

# Mode Adjustment of the CAHPS<sup>®</sup> Hospital Survey

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## Abstract

A randomized Mode Experiment of 27,229 discharges from 45 hospitals was used to develop adjustments for the effects of survey mode (Mail Only, Telephone Only, Mixed, or Active Interactive Voice Response) on responses to the CAHPS<sup>®</sup> Hospital Survey (also known as Hospital CAHPS or HCAHPS). In general, patients randomized to the Telephone Only and Active Interactive Voice Response modes provided more positive evaluations than patients randomized to Mail Only and Mixed (Mail with Telephone follow-up) modes. These mode effects varied little by hospital, and were strongest for global items (Rating and Recommendation) and the Cleanliness & Quiet, Responsiveness, Pain Management, and Discharge Information composites. Adjustments for these mode effects are necessary to make the reported scores independent of the survey mode that was used.

## Introduction

The intent of the CAHPS<sup>®</sup><sup>1</sup> Hospital Survey, also known as Hospital CAHPS<sup>®</sup> or HCAHPS, is to provide a standardized survey instrument and data collection methodology for measuring patients' perspectives of hospital care. One of the methodological issues associated with making comparisons across hospitals is the need to adjust appropriately for patient-mix differences, survey mode, and non-response. In order to ensure that HCAHPS scores are being fairly and accurately compared across hospitals, CMS conducted a Mode Experiment in early 2006 to examine whether mode of data collection systematically affects survey results and to develop any needed statistical adjustments.

Patient-mix refers to patient characteristics that are *not under the control of the hospital* that may affect measures of patient experiences. These include demographic characteristics and general health status. The basic goal of adjusting for patient-mix is to estimate how different hospitals would be rated if they all provided care to comparable groups of patients. It is necessary to adjust for survey mode because hospitals participating in the HCAHPS survey have the option of choosing among four different modes of data collection: Mail, Telephone, Mail combined with Telephone follow-up (also known as Mixed mode), and Active Interactive Voice Response (IVR).

A random sample of 45 hospitals from across the United States participated in the Mode Experiment in early 2006. Each hospital provided a sample of discharged patients who met HCAHPS-eligibility criteria. These samples were randomly allocated to each of the four

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<sup>1</sup> CAHPS<sup>®</sup> (Consumer Assessment of Healthcare Providers and Systems) is a registered trademark of the Agency for Healthcare Research and Quality, a U.S. Government agency.

modes in equal numbers within each hospital and the patients were then surveyed accordingly. Sample selection and surveying for the Mode Experiment were conducted by the National Opinion Research Center (NORC) of the University of Chicago. Analysis of Mode Experiment data and construction of the adjustment algorithms were performed by the RAND Corporation.

### **The HCAHPS Mode Experiment**

This document describes the derivation of mode adjustments for HCAHPS on the basis of a randomized Mode Experiment. To assess the effect of mode of data collection, an experiment was conducted to compare four different modes of data collection: Telephone interview only; Mail questionnaire only; Mixed mode (Mail questionnaire with Telephone follow up if needed); and Active IVR. In the Active IVR mode, live telephone interviewers contact the patients and invite them to participate in an automated IVR interview using their telephone keypads.

Certain patient characteristics, such as age and education, are not under the control of the hospital, but are related to the patient's experiences and survey responses. For example, several studies have found that younger and more educated patients provide less positive evaluations of healthcare. Thus, one should adjust for such respondent characteristics when comparing hospitals' CAHPS results.

Similarly, the randomized test of the HCAHPS survey has found that patients tend to report more positive healthcare experiences when they are surveyed over the Telephone (including IVR) than when they are surveyed by Mail. One should adjust for the survey approach that a hospital uses, so that the reported scores are not affected by the hospital's choice of what is called *survey mode*.

Table 1 describes response rates from the HCAHPS Mode Experiment. As can be seen, the response rate was highest for Mixed mode (41.2%) and lowest for IVR (20.7%). Although there was some variation in response rate by hospital (the hospital-level standard deviation in response rates was 5.6%), the response rate patterns by mode were consistent across hospitals. While hospitals should base their anticipated response rates in part on their own experiences, it should be noted that in the HCAHPS Mode Experiment, it was necessary to field about 2.73 discharges in the Mixed mode (1/0.366) and 5.59 discharges in the IVR mode (1/0.179) for every completed survey. The last row of Table 1 suggests that, as a starting point, one might field 820 eligible discharges in Mixed mode and 1676 surveys in IVR mode in order to achieve the required 300 completed surveys over four quarters.

Table 1  
Comparison of Patient Response Rates by Survey Mode

	MAIL ONLY	TELEPHONE ONLY	MIXED	ACTIVE IVR	OVERALL
Discharges Randomized to Mode	6806	6808	6808	6807	27,229
Cases Determined to be Ineligible in the Field	23 (0.3%)	928 (13.6%)	761 (11.2%)	900 (13.2%)	2612 (9.6%)
Completed Surveys	2239	1607	2489	1220	7555
Response Rate of Eligible Patients (Completes/Eligible)	33.0%	27.3%	41.2%	20.7%	30.7%
Yield (Completes/Randomized)	32.9%	23.6%	36.6%	17.9%	27.7%
Expected Discharges Needed for 300 Completes (300/Yield)	912	1271	820	1676	

### Mode Adjustment Approach

Although the HCAHPS Mode Experiment involves randomization to mode within hospitals, CMS estimates mode effects in linear models that include both hospital fixed effects and patient-mix adjustment (PMA)<sup>2</sup> for demographic factors associated with response tendency in order to maximize the precision of mode effects estimates and adjustments.<sup>3</sup> For each HCAHPS rating or report item, a linear regression model consisting of mode fixed effects, hospital fixed effects, and patient-mix adjusters was estimated. Adjustment of composite scores takes place through adjustment of individual constituent report items and consists of an average of those effects.

<sup>2</sup> Also known as *case-mix adjustment* (CMA) in other parts of the CAHPS literature. CMS uses the term *patient-mix adjustment* here to distinguish this adjustment from severity adjustments for clinical outcomes or payment.

<sup>3</sup> Forthcoming (2007) documents will discuss the nature of the PMA, which made little difference in calculating mode adjustments, but which will have more of a role in adjusting reported scores.

CMS selected the Mail Only mode as the reference mode of survey administration. Surveys conducted in the Mail Only mode are not adjusted further for mode after PMA. Surveys conducted in any of the other three modes (Telephone Only, Mixed, and IVR) are further adjusted according to the difference in mode effects between that mode and the Mail Only mode, as estimated through the HCAHPS Mode Experiment. This approach results in estimates for hospitals that correspond to the score the hospital would have received if it had the same patients as other hospitals and conducted the survey in the Mail Only mode, regardless of patient mix or mode of administration.

### **Mode Adjustment Results**

The HCAHPS Mode Experiment found that, in general, patients provided more positive responses in the Telephone Only and IVR modes than in the Mail Only and Mixed modes. There were very few differences in responses between the Mail Only and Mixed modes. Mode effects were largely independent of PMA and varied little by hospital. Mode effects were strongest for global items (Rating and Recommendation), and the Cleanliness & Quiet, Responsiveness, Pain Management, and Discharge Information composites.

Table 2 presents mode adjustments derived from the HCAHPS Mode Experiment for the top category, or “top box,” proportion (e.g., the proportion of desirable “always” responses for items on the Nurse Communication composite). As an example, a patient-mix adjusted score of 84.2% “always” for the Nurse Communication composite for a survey conducted by Telephone Only mode would be further adjusted to  $(84.2\% - 4.2\% = )$  80.0% in order to account for the fact that 80.0% is the corresponding expected score for that composite had the survey been conducted in Mail Only mode. Here, 4.2% represents the increase in the proportion of patients responding “always” that would be expected from the same patients had they been surveyed by Telephone Only mode (when compared to Mail Only reference mode).

The standard error of a patient-mix adjusted estimate can also be updated to take into account mode adjustment. The new standard error is simply the square root of the sum of the squared standard error before mode adjustment (SEold), and the square of the standard error that appears in Table 2, as follows  
(SEmode\_exp):  $SE_{new} = \text{SQRT} (SE_{old}^2 + SE_{mode\_exp}^2)$ .

### **The Mode Adjustment Spreadsheet and the CAHPS Analysis Program**

In early 2007, CMS will make available adjustments for both mean scoring and top-category percentages. At that time, an Excel spreadsheet model that performs mode adjustments will also be provided. This spreadsheet takes as inputs patient-mix adjusted hospital-level means or percentages and their associated standard errors prior to mode adjustment. These patient-mix adjusted means, percentages, and standard errors can be produced by a variety of means. The most straightforward way of obtaining these values may be the CAHPS Analysis Programs (also known as the “CAHPS Macro”), which are publicly available SAS programs maintained by Harvard Medical School and available for download at <https://www.cahps.ahrq.gov/cahpskit/Healthplan/HPChooseQx2.asp>.

These programs require the exact specification of patient-mix adjustors (called “case-mix adjustors” in that program), which will also be supplied by CMS in early 2007. The Excel mode-adjustment spreadsheet will then convert the patient-mix adjusted scores and standard errors into fully adjusted scores that incorporate mode-adjustment into the patient-mix adjustment that has already been performed. This spreadsheet is unnecessary for surveys conducted in Mail Only mode, which is the reference mode. For each of the other three modes, the spreadsheet displays the fully-adjusted scores and standard errors, which will allow a hospital to find its final adjusted scores in the columns corresponding to the survey mode it employed. Adjustments will be available for individual items, as well as for composites. Hospitals can then compare these fully-adjusted scores to other hospitals, national or regional averages, or their own past performance, regardless of which of the four survey modes were employed.

Table 2

Mode Adjustments of Top Category Percentages (after any PMA) to Adjust Other Modes to a Reference of Mail Only

<b>HCAHPS Composite or Rating</b>	Telephone Only		Mixed Mode		IVR	
	<b>Mode Adjustment</b>	<i>SE of Adjustment</i>	<b>Mode Adjustment</b>	<i>SE of Adjustment</i>	<b>Mode Adjustment</b>	<i>SE of Adjustment</i>
Nurse Communication	<b>-4.2%</b>	1.2%	<b>-0.4%</b>	1.1%	<b>-1.9%</b>	1.3%
Doctor Communication	<b>-1.4%</b>	1.1%	<b>+0.9%</b>	1.0%	<b>-0.5%</b>	1.3%
Cleanliness and Quiet of Hospital Environment	<b>-5.9%</b>	1.2%	<b>-2.6%</b>	1.1%	<b>-6.2%</b>	1.4%
Responsiveness of Hospital Staff	<b>-4.8%</b>	1.6%	<b>+0.1%</b>	1.4%	<b>-2.1%</b>	1.7%
Pain Management	<b>-4.9%</b>	1.5%	<b>-2.4%</b>	1.4%	<b>-3.6%</b>	1.7%
Communication about Medicines	<b>-4.0%</b>	1.8%	<b>-0.9%</b>	1.5%	<b>-1.9%</b>	2.0%
Discharge Information	<b>-1.4%</b>	1.1%	<b>+0.1%</b>	1.0%	<b>-3.2%</b>	1.2%
Recommendation	<b>-4.5%</b>	1.5%	<b>-1.5%</b>	1.3%	<b>-2.3%</b>	1.6%
Rating <sup>4</sup>	<b>-3.0%</b>	1.6%	<b>-1.9%</b>	1.4%	<b>-1.7%</b>	1.7%

<sup>4</sup> Beginning 2007, the top category for 0-10 ratings will be the proportion of ratings that are 9 or 10, as reflected here.