**	.45	.50	.47	.23	.39	.22	.02
Q14	3.21	.88	.49	**.75**	.43	.52	.46	.24	.37	.22	.06
Q25	3.29	.90	.57←	**.58**	.52	.56←	.52	.29	.43	.22	.06
Q39	3.28	.94	.43	.38	**.66**	.43	.39	.23	.37	.14	.07
Q38	3.41	.82	.49	.48	**.70**	.50	.45	.27	.42	.20	.05
Q37	3.32	.89	.46	.46	**.67**	.47	.44	.27	.42	.18	.06
Q40	3.46	.83	.42	.37	**.64**	.41	.39	.23	.38	.14	.07
Q41	2.85	1.09	.46	.44	**.63**	.47	.42	.31	.37	.18	.05
Q5	3.45	.75	.65	.55	.50	**.80**	.60	.22	.46	.22	.03
Q4	3.61	.67	.64	.51	.47	**.76**	.58	.19	.45	.22	.05
Q6	3.46	.79	.61	.57	.51	**.73**	.54	.25	.45	.21	.04
Q7	3.17	.88	.64	.54	.47	**.74**	.56	.23	.42	.22	.04
Q9	3.17	.84	.63	.47	.45	**.68**	.57	.20	.39	.22	.02
Q32	3.38	.78	.55	.47	.42	.54	**.71**	.18	.38	.22	.04
Q33	3.52	.75	.62	.54	.49	.63	**.75**	.22	.45	.24	.04
Q31	3.41	.77	.61	.50	.48	.64	**.70**	.20	.41	.23	.04
Q35	3.20	.86	.40←	.36	.32	.39←	**.40**	.13	.28	.16	.04
Q49	1.83	.38	.17	.21	.26	.19	.16	**.53**	.15	.09	.09
Q47	1.86	.34	.15	.20	.21	.17	.14	**.51**	.12	.09	.09
Q48	1.82	.38	.20	.21	.24	.21	.18	**.38**	.17	.08	.15
Q51	1.92	.27	.14	.16	.22	.15	.14	**.32**	.11	.05	.07
Q28	3.50	.76	.52	.48	.49	.52	.47	.20	**---**	.19	.05
Q43	1.16	.37	.29	.27	.21	.26	.26	.11	.19	**---**	.03
Q44	1.75	.43	.02	.05	.08	.04	.05	.15	.05	.03	**---**

Bolded entries are item-scale correlations for hypothesized composites (corrected for item overlap). Dash entries are single item composites

Table 5: Correlations of Items with Six Composites, Global Rating of Hospital, and Likelihood of Recommending the Hospital to Family and Friends

Item	Question Label	Integrity of Composites: Substantial Corr w 2nd Scale	Integrity of Composites: Alpha & Item-Total Correlation	Relationship of Item and Composite-Level Scores to Hospital Rating and Recommendation: Hosp Rating		Recommend Hosp	
(1) Physical Comfort			**α = .81**	**aR^2=0.44***	**t-value= 54.18**	**aR^2=0.33**	**t-value= 37.09**
Q20	How often bathing		.64		6.44		4.56
Q22	How often bathroom	4(.62)	.64		3.75		3.44
Q17	Room clean		.54		31.18		21.43
Q18	Room quiet		.46		11.78		3.34
Q16	Temperature		.43		14.17		6.94
Q24	Privacy		.55		5.28		6.04
Q27	Visitors help	4 (.57)	.56		26.29		21.05
(2) Communication with Doctors			**α = .88**	**aR^2=0.31**	**t-value= 31.14**	**aR^2=0.25**	**t-value= 28.72**
Q12	MD listen		.80		10.80		6.88
Q11	MD respect		.73		16.60		15.69
Q13	MD explain things		.76		-4.19		-2.79
Q14	MD enough time		.73		-0.33 #		-0.48#
Q25	Involve in Tx decisions	1,4 (.53)	.55		7.33		9.85
(3) Communication about Medication			**α = .85**	**aR^2=0.21**	**t-value= 7.82**	**aR^2=0.16**	**t-value= 4.93**
Q39	Taking other Rx		.67		2.29 #		1.31#
Q38	Purpose of Rx		.70		-2.67		-2.88
Q37	Name of Rx		.67		-1.37 #		-0.63#
Q40	Allergic to Rx		.63		5.68		4.13
Q41	Side-effects of Rx		.64		4.43		3.28
(4) Communication with Nurses			**α = .88**	**aR^2=0.50**	**t-value= 93.42**	**aR^2=0.38**	**t-value= 71.23**
Q5	RN listen		.79		30.10		21.66
Q4	RN respect		.73		39.90		33.02
Q6	RN explain things		.71		12.59		8.66
Q7	RN enough time		.72		17.19		12.15
Q9	Help when call button		.66		15.08		11.31
(5) Pain Control			**α = .80**	**aR^2=0.33**	**t-value= 23.66**	**aR^2=0.26**	**t-value= 22.77**
Q32	Pain controlled		.70		5.13		3.37
Q33	Pain help all can		.74		12.43		11.63
Q31	Pain respond quick		.70		4.26		1.70#
Q35	Tests w/o pain	1 (.35) 4 (.34)	.36		0.55 #		6.69

Table 5: Correlations of Items with Six Composites, Global Rating of Hospital, and Likelihood of Recommending the Hospital to Family and Friends—Cont.

(6) Discharge Information			**α = .68**	**aR^2=0.10**	**t-value= 17.08**	**aR^2=0.08**	**t-value= 15.22**
Q49	Symptoms may have		.55		6.49		8.34
Q47	Activities can't do		.53		1.88#		0.33#
Q48	Help 4u @ home?		.41		9.69		7.16
Q51	Meds – how take?		.38		5.73		2.56#
Other							
Q28	Introduce self		N/A		11.99		7.07
Q43	Delays in admission		N/A		21.96		20.30
Q44	Living will		N/A		0.50#		5.31

p>0.01

Table 6: Rank Order (Descending) of Correlations of Six Composites with Global Ratings

HOSPITAL Rating		Nurses Rating		Doctors Rating		Recommend Hospital	
Nurses	.70	Nurses	.81	Doctor	.80	Nurses	.63
Physical Comfort	.65	Physical Comfort	.65	Nurses	.49	Physical Comfort	.63
Doctor	.60	Pain Control	.46	Physical Comfort	.48	Pain Control	.56
Pain Control	.56	Doctor	.48	Pain Control	.46	Doctor	.48
Medication	.47	Medication	.46	Medication	.40	Medication	.45
Discharge Info	.30	Discharge Info	.28	Discharge Info	.28	Discharge Info	.30

Note: Nurses = Communication with nurses; Doctor = Communication with doctors; Medication = Communication about medication.

Table 7: Hospital Level Factor Analysis Stratified by Service (Note: Rows were ordered first by Surgery, then by Childbirth)

Item	Surgery				Child birth				Other			
	Factor1	Factor2	Factor3	Factor4	Factor1	Factor2	Factor3	Factor4	Factor1	Factor2	Factor3	Factor4
Call Help Frequently (Q9)	0.86	-0.03	-0.08	0.03	0.62	0.10	0.03	0.15	0.41	0.03	0.13	0.34
Spend Enough Time (Q7)	0.84	-0.06	0.01	0.04	0.72	-0.10	0.15	0.09	0.39	-0.05	0.17	0.47
Respect (Q4)	0.83	0.02	-0.07	-0.02	0.80	-0.05	0.05	0.19	0.30	-0.02	0.43	0.30
Listen (Q5)	0.81	-0.04	0.02	0.08	0.88	0.00	0.04	-0.06	0.38	0.00	0.28	0.36
Visitors Help (Q27)	0.70	0.00	0.07	-0.05	0.78	-0.03	0.10	0.01	0.34	0.06	0.32	0.27
MD Pain Help (Q33)	0.63	0.13	0.14	-0.01	0.66	-0.06	0.27	0.12	0.32	0.04	0.20	0.40
How Often Bathroom (Q22)	0.62	-0.01	-0.03	0.14	0.57	0.21	-0.09	-0.20	0.15	0.02	0.13	0.35
Explain Things (Q6)	0.57	0.10	0.14	0.10	0.78	-0.08	0.20	-0.06	0.47	0.16	0.15	0.19
How Often Bathing (Q20)	0.53	0.16	-0.11	0.09	0.56	0.18	-0.05	-0.14	0.08	-0.03	0.12	0.45
Pain Controlled (Q32)	0.51	0.21	0.20	-0.18	0.55	0.04	0.23	0.10	0.26	-0.09	0.14	0.47
Room Quiet (Q18)	0.48	0.03	0.00	-0.06	0.42	0.05	-0.19	0.26	0.13	-0.08	0.61	-0.08
MD Respond Pain (Q31)	0.48	0.21	-0.03	0.07	0.65	0.15	0.08	-0.01	0.20	0.15	0.35	0.14
Room Clean (Q17)	0.44	0.27	0.01	-0.19	0.64	-0.03	-0.29	0.26	-0.10	0.12	0.48	0.18
Introduce (Q28)	0.40	0.26	0.11	-0.11	0.55	-0.11	0.04	0.30	0.18	0.24	0.37	-0.01
Purpose of TX (Q38)	-0.06	0.85	0.00	-0.01	0.41	0.63	-0.04	-0.18	0.09	0.77	0.10	-0.02
Name of TX (Q37)	-0.03	0.78	0.00	0.05	0.43	0.40	0.11	0.09	0.09	0.80	0.06	-0.02
Allergic to RX (Q40)	0.06	0.75	-0.09	0.08	-0.02	0.83	0.02	0.00	-0.01	0.71	0.15	-0.02
Taking Other RX (Q39)	0.02	0.73	0.00	0.12	-0.15	0.90	0.10	0.07	-0.03	0.78	-0.02	0.07
RX Side Effects (Q41)	0.03	0.68	0.05	0.08	0.15	0.65	-0.09	0.26	0.09	0.60	-0.14	0.27
Temperature (Q16)	0.18	0.39	0.04	-0.17	0.22	0.08	0.01	0.39	-0.11	-0.03	0.77	0.02
MD Listen (Q5)	-0.04	0.00	0.91	0.03	-0.11	0.04	0.98	0.01	0.95	0.05	-0.14	0.03
MD Respect (Q11)	0.05	-0.08	0.82	-0.13	0.08	0.04	0.79	0.10	0.75	0.07	0.27	-0.31
MD Explain (Q13)	-0.03	0.09	0.77	0.06	-0.03	-0.08	0.80	0.16	0.93	0.07	-0.14	-0.02
MD Enough Time (Q14)	0.06	0.00	0.70	0.06	0.15	0.03	0.70	0.00	0.98	-0.06	-0.08	-0.04
TX Decisions (Q25)	0.32	0.05	0.44	0.13	0.53	-0.06	0.46	-0.08	0.46	0.20	-0.19	0.39
Writing Activities (Q47)	0.01	-0.16	0.05	0.69	-0.08	0.02	0.01	0.83	-0.11	0.29	-0.09	0.45
Help After Discharge (Q48)	0.07	0.08	-0.02	0.64	0.14	0.10	0.05	0.33	-0.12	0.09	-0.04	0.63
Writing Symptoms (Q49)	-0.06	0.06	0.08	0.55	-0.11	-0.01	0.05	0.76	-0.09	0.35	-0.15	0.54
Living Will (Q44)	-0.06	0.03	-0.07	0.47	0.21	-0.18	-0.02	0.23	-0.13	0.04	0.55	-0.09
Tests Without Pain (Q35)	0.25	0.09	0.22	0.07	0.12	0.06	0.53	-0.27	0.32	-0.03	-0.04	0.40
Writing How to take Rx (Q51)	-0.02	0.15	0.02	0.34	-0.09	0.13	0.06	0.59	0.01	0.27	0.00	0.30
Delays In Admission (Q43)	0.29	-0.16	0.07	-0.01	0.11	-0.02	-0.07	0.31	0.33	-0.05	-0.09	0.27
Privacy (Q24)	0.25	0.00	-0.01	-0.03	0.28	-0.01	0.07	-0.13	0.25	-0.03	0.01	0.13

Table 8: Factor Analysis with Five Factors.

Item	Factor1	Factor2	Factor3	Factor4	Factor5
Respect (Q4)	0.83	-0.03	-0.03	0.10	-0.04
Listen (Q5)	0.78	0.03	0.02	0.14	-0.08
Explain Things (Q6)	0.63	0.19	0.07	0.07	-0.04
MD Pain Help (Q33)	0.63	0.15	-0.02	0.11	0.07
Introduce (Q28)	0.62	0.05	0.08	-0.11	0.06
Spend Enough Time (Q7)	0.59	0.07	-0.06	0.32	0.00
Pain Controlled (Q32)	0.58	0.08	0.02	0.12	0.00
Visitors Help (Q27)	0.56	0.12	-0.01	0.24	-0.02
Room Clean (Q17)	0.52	-0.14	0.08	0.09	0.05
Living Will (Q44)	0.52	-0.01	-0.08	-0.30	0.09
Temperature (Q16)	0.49	0.03	0.03	-0.10	0.15
MD Listen (Q5)	0.02	0.90	0.02	-0.02	0.02
MD Explain (Q13)	-0.02	0.82	0.03	0.02	0.06
MD Enough Time (Q14)	0.03	0.80	-0.02	0.09	-0.03
MD Respect (Q11)	0.25	0.76	-0.02	-0.19	-0.02
TX Decisions (Q25)	0.13	0.37	0.05	0.29	0.13
Taking Other RX (Q39)	0.02	-0.01	0.87	-0.10	-0.03
Allergic to RX (Q40)	0.13	-0.05	0.84	-0.14	-0.05
Purpose of TX (Q38)	-0.10	0.08	0.72	0.22	-0.01
Name of TX (Q37)	0.04	0.09	0.63	0.14	0.02
RX Side Effects (Q41)	-0.06	-0.04	0.63	0.19	0.15
How Often Bathroom (Q22)	0.09	-0.05	0.05	0.62	-0.04
How Often Bathing (Q20)	0.04	-0.06	0.05	0.62	0.03
Call Help FreQuently (Q9)	0.32	0.02	0.03	0.48	0.03
Writing Activities (Q47)	0.03	0.02	-0.02	0.00	0.70
Writing Symptoms (Q49)	-0.04	0.02	0.03	0.07	0.69
Help After Discharge (Q48)	0.08	-0.03	-0.04	0.18	0.49
Writing How to take Rx (Q51)	0.26	0.00	0.14	-0.22	0.41
Room Quiet (Q18)	0.32	-0.06	0.02	0.14	0.10
Privacy (Q24)	0.21	0.08	0.02	0.06	-0.07
MD Respond Pain (Q31)	0.33	0.03	0.11	0.33	0.01
Tests Without Pain (Q35)	0.09	0.26	0.06	0.25	-0.07
Delays In Admission (Q43)	-0.13	0.20	-0.14	0.33	0.21

Table 9: Factor Analysis with Six Factors

Item	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6
Respect (q4)	0.88	-0.03	-0.06	-0.03	0.03	0.07
Listen (q5)	0.85	0.01	-0.01	-0.07	0.06	0.05
Explain Things (q6)	0.76	0.07	0.12	-0.01	-0.02	-0.06
MD Pain Help (q33)	0.73	-0.02	0.09	0.10	0.03	-0.03
Spend Enough Time (q7)	0.69	-0.06	0.03	0.02	0.24	0.01
Pain Controlled (q32)	0.64	0.01	0.05	0.01	0.05	0.02
Visitors Help (q27)	0.63	-0.01	0.08	-0.01	0.17	0.04
Introduce (q28)	0.59	0.08	0.04	0.06	-0.14	0.10
Living Will (q44)	0.48	-0.08	-0.02	0.11	-0.32	0.05
MD Respond Pain (q31)	0.37	0.11	0.02	0.00	0.28	0.07
Taking Other RX (q39)	-0.03	0.88	0.00	-0.04	-0.09	0.06
Allergic to RX (q40)	0.04	0.84	-0.03	-0.06	-0.12	0.12
Purpose of TX (q38)	-0.02	0.72	0.05	0.01	0.18	-0.07
RX Side Effects (q41)	-0.14	0.63	0.00	0.13	0.20	0.13
Name of TX (q37)	0.21	0.63	0.01	0.07	0.07	-0.20
MD Listen (q5)	0.06	0.02	0.87	0.01	-0.01	-0.01
MD Explain (q13)	0.02	0.04	0.80	0.05	0.03	0.00
MD Enough Time (q14)	0.07	-0.02	0.78	-0.05	0.09	0.03
MD Respect (q11)	0.20	-0.02	0.77	-0.05	-0.16	0.11
Writing Symptoms (Q49)	-0.06	0.03	0.00	0.73	0.06	-0.02
Writing Activities (Q47)	-0.02	-0.02	0.01	0.72	-0.01	0.02
Help After Discharge (Q48)	0.07	-0.04	-0.03	0.50	0.16	0.03
Writing How to take Rx (Q51)	0.21	0.14	-0.02	0.44	-0.23	0.01
How Often Bathing (q20)	0.06	0.05	-0.03	0.00	0.59	0.12
How Often Bathroom (q22)	0.17	0.05	-0.06	-0.05	0.56	0.03
Call Help Frequently (q9)	0.34	0.03	0.03	0.01	0.44	0.13
Room Clean (q17)	0.26	0.08	-0.03	-0.02	0.13	0.44
Room Quiet (q18)	0.05	0.02	0.06	0.01	0.20	0.43
Temperature (q16)	0.24	0.03	0.12	0.09	-0.05	0.38
Privacy (q24)	0.22	0.02	0.08	-0.08	0.05	0.04
TX Decisions (q25)	0.23	0.05	0.33	0.15	0.24	-0.05
Tests Without Pain (q35)	0.30	0.06	0.17	-0.03	0.17	-0.20
Delays In Admission (q43)	-0.13	-0.14	0.21	0.19	0.33	0.05

Table 10: Factor Analysis with Seven Factors

Item	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor 7
Listen (Q5)	0.77	0.02	0.01	0.19	-0.05	-0.02	0.04
Respect (Q4)	0.76	-0.05	-0.04	0.14	-0.02	0.07	0.06
Explain Things (Q6)	0.76	0.15	0.06	0.10	0.02	-0.12	-0.07
Introduce (Q28)	0.57	0.05	0.08	-0.08	0.07	0.00	0.10
Spend Enough Time (Q7)	0.57	0.05	-0.06	0.35	0.03	0.02	0.01
Living Will (Q44)	0.47	-0.02	-0.08	-0.30	0.10	0.07	0.05
Visitors Help (Q27)	0.43	0.09	-0.01	0.25	-0.02	0.17	0.04
MD Listen (Q5)	0.02	0.89	0.02	-0.02	0.01	0.02	-0.01
MD Explain (Q13)	0.03	0.82	0.04	0.03	0.06	-0.07	0.00
MD Enough Time (Q14)	0.01	0.80	-0.02	0.10	-0.04	0.01	0.03
MD Respect (Q11)	0.17	0.79	-0.01	-0.17	-0.05	0.04	0.11
Taking Other RX (Q39)	0.00	0.00	0.88	-0.10	-0.04	-0.02	0.06
Allergic to RX (Q40)	0.06	-0.03	0.85	-0.12	-0.07	0.00	0.12
Purpose of TX (Q38)	-0.05	0.06	0.72	0.21	0.01	-0.03	-0.07
RX Side Effects (Q41)	-0.17	-0.01	0.63	0.20	0.13	0.01	0.13
Name of TX (Q37)	0.10	0.01	0.63	0.10	0.07	0.10	-0.19
How Often Bathing (Q20)	-0.08	-0.03	0.04	0.66	0.00	0.01	0.12
How Often Bathroom (Q22)	0.06	-0.05	0.04	0.66	-0.04	-0.03	0.02
Call Help FreQuently (Q9)	0.20	0.04	0.03	0.53	0.02	0.04	0.12
Writing Symptoms (NQ49)	0.03	0.01	0.03	0.06	0.73	-0.11	-0.02
Writing Activities (NQ47)	0.06	0.01	-0.02	-0.02	0.72	-0.06	0.01
Help After Discharge (NQ48)	-0.03	-0.04	-0.04	0.16	0.49	0.13	0.04
Writing How To Take RX (NQ51	0.18	-0.02	0.14	-0.25	0.42	0.13	0.01
Pain Controlled (Q32)	0.14	0.02	0.01	0.05	-0.04	0.69	0.05
MD Pain Help (Q33)	0.30	0.08	-0.02	0.05	0.06	0.59	-0.01
Room Clean (Q17)	0.23	-0.03	0.08	0.18	-0.02	-0.01	0.44
Room Quiet (Q18)	0.07	0.06	0.02	0.24	0.02	-0.08	0.43
Temperature (Q16)	0.13	0.11	0.03	-0.05	0.07	0.17	0.38
TX Decisions (Q25)	0.08	0.34	0.05	0.27	0.15	0.11	-0.05
MD Respond Pain (Q31)	0.06	0.01	0.11	0.32	-0.02	0.34	0.08
Privacy (Q24)	0.13	0.08	0.02	0.07	-0.08	0.09	0.05
Tests Without Pain (Q35)	0.05	0.17	0.06	0.20	-0.05	0.27	-0.19
Delays In Admission (Q43)	-0.23	0.21	-0.14	0.34	0.18	0.07	0.06

Table 11: Eigenvalues of Factors in Seven Factor Solution

Factor	Eigenvalue	Difference	Proportion	Cumulative
1	11.97	10.04	0.68	0.68
2	1.93	0.52	0.11	0.79
3	1.41	0.47	0.08	0.87
4	0.94	0.16	0.05	0.92
5	0.78	0.23	0.04	0.96
6	0.55	0.02	0.03	0.99
7	0.53	0.13	0.03	1.02
8	0.40	0.06	0.02	1.05
9	0.34	0.10	0.02	1.07
10	0.24	0.09	0.01	1.08

Table 12: Correlations between Rotated Factors (inter factor correlations)

	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Factor1	1	0.6041	0.47024	0.61236	0.33151	0.59323	0.27978
Factor2	0.6041	1	0.38062	0.50066	0.4562	0.52278	0.18714
Factor3	0.47024	0.38062	1	0.50721	0.38409	0.40276	0.18003
Factor4	0.61236	0.50066	0.50721	1	0.3566	0.50249	0.15283
Factor5	0.33151	0.4562	0.38409	0.3566	1	0.3432	0.1815
Factor6	0.59323	0.52278	0.40276	0.50249	0.3432	1	0.27008
Factor7	0.27978	0.18714	0.18003	0.15283	0.1815	0.27008	1

Table 13: Variance Explained by Factors

Treatment of other factors	Variance Explained						
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Eliminate other factors	1.418187	1.595023	1.921565	1.1544753	1.161545	0.683486	0.644435
Ignore other factors	9.279909	7.985192	6.560286	7.755295	4.483049	6.6153	1.997522

Table 14: Reliability Analysis for All Items

Survey Question	Proportion Response	Between Variance	Within Variance	Between/ Within	Reliability N=100	Reliability N=200	Reliability N=300	Z Value
Rate Nurse (Q10)	98.9	0.0559	3.7242	0.0150	0.597	0.748	0.817	5.81
Rate Doctor (Q15)	98.8	0.0247	3.3214	0.0074	0.423	0.595	0.688	3.50
Rate Hospital (Q52)	98.9	0.0656	3.5765	0.0184	0.645	0.784	0.845	6.63
Nurse Respect (Q4)	99.5	0.0045	0.3794	0.0118	0.540	0.701	0.779	4.77
Nurse Listen (Q5)	99.3	0.0072	0.4906	0.0147	0.593	0.744	0.814	5.56
Nurse Explain (Q6)	99.2	0.0073	0.5464	0.0133	0.569	0.725	0.798	4.90
Nurse Enough Time (Q7)	99.2	0.0093	0.6954	0.0133	0.569	0.725	0.798	5.18
Call Button Response (Q9)	78.2	0.0158	0.6612	0.0239	0.652	0.789	0.849	6.30
MD Respect (Q11)	98.8	0.0017	0.3610	0.0048	0.323	0.488	0.589	2.74
MD Listen (Q12)	98.7	0.0029	0.4912	0.0059	0.368	0.538	0.636	3.04
MD Explain (Q13)	98.7	0.0036	0.4848	0.0075	0.424	0.595	0.688	3.38
MD Enough Time (Q14)	98.5	0.0044	0.6987	0.0063	0.384	0.555	0.652	3.17
Temperature (Q16)	99.0	0.0037	0.5453	0.0068	0.404	0.575	0.670	3.34
Room Clean (Q17)	98.3	0.0056	0.5855	0.0096	0.487	0.655	0.740	4.53
Room Quiet (Q18)	98.3	0.0099	0.7083	0.0140	0.578	0.733	0.804	4.77
How Often Bathing (Q20)	39.4	0.0124	0.8246	0.0150	0.371	0.542	0.639	3.25
How Often Bathroom (Q22)	47.7	0.0113	0.6885	0.0163	0.438	0.609	0.701	3.92
Privacy (Q24)	49.2	0.0024	0.5688	0.0042	0.171	0.293	0.383	1.67
Treatment Decisions (Q25)	97.5	0.0061	0.7289	0.0084	0.451	0.621	0.711	3.98
Family/Friends Get Help (Q27)	93.7	0.0036	0.4664	0.0078	0.423	0.594	0.687	3.75
Staff Introduce (Q28)	98.7	0.0041	0.5191	0.0079	0.437	0.608	0.699	3.66
MD Respond Pain (Q31)	56.3	0.0098	0.6035	0.0162	0.477	0.646	0.732	4.05
Pain Controlled (Q32)	88.2	0.0019	0.5383	0.0036	0.241	0.388	0.488	2.16
MD Pain Help (Q33)	87.5	0.0043	0.5054	0.0085	0.426	0.598	0.690	3.88
Tests Without Pain (Q35)	84.8	0.0021	0.6837	0.0031	0.209	0.345	0.442	1.94
Name of Rx (Q37)	52.6	0.0039	0.8285	0.0047	0.198	0.331	0.426	1.80
Purpose of Rx (Q38)	53.0	0.0022	0.6884	0.0032	0.147	0.256	0.340	1.35
Taking Other Rx (Q39)	52.4	0.0033	0.9636	0.0035	0.154	0.266	0.353	1.41
Allergic to Rx (Q40)	52.7	0.0041	0.7414	0.0055	0.224	0.366	0.464	2.02
Rx Side Effects (Q41)	52.4	0.0119	1.3032	0.0092	0.324	0.490	0.590	2.77
Recommend Hospital (Q53)	98.7	0.0122	0.5326	0.0229	0.693	0.819	0.871	7.33
Delays in Admission (Q43)	97.7	0.0008	0.1225	0.0066	0.391	0.563	0.659	3.46
Living Will (Q44)	92.4	0.0075	0.1574	0.0476	0.815	0.898	0.930	5.98
Activities in Writing (Q47)	71.7	0.0012	0.1079	0.0107	0.435	0.606	0.698	3.48
Help After Discharge (Q48)	71.4	0.0027	0.1376	0.0198	0.586	0.739	0.809	4.47
Symptoms in Writing (Q49)	94.3	0.0019	0.1328	0.0140	0.568	0.725	0.798	4.25
Meds in Writing (Q51)	37.4	0.0004	0.0754	0.0051	0.159	0.274	0.362	1.50

Note: In computing these reliabilities, State and Hospital within State were random effects.

Table 15: Ratio of Between Hospital to Within Hospital Variance

Predictor	Surgery	Childbirth	Other Medical
General Health Status	0.01	0.04	0.00
Mental Health Status	0.01	0.02	0.01
Age	0.04	0.11	0.08
Gender	0.02		0.01
Education	0.07	0.13	0.07
Spanish Langage	0.14	0.26	0.08
Black	0.23	0.30	0.29
Hispanic	0.08	0.21	0.08
Asian	0.13	0.10	0.03
Native American	0.01	0.76	0.01
Race *	0.15	0.23	0.19
Proxy Response	0.01	0.04	0.01

*Weighted average of Black, Hispanic, Asian, Native American Effects

Table 16: Predictive Power of Case-Mix Variables by Service for Each Outcome

Outcome	Predictor	Surgery	Childbirth	Other Medical
Nurse	General Health Status	0.01	0.01	0.01
	Mental Health Status	0.00	0.00	0.00
	Age	0.02		0.01
	Gender	0.01		
	Education	0.01	0.00	0.00
	Spanish Language	0.00	0.01	
	Race	0.00		0.00
	Proxy	0.00		0.00
Doctor	General Health Status	0.02	0.01	0.01
	Mental Health Status	0.00	0.01	0.01
	Age	0.01		0.02
	Gender	0.00		
	Education	0.01	0.01	0.01
	Spanish Language	0.00	0.01	
	Race	0.00		0.00
	Proxy	0.00		0.00
Hospital	General Health Status	0.03	0.02	0.01
	Mental Health Status	0.00	0.00	0.00
	Age	0.02		0.02
	Gender	0.00		
	Education	0.01	0.01	0.01
	Spanish Language	0.00	0.02	
	Race	0.00		0.01
	Proxy	0.00		0.00

Note: In the above table, blanks indicate that the covariate was omitted from the model after the stepwise regression component of the analysis. Predictive power is computed as the reduction in R^2 that results when the given covariate is omitted from the model.

Table 17: Explanatory Power of Case-Mix Variables by Service for Each Outcome

Outcome	Predictor	Surgery	Childbirth	Other Medical
Nurse	General Health Status	0.15	0.40	0.04
	Mental Health Status	0.01	0.05	0.02
	Age	0.94		0.98
	Gender	0.10		
	Education	0.72	0.52	0.31
	Spanish Language	0.24	3.80	
	Race	0.62		0.77
	Proxy	0.03		0.02
Doctor	General Health Status	0.21	0.25	0.03
	Mental Health Status	0.04	0.23	0.04
	Age	0.52		1.61
	Gender	0.00		
	Education	0.52	0.78	0.40
	Spanish Language	0.09	2.23	
	Race	0.13		0.51
	Proxy	0.00		0.00
Hospital	General Health Status	0.27	0.68	0.05
	Mental Health Status	0.00	0.07	0.01
	Age	0.98		1.78
	Gender	0.08		
	Education	0.81	1.23	0.63
	Spanish Language	0.34	6.03	
	Race	0.35		1.30
	Proxy	0.01		0.02

Note: The values in the above cells are the product of the variance ratio and the predictive power multiplied by 1000. We used a threshold of 0.1 to decide which covariates to keep as case-mix adjustors (the selected variables are indicated by the shaded regions in the table). The covariates retained as case-mix variables by virtue of surpassing the threshold on any of the services are shaded.

Table 18: Covariance Matrix Estimates for Variance Components Analysis of Criterion Variables

Outcome Covar. Parmeter	Estimate	Standard Error	Z Value	Prob < Z
Nurse Rating				
State	0.0020	0.0068	0.30	0.3830
Hospital (State)	0.1118	0.0266	4.21	<.0001
Service (Hospital)	0.0394	0.0134	2.94	0.0017
Residual	3.6696	0.0433	84.76	<.0001
Doctor Rating				
State	0.0002	0.0023	0.10	0.4607
Hospital (State)	0.0254	0.0108	2.35	0.0094
Service (Hospital)	0.0215	0.0100	2.16	0.0155
Residual	3.3036	0.0390	84.80	<.0001
Hospital Rating				
State	0.0027	0.0095	0.28	0.3882
Hospital (State)	0.1456	0.0316	4.60	<.0001
Service (Hospital)	0.0486	0.0142	3.42	0.0003
Residual	3.5076	0.0413	84.98	<.0001

Table 19: Fixed Effects Estimates

Effect			Nurse		Doctor		Hospital	
	Num DF	Den DF	F Value	Pr > F	F Value	Pr > F	F Value	Pr > F
Service	2	301	4.04	0.0186	5.72	0.0036	7.45	0.0007
GHS	1	14346	388.31	<.0001	442.11	<.0001	519.01	<.0001
Age	1	14346	79.94	<.0001	81.74	<.0001	74.8	<.0001
Education	1	14346	64.5	<.0001	74.04	<.0001	113.84	<.0001
Spanish Language	1	14346	25.08	<.0001	9.23	0.0024	43.78	<.0001
Race: Black	1	14346	22.38	<.0001	8.56	0.0034	27.39	<.0001
Race: Hispanic	1	14346	0.73	0.3927	4.18	0.0409	1.75	0.1865
Race: Asian	1	14346	8.88	0.0029	6.95	0.0084	0.03	0.8584
Race: Native American	1	14346	0.07	0.7848	3.15	0.0759	0.3	0.5829
Service*GHS	2	14346	0.73	0.4834	1.27	0.2796	4.15	0.0158
Service*Age	2	14346	5.15	0.0058	6.63	0.0013	3.68	0.0252
Service*Education	2	14346	3.89	0.0205	0.24	0.788	1.1	0.3336
Service*Spanish Language	2	14346	0.16	0.8514	0.15	0.8577	0.68	0.5073
Service*Black	2	14346	1.33	0.2647	0.81	0.4462	3.61	0.0271
Service*Hispanic	2	14346	0.94	0.3893	0.74	0.4757	0.62	0.5355
Service*Asian	2	14346	2.09	0.1232	0.57	0.5676	2.86	0.0573
Service*Native Am.	2	14346	1.28	0.2782	0.26	0.7691	0.28	0.7573

Table 20: Variance Components Analysis for all items

Survey Question	State	Hospital (State)	Service (Hospital)	Residual
Rate Nurse (Q10)	0.0091	0.0390	0.0468	3.6949
Rate Doctor (Q15)	0.0015	0.0162	0.0214	3.3084
Rate Hospital (Q52)	0.0083	0.0506	0.0438	3.5492
Nurse Respect (Q4)	0.0003	0.0037	0.0020	0.3781
Nurse Listen (Q5)	0.0009	0.0064	0.0029	0.4885
Nurse Explain (Q6)	0	0.0057	0.0046	0.5434
Nurse Enough Time (Q7)	0.0002	0.0081	0.0034	0.6933
Call Button Response (Q9)	0.0024	0.0133	0.0092	0.6549
MD Respect (Q11)	0	0.0011	0.0017	0.3600
MD Listen (Q12)	0.0002	0.0018	0.0027	0.4896
MD Explain (Q13)	0.0002	0.0023	0.0031	0.4831
MD Enough Time (Q14)	0.0003	0.0039	0.0011	0.6981
Temperature (Q16)	0.0011	0.0024	0.0021	0.5447
Room Clean (Q17)	0.0006	0.0036	0.0045	0.5832
Room Quiet (Q18)	0.0005	0.0062	0.0087	0.7034
How Often Bathing (Q20)	0.0048	0.0104	0.0081	0.8185
How Often Bathroom (Q22)	0.0023	0.0093	0.0057	0.6851
Privacy (Q24)	0.0012	0.0025	0.0003	0.5681
Treatment Decisions (Q25)	0.0002	0.0053	0.0017	0.7279
Family/Friends Get Help (Q27)	0	0.0027	0.0023	0.4651
Staff Introduce (Q28)	0	0.0036	0.0006	0.5189
MD Respond Pain (Q31)	0.0012	0.0083	0.0034	0.6015
Pain Controlled (Q32)	0	0.0016	0.0007	0.5379
MD Pain Help (Q33)	0.0001	0.0030	0.0036	0.5032
Tests Without Pain (Q35)	0	0.0020	0.0003	0.6835
Name of Rx (Q37)	0.0020	0.0024	0.0056	0.8246
Purpose of Rx (Q38)	0.0014	0.0003	0.0065	0.6839
Taking Other Rx (Q39)	0.0011	0.0014	0.0060	0.9595
Allergic to Rx (Q40)	0.0006	0.0034	0.0022	0.7399
Rx Side Effects (Q41)	0.0008	0.0102	0.0056	1.2995
Recommend Hospital (Q53)	0.0022	0.0111	0.0047	0.5075
Delays in Admission (Q43)	0.0001	0.0006	0.0005	0.1222
Living Will (Q44)	0.0047	0.0053	0.0024	0.1572
Activities in Writing (Q47)	0.0002	0.0009	0.0004	0.1078
Help After Discharge (Q48)	0	0.0025	0.0006	0.1371
Symptoms in Writing (Q49)	0	0.0016	0.0006	0.1322
Meds in Writing (Q51)	0	0.0004	0	0.0755

Table 21: Response Rates Among Core and Noncore Hospitals

	All hospitals		Core hospitals		Noncore hospitals	
	N	Pct of all	N	Pct of core	N	Pct of noncore
All hospitals	132	100%	24	100%	108	100%
Hospitals with 0 to 10% response rate	22	17%	0	0%	23	21%
Hospitals with 10 to 20% response rate	8	6%	0	0%	8	7%
Hospitals with 20 to 30% response rate	33	25%	1	4%	31	29%
Hospitals with 30 to 40% response rate	43	33%	4	17%	40	37%
Hospitals with 40 to 50% response rate	19	14%	14	58%	5	5%
Hospitals with 50% or greater response rate	6	5%	5	21%	1	1%

Table 22: Adjusted Response Rates and Mode Used to Respond: Final Data

	%	# Respondents	Adjusted # Sampled
Overall	40.4	19720	48823
Core Hospitals	47.3	9504	20073
Noncore Hospitals	35.5	10216	28750
Mode			
Core Hospitals: Mail	29.0	5829	20073
Core Hospitals: Phone	18.3	3675	20073
Noncore Hospitals: Mail	35.5	10216	28750
	% of Total Respondents	# Respondents	Total Respondents
Language			
English	97.0	19134	19720
Spanish	3.0	586	19720
Mode			
Phone	18.6	3675	19720
Mail	81.6	16045	19720

Table 23: T-tests of Difference in Mean Ratings (controlling for race, education, gender, language and service line) between Mail and Phone Respondents for Core Hospitals

Global CAHPS ratings	Adjusted Means		T-score	P(t)
	Mail survey	Phone survey		
Global nurses rating	8.38	8.44	-1.46	0.14
Global doctors rating	8.74	8.67	1.69	0.09
Global hospital rating	8.45	8.45	-0.07	0.94
Likelihood of recommending hospital	3.56	3.56	-0.09	0.93
Individual-level composites				
Physical Comfort	3.39	3.46	-6.19	<0.0001
Doctor Communications	3.47	3.44	1.96	0.05
Communication about Medication	3.32	3.36	-1.86	0.06
Communication with Nurses	3.39	3.43	-2.90	0.0037
Pain Control	3.42	3.32	6.35	<0.0001
Discharge Information	1.85	1.85	-0.29	0.77
Hospital-level composites				
Patient Concern	3.46	3.49	-2.67	0.077
Doctor Communications	3.51	3.46	3.52	0.0004
Communication about Medication	3.19	3.22	-0.83	0.41
Nursing Services	3.20	3.28	-4.40	<0.0001
Pain Control	3.47	3.43	2.53	0.01
Discharge Information	1.83	1.83	-0.26	0.80
Physical Environment	3.35	3.43	-6.44	<0.0001

Table 24: Survey Response Times by Race and Education

Sociodemographic characteristics	N	Mean Response time	Median response time	Minimum response time	Maximum response time
Race					
White	11,748	31	26	7	81
Black	1,407	35	31	9	73
Hispanic	1,551	35	36	8	82
Other	682	36	35	11	72
Education					
8^{th} grade or less	879	34	30	8	71
Some high school	1,526	33	28	8	73
High school or GED	4,379	32	27	7	82
Some college or 2-year degree	4,450	32	27	7	81
4-year college degree	1,852	32	27	7	73
More than 4 years of college	2,291	31	27	8	73

Table 25: Estimates of the Effect of Survey Response Time on Ratings of HCAHPS dimensions (controlling for race, education, gender, language and service line)

Global CAHPS ratings	Parameter estimate	T-value	P(t)
Global nurses rating	-0.0072	-5.07	<0.0001
Global doctors rating	-0.0039	-2.96	0.0031
Global hospital rating	-0.0048	-3.43	0.0006
Likelihood of recommending hospital	-0.0012	-2.25	0.0242
Individual-level composites			
Physical Comfort	-0.0006	-1.61	0.1070
Doctor Communications	-0.0009	-2.09	0.0368
Communication about Medication	-0.0012	-1.74	0.0816
Communication with Nurses	-0.0018	-4.06	<0.0001
Pain Control	-0.0015	-3.47	0.0005
Discharge Information	0.0002	1.01	0.3143
Hospital-level composites			
Patient Concern	-0.0014	-3.61	0.0003
Doctor Communications	-0.0011	-2.46	0.0139
Communication about Medication	-0.0012	-1.41	0.1593
Nursing Services	-0.0020	-3.49	0.0005
Pain Control	-0.0017	-.351	0.0004
Discharge Information	0.0002	0.69	0.4892
Physical Environment	-0.0002	-0.44	0.6604

Table 26: Individual Rates of Item Nonresponse

RATE OF ITEM MISSINGNESS	Report Items	General Items
0%	77.8%	48.1%
1-4%	11.1%	28.6%
5-9%	5.7%	10.9%
10-24%	4.0%	8.7%
25-49%	1.0%	1.3%
>=50%	0.4%	0.4%

Table 27: HCAHPS Questionnaire Items Referred to in Open-Ended Items

HCAHPS questionnaire items	What did you like most?		What would you change?	
	English questionnaire (n = 200)	Spanish questionnaire (n = 100)	English questionnaire (n = 200)	Spanish questionnaire (n = 100)
Q4 – How often did nurses treat you with courtesy and respect	19.0%	14.0%	4.5%	7.0%
Q5 – How often did nurses listen carefully to you	0.0%	0.0%	1.0%	0.0%
Q6 – How often did nurses explain things in a way you could understand	1.5%	1.0%	1.5%	0.0%
Q7 – How often did nurses spend enough time with you	3.0%	9.0%	4.5%	3.0%
Q9 – How often did you get help as soon as you wanted it	5.5%	1.0%	5.0%	0.0%
Q10 – Global nurses rating	26.0%	15.0%	7.5%	6.0%
Q11 – How often did doctors treat you with courtesy and respect	3.0%	12.0%	3.0%	2.0%
Q12 – How often did doctors listen carefully to you	0.5%	0.0%	1.5%	0.0%
Q13 – How often did doctors explain things in a way you could understand	3.0%	1.0%	2.5%	0.0%
Q14 – How often did doctors spend enough time with you	1.0%	6.0%	1.0%	1.0%
Q15 – Global doctors rating	11.5%	13.0%	1.5%	3.0%
Q16 – How often was the temperature in your room comfortable	0.0%	0.0%	0.5%	0.0%
Q17 – How often were your room and bathroom kept clean	2.5%	1.0%	3.5%	1.0%
Q18 – How often was the area around your room quiet at night	1.0%	0.0%	5.5%	2.0%
Q20 – How often did you get help with bathing, washing or keeping clean as soon as you wanted	0.0%	0.0%	0.5%	0.0%
Q21 – Did you need help from doctors, nurses or other hospital staff in getting to the bathroom or in using a bedpan	0.0%	0.0%	0.5%	0.0%
Q22 – How often did you get help in getting to the bathroom or in using a bedpan as soon as you wanted	0.0%	0.0%	2.5%	0.0%
Q23 – Did you share a hospital room with one or more other patients	2.0%	1.0%	3.0%	1.0%
Q24 – How often did doctors, nurses, and other hospital staff make sure that you had privacy when they took care of you or talked to you	0.0%	1.0%	0.0%	1.0%
Q25 – Did doctors, nurses or other hospital staff involve you in decisions about your treatment as much as you wanted	0.0%	0.0%	3.0%	0.0%
Q27 – How often did you family and friends receive the help they needed when they called or visited the hospital	0.0%	0.0%	1.0%	1.0%

Table 27: HCAHPS Questionnaire Items Referred to in Open-Ended Items—Continued

HCAHPS questionnaire items	What did you like most?		What would you change?	
	English questionnaire (n = 200)	Spanish questionnaire (n = 100)	English questionnaire (n = 200)	Spanish questionnaire (n = 100)
Q28 – When doctors, nurses or other hospital staff first came to care for you, how often did they introduce themselves	0.5%	0.0%	0.5%	0.0%
Q29 – Did you have pain during this hospital stay	1.0%	1.0%	0.0%	2.0%
Q31 – How often did doctors, nurses or other hospital staff respond quickly when you asked for pain medicine	0.0%	0.0%	0.5%	0.0%
Q32 – How often was your pain well controlled	1.5%	0.0%	2.0%	1.0%
Q33 – How often did the doctors, nurses or other hospital staff do everything they could to help you with your pain	0.5%	0.0%	1.5%	1.0%
Q35 – How often were these tests and procedures done without causing you too much pain	1.0%	0.0%	1.5%	0.0%
Q38 – How often did doctors, nurses or other hospital staff tell you what the medicine was for	0.0%	0.0%	1.0%	0.0%
Q41 – How often did doctors, nurses, or other hospital staff describe possible side effects of the medicine in a way you could understand	0.0%	0.0%	0.5%	0.0%
Q42 – Were you admitted to this hospital through the Emergency Room	0.0%	1.0%	3.0%	2.0%
Q43 – Were there any unreasonable delays during the admissions process	0.0%	0.0%	3.5%	3.0%
Q52 – Global hospitals rating	5.0%	20.0%	2.0%	3.0%
Missing	20.0%	6.0%	19.5%	15.0%
Did not like anything/Would not change anything	2.0%	2.0%	21.0%	44.0%
Domains not captured in the HCAHPS questionnaire	**What did you like most?**		**What would you change?**	
	English questionnaire (n = 200)	**Spanish questionnaire (n = 100)**	**English questionnaire (n = 200)**	**Spanish questionnaire (n = 100)**
Care coordination	2.5%	0.0%	1.5%	0.0%
Food	2.5%	8.0%	4.0%	4.0%
Language	0.0%	4.0%	0.5%	9.0%
Staff	25.0%	30.0%	2.5%	2.0%
Timeliness	1.0%	2.0%	2.0%	5.0%
Other	6.5%	9.0%	14.5%	8.0%

Table 28: Summary Table of Psychometric Analyses on Seven-Factor Hospital-Level Structure

		Integrity of Composites		Relationship of Item and Composite-Level Scores to Hospital Rating and Recommendation**				Hospital-Level Reliability
Quest #	Question Label	Sub-stantial Corr w 2nd Scale	Alpha & Item-Total Correlation	Hospital Rating		Recommend Hospital		Item z-values (from Table 14)
(1) Concern for Patient			**α = .86**	**aR^2=0.52***	**t-value= 98.40**	**aR^2=0.40**	**t-value= 76.05**	
Q5	RN Listen		.76		30.10		21.66	5.56
Q4	RN Respect		.72		39.90		33.02	4.78
Q6	RN Explain		.71		12.59		8.66	4.93
Q28	Introduce		.48		11.99		7.07	3.52
Q7	RN Enough Time		.69		17.19		12.15	5.17
Q27	Visitors Help		.58		26.29		21.05	3.72
(2) Communication with Doctors			**α = .89**	**aR^2=0.25**	**t-value= 27.77**	**aR^2=0.20**	**t-value= 24.94**	
Q12	MD Listen		.81		10.80		6.88	3.08
Q11	MD Respect		.75		16.60		15.69	3.26
Q13	MD Explain		.76		-4.19		-2.79	2.89
Q14	MD Enough Time		.72		-0.33 (p=0.74)		-0.48 (p=0.74)	3.40
(3) Communication about Medication			**α = .67**	**aR^2=0.18**	**t-value= 8.89**	**aR^2=0.14**	**t-value= 6.29**	
Q40	Allergies to Medicines		.50		2.29 (p=0.02)		4.13	2.05
Q41	Side-Effects of Medicine	1(.47)	.50		4.43		3.28	2.78
(4) Nursing Services			**α = .80**	**aR^2=0.37**	**t-value= 22.96**	**aR^2=0.28**	**t-value= 18.19**	
Q20	How often Bathing		.66		6.44		4.56	3.30
Q22	How often Bathroom		.72		3.75		3.44	3.95
Q9	Help when Call Button	1(.66)	.57		15.08		11.31	6.23

Table 28: Summary Table of Psychometric Analyses on Seven-Factor Hospital-Level Structure—Cont.

		Integrity of Composites		Relationship of Item and Composite-Level Scores to Hospital Rating and Recommendation**				Hospital-Level Reliability
Quest #	Question Label	Sub-stantial Corr w 2nd Scale	Alpha & Item-Total Correlation	Hospital Rating		Recommend Hospital		Item z-values (from Table 14)
(5) Discharge Information			**α = .51**	**aR^2=0.08**	**t-value= 16.75**	**aR^2=0.07**	**t-value= 15.89**	
Q49	Symptoms you may have		.34		6.49		8.34	2.18
Q48	Help for you at home?		.34		9.69		7.16	3.93
(6) Pain Control			**α = .83**	**aR^2=0.29**	**t-value= 26.71**	**aR^2=0.23**	**t-value= 23.02**	
Q32	Pain Controlled		.70		5.13		3.37	4.22
Q33	Pain Help All Can		.70		12.43		11.63	4.52
(7) Physical Environment			**α = .60**	**aR^2=0.27**	**t-value= 41.53**	**aR^2=0.20**	**t-value= 24.47**	
Q17	Room Clean		.43		31.18		21.43	4.56
Q18	Room Quite		.39		11.78		3.34	4.81
Q16	Temperature		.40		14.17		6.94	3.32

* aR^2 = Adjusted R-squared, how much variance in the dependent variable is accounted for by the set of items in the composite controlling for the effect of number of variables (i.e., all things being equal, a larger set of items will account for a larger percentage of the variance.

** t-values listed in grey cells are for the unique relationship of this composite to the criterion variable controlling for the other composites. t-values in cells adjacent to the item are for the unique relationship of that item controlling for the other report items in the questionnaire, therefore these are the same values as those depicted in Table 5. Probability of t-value is less than 0.01 unless otherwise denoted.

α = Cronbach's alpha coefficient, an estimate of internal consistency reliability.

Table 29: Rank Order (Descending) of Correlations of Revised Composite Scores to Global Ratings

Hospital Rating		Nurses Rating		Doctors Rating		Recommend Hospital	
Concern for Pt	.72	Concern for Pt	.80	Doctor	.81	Concern for Pt	.63
Nursing Services	.60	Nursing Services	.66	Concern for Pt	.53	Nursing Services	.52
Pain Control	.53	Pain Control	.54	Pain Control	.44	Pain Control	.47
Physical Environment	.52	Physical Environment	.48	Nursing Services	.43	Doctor	.45
Doctor	.49	Doctor	.43	Medication	.36	Physical Environment	.43
Medication	.43	Medication	.42	Physical Environment	.35	Medication	.38
Discharge Info	.28	Discharge Info	.24	Discharge Info	.25	Discharge Info	.26

Table 30: Summary of Considerations in Retaining or Deleting HCAHPS Items and Final Results

Question Number[1]		Item Label[2]	Hospital-Level Reliability[3]	Hospital Care Ratings	Membership in Composite	Variability	Other Sources	Case-mix Adjust	Impt to FG Patients[4]	Cognitive Complexity	Screener for deleted item	Parallelism
New	Old											
	1	Hosp name	NA	NA	NA	NA	-	NA		-	NA	NA
	2	Service line	NA	NA	NA	NA	-	NA		-	NA	NA
	3	No. nights	NA	NA	NA	NA	-	NA		-	NA	NA
1	4	RN respect	+	+	+	+	+	NA		+	NA	+
2	5	RN listen	+	+	+	+	+	NA		+	NA	+

[1] "New" refers to the item numbers on the revised questionnaire whereas "old" refers to the item numbers on the three-state pilot questionnaire.

[2] For the full item text, please consult the copy of the three-state pilot test questionnaire that is reproduced in Appendix B.

[3] The table below is a key to the criteria listed in the headings for columns 3 through 11 and the associated symbols:

Criterion	Delete (-)	Keep (+)	Evidence Unclear (~)
Hospital-level reliability	Inadequate	Adequate	Reliability between .50 and .70 @ N=300
Hospital Care Ratings	Not uniquely and/or strongly related	Uniquely and substantially related	NA
Membership in a Composite	Covariance statistics do not support	Covariance statistics do support	Correlation with composite < correlation with other
Variability	Minimal variation in response	Adequate variability in response	NA
Other Sources	Can get information elsewhere	Can NOT get information elsewhere	NA
Case-mix Adjustment	Not necessary	Necessary	NA
Patient FG Results	Less important than other aspects of care	More important than other aspects of care	NA
Cognitive Complexity	Difficult for patients to understand item	Item easily understood by patients	NA
Screener	Item following this screener was deleted	Item following this screener was not deleted	NA
Parallelism	Item eliminated in parallel composite	Item retained in parallel composite	NA

[4] Where cells are left blank, patient focus groups indicated that the content was important. In general, patient focus groups indicated that all content on the HCAHPS three-state pilot questionnaire was important. When asked to rank the importance of obtaining help for bathing and toileting, FG patients indicated that toileting was the more important.

Table 30: Summary of Considerations in Retaining or Deleting HCAHPS Items and Final Results—Cont.

Question Number[1]		Item Label[2]	Hospital-Level Reliability[3]	Hospital Care Ratings	Membership in Composite	Variability	Other Sources	Case-mix Adjust	Impt to FG Patients[4]	Cognitive Complexity	Screener for deleted item	Parallelism
New	Old											
3	6	RN explain	+	+	+	+	+	NA		+	NA	+
	7	RN time	+	+	+	+	+	NA		+	NA	-
	8	Call button ***S***	NA	NA	NA	-	+	NA		+	+	NA
4	9	Call button	+	+	~	+	+	NA		+	NA	NA
5	10	RN Global	+	+	NA	+	+	NA		+	NA	+
6	11	DR respect	~	+	+	+	+	NA		+	NA	+
7	12	DR listen	~	+	+	+	+	NA		+	NA	+
8	13	DR explain	~	+	+	+	+	NA		+	NA	+
	14	DR time	~	-	+	+	+	NA		+	NA	-
9	15	DR Global	~	+	NA	+	+	NA		+	NA	+
	16	Room Temp	~	+	+	+	+	NA		+	NA	NA
10	17	Room Clean	+	+	+	+	+	NA		+	NA	NA
11	18	Room Quiet	+	+	+	+	+	NA		+	NA	NA
	19	Bathing ***S***	NA	NA	NA	+	+	NA		+	-	NA
	20	Bathing	~	+	+	+	+	NA	-	+	NA	NA
12	21	Toileting ***S***	NA	NA	NA	+	+	NA		+	+	NA
13	22	Toileting	+	+	+	+	+	NA	+	+	NA	NA
	23	Privacy ***S***	NA	NA	NA	+	-	NA		+	-	NA
	24	Privacy	-		-	+	+	NA		-	NA	NA
	25	Involve Tx	+	+	-	+	+	NA		-	NA	NA
	26	Visit ***S***	NA	NA	NA	+	-	NA		+	-	NA
	27	Visit	+	+	~	+	+	NA		-	NA	NA
	28	Introduce	~	+	~	+	+	NA		+	NA	NA
	29	Pain ***S***	NA	NA	NA	+	+	NA		+	NA	NA
14	30	Pain Med ***S***	NA	NA	NA	+	-	NA		+	+	NA
	31	Pain Quick	+	-	-	+	+	NA		+	NA	NA
15	32	Pain Control	-	+	+	+	+	NA		+	NA	NA
16	33	Pain help	~	+	+	+	+	NA		+	NA	NA
	34	Pain Tests ***S***	NA	NA	NA	+	-	NA		+	-	NA
	35	Pain Tests	-	-	-	+	+	NA		-	NA	NA
17	36	New Med ***S***	NA	NA	NA	+	-	NA		+	+	NA
	37	Med Name	-	-	+	+	+	NA		+	NA	NA

Table 30: Summary of Considerations in Retaining or Deleting HCAHPS Items and Final Results—Cont.

Question Number[1]		Item Label[2]	Hospital-Level Reliability[3]	Hospital Care Ratings	Membership in Composite	Variability	Other Sources	Case-mix Adjust	Impt to FG Patients[4]	Cognitive Complexity	Screener for deleted item	Parallelism
New	Old											
	38	Med Purpose	-	-	+	+	+	NA		+	NA	NA
	39	Med Interact	-	-	+	+	+	NA		+	NA	NA
18	40	Med Allergic	-	+	+	+	+	NA		+	NA	NA
19	41	Side Effects	~	+	+	+	+	NA		+	NA	NA
	42	Admit ER	~	NA	NA	+	-	NA		+	NA	NA
	43	Admit Delay		+	-	-	+	NA		+	NA	NA
	44	Living Will	+	-	-	+	-	NA		-	NA	NA
20	45	Dschrg Dest	NA	NA	NA	-	-	NA		+	NA	
	46	Disability *S*	NA	NA	NA	+	+	NA		-	NA	
	47	Home Activities	~	-	+	+	+	NA		+	NA	
21	48	Home Help	+	+	+	+	+	NA		+	NA	
22	49	Home Sympt	+	+	+	+		NA		+	NA	
	50	Home Med *S*	NA	NA	NA	+	-	NA		+	-	
	51	Home Med	-	-	+	+	+	NA		+	NA	
23	52	Hosp Global	+	NA	NA	+	+	NA		+	NA	
24	53	Recommend	+	NA	NA	+	+	NA		+	NA	
	54	Like Most	NA	NA	NA	-	-	NA		+	NA	
	55	Would Chng	NA	NA	NA	-	-	NA		+	NA	
25	56	Phys Health	NA	NA	NA	+	+	+		+	NA	
26	57	Emot Health	NA	NA	NA	+	+	+		+	NA	
	58	Age	NA	NA	NA	+	-	+		+	NA	
	59	Gender	NA	NA	NA	+	-	+		+	NA	
27	60	Education	NA	NA	NA	+	-	+		+	NA	
28	61	Hispanic	NA	NA	NA	+	-	+		+	NA	
29	62	Race	NA	NA	NA	+	-	+		+	NA	
30	63	Language	NA	NA	NA	+	-	+		+	NA	
	64	No. Stays	NA	NA	NA	-	-	-		+	NA	
31	65	Help *S*	NA	NA	NA	-	+	NA		+	NA	
32	66	How help	NA	NA	NA	+	+	NA		+	NA	

Table 31: Summary Table of Psychometric Analyses on Final Seven-Factor Hospital-Level Structure

		Integrity of Composites		Relationship of Item and Composite-Level Scores to Hospital Rating and Recommendation**				Hospital-Level Reliability
Quest #	Question Label	Substantial Corr w 2nd Scale	Apha & Item-Total Corr	**Hospital Rating**		**Recommend Hospital**		Item z-values (from Table 25)
(1) Communication with Nurse			**α = .85**	**aR^2=0.47***	**t-value= 93.18**	**aR^2=0.36**	**t-value= 72.34**	**reliability = 0.78**
Q5	RN Listen		.76		30.10		21.66	5.56
Q4	RN Respect		.72		39.90		33.02	4.78
Q6	RN Explain		.68		12.59		8.66	4.93
(2) Communication with Doctors			**α = .88**	**aR^2=0.24**	**t-value= 37.24**	**aR^2=0.19**	**t-value= 32.30**	**reliability =0.60**
Q12	MD Listen		.81		10.80		6.88	3.08
Q11	MD Respect		.76		16.60		15.69	3.26
Q13	MD Explain		.73		-4.19		-2.79	2.89
(3) Communication about Medication			**α = .67**	**aR^2=0.18**	**t-value= 14.65**	**aR^2=0.14**	**t-value= 10.76**	**reliability =0.72**
Q40	Allergies to Medicines		.50		2.29 (p=0.02)		4.13	2.05
Q41	Side-Effects of Medicine		.50		4.43		3.28	2.78
(4) Nursing Services			**α = .71**	**aR^2=0.35**	**t-value= 32.55**	**aR^2=0.27**	**t-value= 25.48**	**Reliability =0.81**
Q22	How often Bathroom	1(.55)	.56		3.75		3.44	3.95
Q9	Help when Call Button	1(.63)	.56		15.08		11.31	6.23
(5) Discharge Information			**α = .51**	**aR^2=0.08**	**t-value= 19.36**	**aR^2=0.07**	**t-value= 18.11**	**reliability =0.75**
Q49	Symptoms may have		.34		6.49		8.34	2.18
Q48	Help for you at home?		.34		9.69		7.16	3.93
(6) Pain Control			**α = .83**	**aR^2=0.29**	**t-value= 35.60**	**aR^2=0.23**	**t-value= 29.74**	**reliability =0.62**
Q32	Pain Controlled		.70		5.13		3.37	4.22
Q33	Pain Help All Can		.70		12.43		11.63	4.52
(6) Physical Environment			**α = .51**	**aR^2=0.25**	**t-value= 45.44**	**aR^2=0.18**	**t-value= 28.27**	**reliability =0.77**
Q17	Room Clean	1(.43) 4(.43) 6(.34)	.34		31.18		21.43	4.56
Q18	Room Quite	1(.35) 4(.38)	.34		11.78		3.34	4.81

* aR^2 = Adjusted R-squared, how much variance in the dependent variable is accounted for by the set of items in the composite controlling for the effect of number of variables (i.e. all things being equal, a larger set of items will account for a larger percentage of the variance.

** t-values listed in grey cells are for the unique relationship of this composite to the criterion variable controlling for the other composites. t-values in cells adjacent to the item are for the unique relationship of that item controlling for the other report items in the questionnaire, therefore these are the same values as those depicted in Table 5. Probability of t-value is less than 0.01 unless otherwise denoted.

α = Cronbach's alpha coefficient, an estimate of internal consistency reliability.

Table 32: Rank Order (Descending) of Correlations of Final Composite Scores with Global Ratings

Hospital Rating		Nurses Rating		Doctors Rating		Recommend Hospital	
Nurse Com	.68	Nurse Com	.78	Doctor Com	.79	Nurse Com	.60
Nursing Services	.59	Nursing Services	.66	Nurse Com	.48	Nursing Services	.51
Pain	.53	Pain	.54	Pain	.44	Pain	.47
Physical Environ.	.49	Physical Environ.	.46	Nursing Services	.41	Doctor Com	.43
Doctor Com	.48	Doctor Com	.42	Medicine	.36	Physical Environ.	.41
Medicine	.43	Medicine	.42	Physical Environ.	.33	Medicine	.38
Discharge	.28	Discharge	.24	Discharge	.25	Discharge	.26

9. FIGURES

Figure 1. HCAHPS Pilot Survey Administration Timeline: Core Hospitals

Task	May	Jun	Jul	Aug	Sep	Oct	Nov
Delmarva sent sample file to NORC	**19**						
Survey administered (6/2-10/10)							
Start pre-note mailing		**2**					
Start first survey mailing		**9**					
Start reminder / thank you postcards mailing		**16**					
Reminder calls / phone interviews started			**13**				
Reminder calls / phone interviews stopped				**18**			
Interim data file delivered to DFMC					**2**		
NORC closed incoming mail processing						**10**	
NORC sent final survey data to Delmarva (Interim data delivery: 9/2)						**29**	

Figure 2. HCAHPS Pilot Survey Administration Timeline: Noncore Hospitals

Task	May	Jun	Jul	Aug	Sep	Oct	Nov
Delmarva sent sample file to NORC	**19**						
Survey administered (6/9-10/10)							
Start pre-note mailings		**9**					
Start first survey mailing		**17**					
Start reminder / thank you postcard mailing		**27**					
Start second survey mailing			**25**				
NORC closed incoming mail processing						**10**	
NORC sent final survey data to Delmarva						**29**	

Figure 3: Service Line Distribution of Respondents for the Combined, Core, and Noncore Surveys

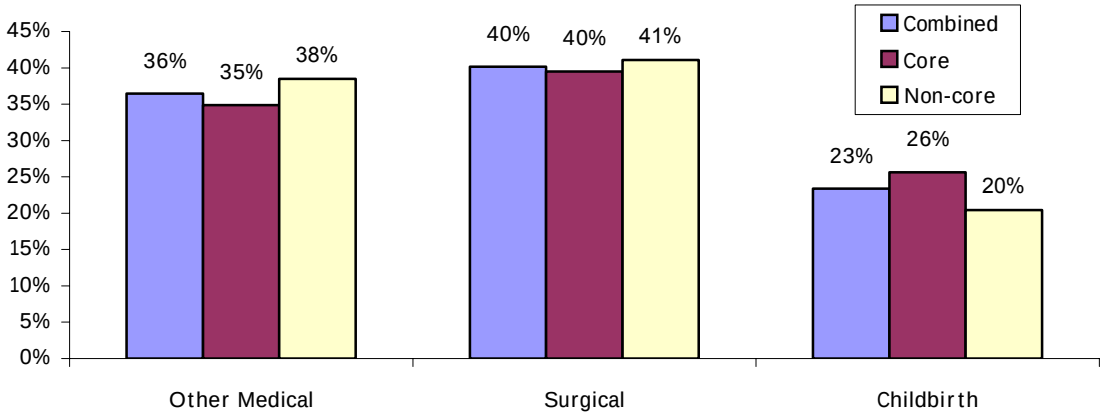


Figure 4: Distribution of Education among Mail and Phone Respondents in Core Hospitals

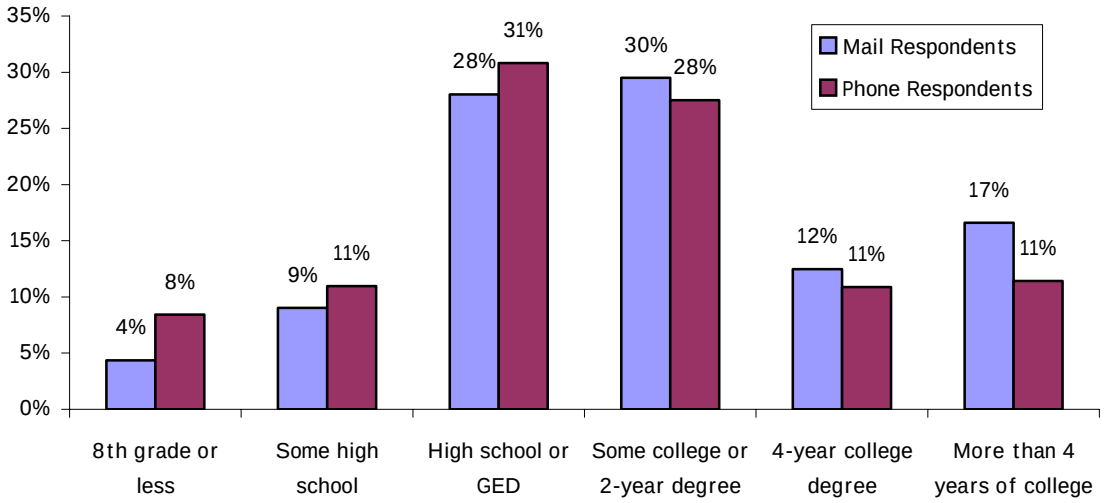


Figure 5: Distribution of Race among Mail and Phone Respondents in Core Hospitals

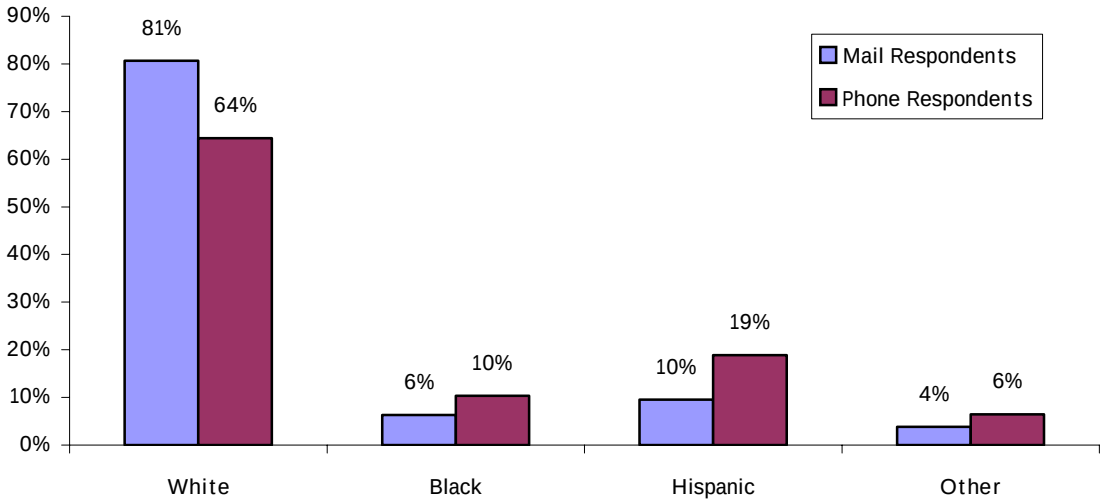
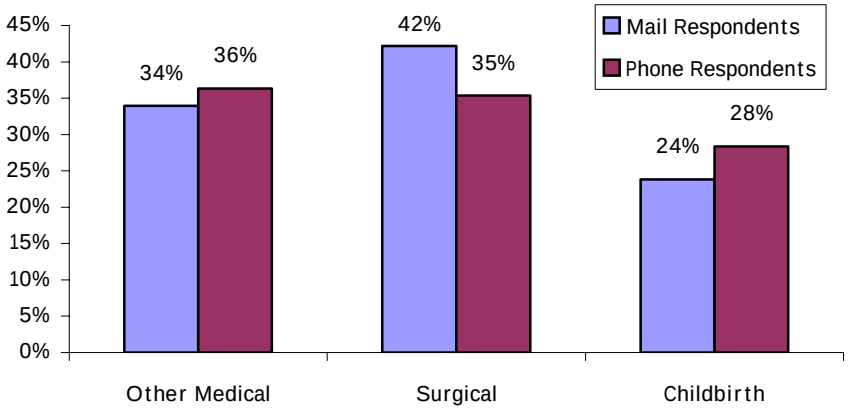


Figure 6: Distribution of Service Line among Mail and Phone Respondents in Core Hospitals



Appendix A

Notation for Hospital Level Factor Analysis, Case-Mix Adjustment, and Variance Components Models

APPENDIX A

NOTATION FOR HOSPITAL LEVEL FACTOR ANALYSIS, CASE-MIX ADJUSTMENT, AND VARIANCE COMPONENTS MODELS

Let Y_{ijk} denote the rating for a given item for the kth patient that received the jth service (surgical, child birth, other) in the ith hospital. The covariate s_{ijk} indicates if the jth service (surgery, childcare, other) was performed; $s_{ijk} = 1$ if the jth service was performed and 0 otherwise. Let x_{ijk} denote a vector of patient characteristics (general health status, mental health status, age, gender, education, Spanish language, race, proxy) considered to be potential case-mix adjustors (service is not included in this list as it is used for stratification), and $\bar{x}_j$ be the associated vector of mean values of these variables across hospitals and patients for service j.

Model Used for Hospital Level Factor Analysis

The first part of the modeling process involves fitting a model for the sampling variance and covariance of each rating in each domain. In this model, variance functions were assumed to have the form:

$$\sigma^{2,l}_{ijk} = \alpha^{l}_{1j}(M^{l}_{ijk} - \mu^{l}_{ijk}) + \alpha^{l}_{2j}\mu^{l}_{ijk}(M^{l}_{ijk} - \mu^{l}_{ijk}) + \varepsilon^{l}_{ijk},$$

where $\varepsilon^{l}_{ijk} \sim N(0, \tau^{2,l}_{\text{var}})$, and subscripts containing the superscript l point to the lth item, while covariances are modeled via the following model for the associated Pearson correlation coefficient:

$$\log\left(\frac{1+\rho^{lm}_{ijk}}{1-\rho^{lm}_{ijk}}\right) = \alpha^{lm}_{1j} + \alpha^{lm}_{2j}(M^{l}_{ijk} - \mu^{l}_{ijk})(M^{m}_{ijk} - \mu^{m}_{ijk}) + \varepsilon^{lm}_{ijk},$$

where $\varepsilon^{lm}_{ijk} \sim N(0, \tau^{2,lm}_{\text{cov}})$ and the superscripts involving l and m point to the (l,m) pair of items. With 33 items in total, the above entailed fitting 33 variance function models, and 528 covariance function models. These models allow sampling variation to be removed from the estimation of the between hospital covariance matrix.

The estimates of the γ parameters are treated as known in the second part of the modeling process, the estimation of the hospital-level covariance matrix. The following general model is used to estimate the hospital level covariance matrix:

$$Y_{ijk} \mid \mu_{ijk} \sim N(\mu_{ijk}, \mathrm{V}_{ijk}),$$
$$\mu_{ijk} \sim N(\mu_{0j}, \Sigma_j),$$

where $\mathrm{V}_{ijk} = \mathrm{V}(\mu_{ijk}, \alpha_j)$ is treated as a matrix of known functions of the variance and correlation model parameters contained in α_j. The expectation-maximization algorithm is used to obtain parameter estimates. Factor analysis is then applied to the estimated values of Σ_j.

Model Used for Case-mix Adjustment

The model for case-mix adjustment has the form:

$$Y_{ijk} \mid x_{ijk} \sim N(\mu_{ijk}, \sigma^2_{ijk}),$$

where

$$\mu_{ijk} = \theta_{ij} s_{ijk} + \beta_j^T (x_{ijk} - \bar{x}_j) \text{ and } \sigma^2_{ijk} = \sigma^2_j,$$

θ_{ij} and β_j are regression parameters for the hospital indicators and case-mix variables respectively, and σ^2_j is the error variance for outcome j. Note that previous research has shown that $\sigma^2_{ijk} = \alpha_{1j}(M_{ijk} - \mu_{ijk}) + \alpha_{2j}\mu_{ijk}(M_{ijk} - \mu_{ijk})$, where M_{ijk} is the maximum value of the rating responded to by the ijk'th patient, is an efficacious variance model for CAHPS data. However, readily available software tends not to be able to handle such models so for now we just assume that the variance is a constant function of the mean.

Model Used for Variance Components Analysis

Let h denote the subscript for region, define s_{hijk} and r_{hijk} as the indicator variables for service j in hospital i, and hospital i in region h, respectively. The model is specified as follows:

$$Y_{hijk} \mid x_{hijk} \sim N(\mu_{hijk}, \sigma^2_{hijk}),$$

where

$$\mu_{hijk} = \theta_{hij} s_{hijk} r_{hijk} + \beta^T (x_{hijk} - \bar{x}_j) + \lambda_j^T s_{hijk} (x_{hijk} - \bar{x}_j) \text{ and } \sigma^2_{hijk} = \sigma^2,$$
$$\theta_{hij} \mid \gamma_{hi} \sim N(\gamma_{hi}, \tau^2_\theta),$$
$$\gamma_{hi} \mid \nu_h \sim N(\nu_h, \tau^2_\gamma),$$
$$\nu_h \sim N(\nu_0, \tau^2_\nu),$$

In this model, θ_{hij}, β, λ_j, τ^2_γ, τ^2_θ, and σ^2 are the random intercept for service j in hospital i in region h, the vector of main-effects of the case-mix variables, the vector of parameters associated with the case-mix interaction effect contrasts for service j, and the variance components for hospitals, service within hospital, and patients within service respectively.

To evaluate the magnitude of heterogeneity in the case-mix variables across regions the following extended model was fitted:

$$Y_{hijk} \mid x_{hijk} \sim N(\mu_{hijk}, \sigma^2_{hijk}),$$

where

$$\mu_{hijk} = \theta_{hij} s_{hijk} r_{hijk} + \beta^T (x_{hijk} - \bar{x}_j) + \lambda_j^T s_{hijk} (x_{hijk} - \bar{x}_j) + \eta_{hj}^T r_{hijk} (x_{hijk} - \bar{x}_j) \text{ and } \sigma^2_{hijk} = \sigma^2,$$
$$\theta_{hij} \mid \gamma_{hi} \sim N(\gamma_{hi}, \tau^2_\theta),\ \lambda_j \sim N(\lambda_0, \Omega_\lambda),\ \text{and } \eta_{hj} \sim N(\eta_0, \Omega_\eta),$$
$$\gamma_{hi} \mid \nu_h \sim N(\nu_h, \tau^2_\gamma),$$
$$\nu_h \sim N(\nu_0, \tau^2_\nu),$$

and Ω_λ and Ω_η are the covariance matrices for the variation in the case-mix variables across services and regions respectively. The diagonal elements of Ω_λ and Ω_η are the variance components for each of

the case-mix coefficients, while the off-diagonal elements measure the covariation of the case-mix coefficients for pairs of case-mix variables, across services and regions respectively. We constrained Ω_{λ} and Ω_{η} to be diagonal matrices (i.e. all covariances were set equal to 0).

Appendix B

HCAHPS Pilot Questionnaire

Hospital CAHPS: Hospital Patient Perspectives on Care Survey

NORC is conducting a survey for the Department of Health and Human Services about patient experiences in the hospital. Please base your answers on the following information:

Hospital Name:

Approximate Discharge Date:

All the information that would identify you or your family will be kept private. Taking part in the survey is up to you. Your decision on whether to participate or not participate will not affect your health care or the benefits you get in any way.

Please return your completed survey in the enclosed postage-paid business reply envelope. You may notice some numbers on the cover of this survey. These numbers are ONLY used to let us know if you returned your survey. If you want to know more about this study, please call toll-free, 1-866-309-0544.

AQID:
CASEID:

OMB # 0938-0891

INSTRUCTIONS

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 → If Yes, Go to Question 1**
- ❑ **No**

Statement of Burden

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0938-0891. The time required to complete this information collection is estimated to average 20 minutes per response, including the time to review instructions, search existing data resources, gather the data needed, and complete and review the information collection. If you have any comments concerning the accuracy of the time estimate(s) or suggestions for improving this form, please write to: Centers for Medicare & Medicaid Services, 7500 Security Boulevard, N2-14-26, Baltimore, Maryland 21244-1850 and to the Office of the Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

1. Please confirm the hospital name and approximate discharge date listed on the cover. Is this information right?

1 ❑ Yes

2 ❑ No → If No, Stop and return this survey.

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

2. Which option below best describes the reason for this hospital stay?

1 ❑ Surgery

2 ❑ Childbirth (including caesarian section)

3 ❑ Other medical reason

3. About how many nights was this hospital stay?

*Enter number of nights:*_____

YOUR CARE FROM NURSES

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

1 ❑ Never

2 ❑ Sometimes

3 ❑ Usually

4 ❑ Always

5. During this hospital stay, how often did nurses listen carefully to you?

1 ❑ Never

2 ❑ Sometimes

3 ❑ Usually

4 ❑ Always

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

1 ❑ Never

2 ❑ Sometimes

3 ❑ Usually

4 ❑ Always

7. During this hospital stay, how often did nurses spend enough time with you?

1 ❑ Never

2 ❑ Sometimes

3 ❑ Usually

4 ❑ Always

8. During this hospital stay, did you press the call button?

1 ❑ Yes

2 ❑ No → If No, Go to Question 10

9. 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

10. We want to know your rating of the care you received from nurses during this hospital stay.

Using any number from 0 to 10 where 0 is the worst possible care and 10 is the best possible care, what number would you give the care you got from all the nurses who treated you?

- 0 ❑ Worst possible nursing care
- 1 ❑
- 2 ❑
- 3 ❑
- 4 ❑
- 5 ❑
- 6 ❑
- 7 ❑
- 8 ❑
- 9 ❑
- 10 ❑ Best possible nursing care

YOUR CARE FROM DOCTORS

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

- 1 ❑ Never
- 2 ❑ Sometimes
- 3 ❑ Usually
- 4 ❑ Always

12. During this hospital stay, how often did doctors listen carefully to you?

- 1 ❑ Never
- 2 ❑ Sometimes
- 3 ❑ Usually
- 4 ❑ Always

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

- 1 ❑ Never
- 2 ❑ Sometimes
- 3 ❑ Usually
- 4 ❑ Always

14. During this hospital stay, how often did doctors spend enough time with you?

- 1 ❑ Never
- 2 ❑ Sometimes
- 3 ❑ Usually
- 4 ❑ Always

15. We want to know your rating of the care you received from doctors during this hospital stay.

Using any number from 0 to 10 where 0 is the worst possible care and 10 is the best possible care, what number would you give the care you got from all the doctors who treated you?

- 0 ❑ Worst possible doctor care
- 1 ❑
- 2 ❑
- 3 ❑
- 4 ❑
- 5 ❑
- 6 ❑
- 7 ❑
- 8 ❑
- 9 ❑
- 10 ❑ Best possible doctor care

THE HOSPITAL ENVIRONMENT

16. During this hospital stay, how often was the temperature in your room comfortable?

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

17. During this hospital stay, how often were your room and bathroom kept clean?

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

18. 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

19. During this hospital stay, did you need help from doctors, nurses or other hospital staff with bathing, washing or keeping clean?

1 ❑ Yes
2 ❑ No → If No, Go to Question 21

20. How often did you get help with bathing, washing or keeping clean as soon as you wanted?

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

21. During this hospital stay, did you need help from doctors, nurses or other hospital staff in getting to the bathroom or in using a bedpan?

1 ❑ Yes
2 ❑ No → If No, Go to Question 23

22. 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

23. At any time during this stay, did you share a hospital room with one or more other patients?

1 ❑ Yes
2 ❑ No → If No, Go to Question 25

24. How often did doctors, nurses, and other hospital staff make sure that you had privacy when they took care of you or talked to you?

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

25. During this hospital stay, how often did doctors, nurses or other hospital staff involve you in decisions about your treatment as much as you wanted?

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

26. During this hospital stay, did your family or friends call or come to visit you?

1 ❑ Yes
2 ❑ No → If No, Go to Question 28

27. During this hospital stay, how often did your family and friends receive the help they needed when they called or visited the hospital?

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

28. During this hospital stay, when doctors, nurses, or other hospital staff first came to care for you, how often did they introduce themselves?

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

29. Did you have pain during this hospital stay?

1 ❑ Yes
2 ❑ No

30. During this hospital stay, did you have to ask for pain medicine?

1 ❑ Yes
2 ❑ No → If No, Go to Question 32

31. How often did doctors, nurses or other hospital staff respond quickly when you asked for pain medicine?

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

32. During this hospital stay, how often was your pain well controlled?

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

33. During this hospital stay, how often did the doctors, nurses or other hospital staff do everything they could to help you with your pain?

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

34. We want to ask you about medical procedures and tests, for example, drawing blood, taking x-rays, and applying and removing stitches and bandages.

During this hospital stay did you have any medical procedures or tests?

1 ❑ Yes
2 ❑ No → If No, Go to Question 36

35. How often were these tests and procedures done without causing you too much pain?

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

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

1 ❑ Yes
2 ❑ No → If No, Go to Question 42

37. Before giving you any new medicine, how often did doctors, nurses, or other hospital staff tell you the name of the medicine?

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

38. Before giving you any new medicine, how often did doctors, nurses, or other hospital staff tell you what the medicine was for?

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

39. Before giving you any new medicine, how often did doctors, nurses, or other hospital staff ask you if you were taking any other medicines or supplements?

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

40. Before giving you any new medicine, how often did doctors, nurses, or other hospital staff ask if you were allergic to any medicines?

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

41. Before giving you any new medicine, how often did doctors, nurses, or other hospital staff describe possible side effects of the medicine in a way you could understand?

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

ADMISSIONS

42. During this hospital stay, were you admitted to this hospital through the Emergency Room?

1 ❑ Yes
2 ❑ No

43. Think about when you were admitted to the hospital for this stay. Were there any unreasonable delays during the admission process?

1 ❑ Yes

2 ❑ No

44. A living will is a signed document that gives instructions about the kinds of medical treatment people want, or do not want, if they are not able to speak for themselves.

When you were admitted to the hospital for this stay, were you asked if you had a living will?

1 ❑ Yes

2 ❑ No

DISCHARGE

45. 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 52

46. After you left the hospital, did your health condition limit what you were able to do in <u>any</u> way?

1 ❑ Yes

2 ❑ No → If No, Go to Question 49

47. Before you left the hospital, did you get information in writing about what activities you could and could not do?

1 ❑ Yes

2 ❑ No

48. Before you left the hospital, did someone talk with you about whether you would have the help you needed when you were discharged?

1 ❑ Yes

2 ❑ No

49. Before you left the hospital, did you get information in writing about what symptoms or health problems to look out for after you were discharged?

1 ❑ Yes

2 ❑ No

50. Before you left the hospital, were you told to take any medicine at home that you had <u>not</u> taken before this hospital stay?

1 ❑ Yes

2 ❑ No → If No, Go to Question 52

51. Before you left the hospital, did you get information in writing about <u>how</u> to take this medicine at home?

1 ❑ Yes

2 ❑ No

OVERALL RATING OF HOSPITAL

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

52. We want to know your overall rating of this hospital.

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?

- 0 ❑ Worst hospital possible
- 1 ❑
- 2 ❑
- 3 ❑
- 4 ❑
- 5 ❑
- 6 ❑
- 7 ❑
- 8 ❑
- 9 ❑
- 10 ❑ Best hospital possible

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

- 1 ❑ Definitely no
- 2 ❑ Probably no
- 3 ❑ Probably yes
- 4 ❑ Definitely yes

54. What did you like most about the care you received during this hospital stay?

_____

_____

_____

_____

_____

_____

_____

55. If you could change one thing about the care you received during this hospital stay, what would it be?

_____

_____

_____

_____

_____

_____

_____

_____

ABOUT YOU

56. In general, how would you rate <u>your overall health</u> now?

- 1 ❑ Excellent
- 2 ❑ Very good
- 3 ❑ Good
- 4 ❑ Fair
- 5 ❑ Poor

57. In general, how would you rate your overall mental or emotional health now?

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

58. What is your age now?

1 ❑ 18 to 24
2 ❑ 25 to 34
3 ❑ 35 to 44
4 ❑ 45 to 54
5 ❑ 55 to 64
6 ❑ 65 to 74
7 ❑ 75 to 79
8 ❑ 80 or older

59. Are you male or female?

1 ❑ Male
2 ❑ Female

60. 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

61. Are you of Hispanic or Latino origin or descent?

1 ❑ Yes, Hispanic or Latino
2 ❑ No, not Hispanic or Latino

62. 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 Alaskan Indian or Alaskan Native
6 ❑ Other, (please print)

_____

63. What language do you mainly speak at home?

1 ❑ English
2 ❑ Spanish
8 ❑ Some other language, (*please print)*

_____

64. Including this hospital stay, how many hospital stays did you have in the last 12 months?

1 ❑ One
2 ❑ Two
3 ❑ Three
4 ❑ Four or more stays

65. Did someone help you complete this survey?

1 ❑ Yes

2 ❑ No → *If no, stop and return this survey*

66. How did that person help you?

Check all that apply.

1 ❑ Read the questions to me

2 ❑ Wrote down the answers I gave

3 ❑ Answered the questions for me

4 ❑ Translated the questions into my language

5 ❑ Helped in some other way, (*please print)*

_____

Thank you!

Please fold and return the completed survey in the postage-paid envelope to:

NORC
Attn: HCAHPS Survey
1 North State Street, 16th Floor
Chicago, IL 60602

OFFICE USE ONLY

Receipt		CADE		Ver.		Adjudication	
Initials	Date	Initials	Date	Initials	Date	Initials	Date

Appendix C

Revised HCAHPS Questionnaire

Hospital CAHPS®

SURVEY INSTRUCTIONS

- Answer <u>all</u> 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 on Page 1***

{This box should be placed on the Cover Page}

All information that would let someone identify you or your family will be kept private. **{SPONSOR NAME}** ***will not share your personal information with anyone without your OK. You may choose to answer this survey or not. If you choose not to, this will not affect the benefits you get.***

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

If you want to know more about this study, please call XXX.

Draft—Not for Circulation
This questionnaire may not be used without permission

This Hospital CAHPS® Questionnaire is being developed under the sponsorship of the Agency for Healthcare Research and Quality (AHRQ) and the Center for Medicare & Medicaid Services (CMS).

Please answer the questions in this survey about this stay at [FACILITY NAME]. Do not include any other hospital stay 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
- [9] ☐ I never pressed the call button

5. Using any number from 0 to 10 where 0 is the worst possible care and 10 is the best possible care, what number would you give the care you got from all the nurses who treated you?

- [0] ☐ 0 Worst possible nursing care
- [1] ☐ 1
- [2] ☐ 2
- [3] ☐ 3
- [4] ☐ 4
- [5] ☐ 5
- [6] ☐ 6
- [7] ☐ 7
- [8] ☐ 8
- [9] ☐ 9
- [10] ☐ 10 Best possible nursing care

YOUR CARE FROM DOCTORS

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

- [1] ☐ Never
- [2] ☐ Sometimes
- [3] ☐ Usually
- [4] ☐ Always

7. During this hospital stay, how often did doctors listen carefully to you?

- [1] ☐ Never
- [2] ☐ Sometimes
- [3] ☐ Usually
- [4] ☐ Always

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

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

9. Using any number from 0 to 10 where 0 is the worst possible care and 10 is the best possible care, what number would you give the care you got from all the doctors who treated you?

0 ☐ 0 Worst possible doctor care
1 ☐ 1
2 ☐ 2
3 ☐ 3
4 ☐ 4
5 ☐ 5
6 ☐ 6
7 ☐ 7
8 ☐ 8
9 ☐ 9
10 ☐ 10 Best possible doctor care

THE HOSPITAL ENVIRONMENT

10. During this hospital stay, how often were your room and bathroom kept clean?

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

11. 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

12. During this hospital stay, did you need help from doctors, nurses or other hospital staff in getting to the bathroom or in using a bedpan?

1 ☐ Yes
2 ☐ No ➔ **If No, Go to Question 14**

13. 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

14. During this hospital stay, did you need medicine for pain?

1 ☐ Yes
2 ☐ No ➔ **If No, Go to Question 17 on Page 3**

15. During this hospital stay, how often was your pain well controlled?

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

16. 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

17. During this hospital stay, did doctors, nurses, or other hospital staff ever ask if you were allergic to any medicine?

1☐ Yes
2☐ No

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

1☐ Yes
2☐ No ➔ **If No, Go to Question 20**

19. Before giving you the medicine, did hospital staff describe possible side effects in a way you could understand?

1☐ Yes
2☐ No

WHEN YOU LEFT THE HOSPITAL

20. 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 23**

21. During your hospital stay, did hospital staff talk with you about whether you would have the help you needed when you left the hospital?

1☐ Yes
2☐ No

22. During your 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 the stay at the hospital _____ shown on the cover. Do not include any other hospital stays in your answer.

23. 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?

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

24. 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.

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

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

26. In general, how would you rate your <u>overall mental or emotional health</u>?

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

27. What is the highest grade or level of school that you have <u>completed</u>?

[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

28. Are you of Hispanic or Latino origin or descent?

[1]☐ Yes, Hispanic or Latino
[2]☐ No, not Hispanic or Latino

29. 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 Alaskan Indian or Alaskan Native
[8]☐ Other (please print):

_____

30. What language do you <u>mainly</u> speak at home?

[1]☐ English
[2]☐ Spanish
[8]☐ Some other language (please print): _____

31. Did someone help you complete this survey?

[1]☐ Yes ➔ **Go to Question 32**
[2]☐ No ➔ **Please return the survey in the postage-paid envelope.**

32. How did that person help you? Check all that apply.

[1]☐ Read the questions to me
[2]☐ Wrote down the answers I gave
[3]☐ Answered the questions for me
[4]☐ Translated the questions into my language
[5]☐ Helped in some other way

THANK YOU

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