Analysis of Baseline Measures in the Medicare Current Beneficiary Survey for Use in Monitoring the National Medicare Education Program

Final Phase One Report

Research Triangle Institute
3040 Cornwallis Road
PO Box 12194
Research Triangle Park, NC 27709-2194

Authors:
Arthur J. Bonito, Ph.D.
Carla Bann, Ph.D.
May Kuo, Ph.D.
San Keller, Ph.D.
Lauren A. McCormack, Ph.D.
Wayne L. Anderson, M.Div.
Steven A. Garfinkel, Ph.D.

HCFA Contract Number 500-95-0061/004
University of Wisconsin Project Number 500-95-0061/004
RTI Project Number 7569-001

November 13, 2000

Contents

Page

Contents (continued)

Page

List of Exhibits and Tables

Page

List of Exhibits and Tables (continued)

Page

List of Exhibits and Tables (continued)

Page

Analysis of Baseline Measures in the Medicare Current Beneficiary Survey for Use in Monitoring the National Medicare Education Program

Executive Summary

Background

Current changes to the Medicare program increase the number and range of choices available to beneficiaries. The creation of Medicare+Choice and Medicare HMOs as well as changes within the fee-for-service program over time have presented beneficiaries with many challenges in understanding their benefits and options. The Health Care Financing Administration (HCFA) and the Congress have expressed concern about the ability of Medicare beneficiaries to make informed choices in this changing environment.

Recent research has documented the low level of understanding that beneficiaries possess about the Medicare program. Many beneficiaries do not understand what is covered, who operates the program, or what plan options are available to them. Many have never heard of a Medicare HMO and the vast majority is unable to identify the differences between the original Medicare program and a Medicare managed care plan. This is an especially important finding, as understanding the differences among original Medicare, Medicare HMOs, and the newer Medicare+Choice options is a prerequisite to making an informed choice. Thus, the need is greater than ever for easily understood information about Medicare that beneficiaries are motivated to use.

The National Medicare Education Program (NMEP) is HCFA's coordinated effort to address this apparent lack of beneficiary understanding, in both the short and long term, by creating useful information resources (e.g., print materials, Internet materials, toll-free information hotlines, trained intermediaries), informing beneficiaries that these resources are available, and motivating them to use the resources.

The goals of the NMEP are:

- increasing beneficiary access to information,
- raising beneficiary awareness of these new information sources,
- helping beneficiaries understand the choices that can be made, and
- helping beneficiaries use the information obtained to make an optimal choice.

HCFA must identify and use data collected from beneficiaries to monitor progress toward achievement of the NMEP goals, and measuring progress using knowledge constructs or indices is an important avenue for determining if the NMEP is successful.

The purpose of this report is to recommend Medicare Current Beneficiary Survey (MCBS) variables that provide a baseline for measuring progress toward achievement of the four

NMEP goals, and to help HCFA identify effective measures of beneficiary knowledge that can be used to evaluate the NMEP. This effort will be achieved by accomplishing the following four objectives:

- Identify measures in the MCBS that potentially may be used as baseline measures;
- Evaluate the reliability and validity of potential baseline MCBS variables and recommend measures to be used for measuring NMEP progress;
- Assess how these recommended measures vary with important beneficiary attributes; and
- Identify important knowledge measures from prior work on the NMEP that can be used in future monitoring of the NMEP.

Two reports are planned for this project. This Phase 1 report will identify MCBS variables that can be used to establish a pre-NMEP baseline. The Phase 2 report will identify progress toward NMEP goals using 1998 MCBS Rounds 23 and 24, which immediately follow NMEP implementation. The Phase 2 report contains analyses using MCBS variables that were explicitly created to measure progress toward NMEP goals, and can be used in future longitudinal analyses.

Key Findings

Four measures related to knowledge were identified in the MCBS that may potentially serve as baseline measures for monitoring the NMEP. One measure concerned beneficiaries' perceived understanding of Medicare generally, two measures concerned their knowledge of benefits, and one measure concerned their perceived knowledge about specific aspects of the Medicare program. Of these four measures, only the 4-item quiz in Round 18 and the Know All Need To Know Index in Rounds 18 and 24 were found to be acceptable with respect to internal consistency reliability and construct validity.

To investigate the effects of the NMEP on beneficiary knowledge as measured by these two indexes, descriptive analyses were conducted. Persons who were hypothesized to be more knowledgeable generally had the most favorable knowledge outcomes. Persons who were married, male, 65-75 years of age, white non-Hispanic, had more than $25,000 in income, in households with two persons, and college educated were more knowledgeable. In addition, persons who did not have a proxy answer for them, had no limitations in the activities of daily living, and reported themselves to be in very good or excellent health status were more knowledgeable. Finally, persons without disabilities, who had Medicare and private insurance, and with some utilization of health services were more knowledgeable.

In general, persons who were: divorced, separated, or otherwise living alone; under age 65; had minority group status; had lower income; lived in larger households; had less than an 8th grade education; had several limitations in the activities of daily living; said they were in fair or poor health, were disabled; had both Medicare and Medicaid; and had no use of services were less knowledgeable. These persons may be the most appropriate persons toward whom to target knowledge improvement efforts. The NMEP strategy may prove more efficient if focused on characteristics where there was a large variance in the distribution of responses, and then

targeted to those individuals who scored much lower than other respondents. An example of a characteristic with a large variance is Type of Health Insurance, where persons with both Medicare and Medicaid scored substantially lower on knowledge measures than persons in other insurance categories.

RTI is conducting two other studies for HCFA in which it has created and evaluated indices to measure knowledge in the Medicare population. These studies include the *Evaluation of Medicare CAHPS and the Medicare & You* 1999 *Handbook in Kansas City* and the *Expanded (National) Evaluation of the Medicare & You* 2000 *Handbook*. For each of these evaluations, RTI created a knowledge index to assess how well beneficiaries understand the Medicare program and related health insurance options.

We compared the psychometric performance of these two indices and the 8-item quiz from MCBS Round 23 to determine which provides the best measure of knowledge for future research. Based on the results of the scale-level and item-level psychometric analyses, the *National Evaluation* index performed best. This index had the highest reliability of the three scales and demonstrated evidence of construct validity. The index contains a variety of difficulty levels, allowing it to measure the knowledge of beneficiaries with a wide range of ability levels. Finally, the *National Evaluation* index performed well with respect to item content. Results of the factor analyses as well as the content of the items suggest that this scale measures a wider range of topics in comparison to the other two knowledge scales. This diversity allows the scale to more accurately assess the knowledge beneficiaries need to successfully navigate the Medicare program.

We also compared questions that were common to both the MCBS and the *National Evaluation*. One set of questions dealt with the use of the handbook by beneficiaries and the second set were knowledge quizzes. Only two questions concerning the use of the handbook could be compared between the two surveys. *National Evaluation* respondents were more likely to read and keep the handbook than MCBS respondents. Five of the quiz questions could be compared directly. On three of the five questions there was considerable difference in responses, with respondents from the *National Evaluation* scoring higher on two of the three questions, perhaps because these persons had received the handbook as an intervention and knew they were being evaluated.

Conclusion

Two sets of MCBS questions form knowledge indices that may be used as baseline measures in tracking the progress of the NMEP. One index measures beneficiary knowledge using 4 questions with objective answers, and the other index measures the perceived knowledge of beneficiaries using 5 questions. In general, persons who were socio-economically disadvantaged, had health limitations, had Medicaid, and who did not use any services scored lower on these knowledge indices in the 1996 MCBS. However, questions from the *Expanded (National) Evaluation of the Medicare & You* 2000 Handbook performed better than the MCBS questions.

Future efforts are needed to develop an analysis framework for MCBS longitudinal modeling to track NMEP progress, develop additional measures for assessing the impact of the NMEP, make direct comparisons among knowledge questions administered to the same population, and create an optimum knowledge index using item response theory, which enables the knowledge scale to vary in response to changes in NMEP objectives, while maintaining the ability to measure trends.

1.0 Introduction

1.1 Background on NMEP

Recent changes to the Medicare program increase the number and range of options open to individual beneficiary choice. Understanding these options and choosing optimally places a greater burden on beneficiaries at the same time that they express concern over decreasing cognitive acuity from aging (Gibbs et al., 1996). Thus, the need is greater than ever for easily understood information about Medicare that beneficiaries are motivated to use.

Several studies have documented that adults of all ages have an inadequate understanding of their health insurance coverage (Mechanic, 1989; Isaacs, 1996; Garnick, 1993). Now there is a growing body of research documenting the low level of understanding that Medicare beneficiaries possess about the Medicare program (Gibbs et al., 1996; Hibbard et al., 1998; Murray and Shatto, 1998; National Academy of Social Insurance (NASI), 1998). Many beneficiaries do not understand what is covered, who operates the program, or what plan options are available under the Medicare program. Many have never heard of a Medicare HMO and the vast majority are unable to identify the differences between the original Medicare program and a Medicare managed care plan (Hibbard et al., 1998). This is an especially important finding, as understanding the differences among original Medicare, Medicare HMOs, and the newer Medicare+Choice options is a prerequisite to making an informed choice. The National Medicare Education Program (NMEP) is the Health Care Financing Administration's (HCFA) coordinated effort to address this problem, in both the short and long term, by creating useful information resources (e.g., print materials, Internet materials, toll-free information hotlines, trained intermediaries), informing beneficiaries that these resources are available, and motivating them to use the resources.

The goals of the NMEP are:

- increasing beneficiary access to information,
- raising beneficiary awareness of these new information sources,
- helping beneficiaries understand the choices that can be made, and
- helping beneficiaries use the information obtained to make an optimal choice.

While beneficiary knowledge per se is not an NMEP goal, it is an important construct for measuring attainment of the NMEP goals. HCFA must identify and use data collected from beneficiaries to monitor progress toward the NMEP goals, and measuring progress using knowledge constructs or indices is one important avenue for determining if the NMEP is successful.

1.2 Purpose

The purpose of this report is to recommend Medicare Current Beneficiary Survey (MCBS) variables that provide a baseline for measuring progress toward achievement of the four NMEP goals, and to help HCFA identify effective measures of beneficiary knowledge. This effort involves the following objectives:

- Identify items in the MCBS that may potentially be used as baseline measures;
- Evaluate the reliability and validity of potential baseline MCBS variables for measuring NMEP progress;
- Assess how these measures vary with important beneficiary attributes; and
- Identify important knowledge measures from prior work on the NMEP that can be used in future monitoring of the NMEP.

This report is the first of two reports concerning how the MCBS can be used to effectively measure progress toward NMEP goals. While this Phase 1 report will identify MCBS variables that could be used to establish a pre-NMEP baseline, the Phase 2 report will identify progress toward NMEP goals using 1998 MCBS Rounds 23 and 24 which immediately followed full national NMEP implementation. The Phase 2 report contains analyses using MCBS variables that were explicitly created to measure progress toward achievement of NMEP goals, and potentially can be used in future longitudinal analyses.

Two companion reports accompany the Phase 1 and Phase 2 reports. The *Technical Note 1: Knowledge Index* contains psychometric analyses of four potential measures that we considered for measuring NMEP progress. *Technical Note 2: Preliminary Baseline Analysis* contains the foundation for longitudinal analyses that takes advantage of the 5-state pilot project where the *Medicare & You* handbook was initially fielded. All of these reports serve to provide HCFA with information and recommendations for using the MCBS to measure progress toward achievement of the NMEP goals.

2.0 Potential MCBS Baseline Measures for Monitoring the NMEP

2.1 Rationale for Using Knowledge to Evaluate Achievement of NMEP Goals

Progress toward accomplishment of the NMEP goals is best determined by measuring beneficiaries' knowledge of the Medicare program. Ideally, measures should be found to track progress toward each of the goals of the NMEP. Items that precede the implementation of the NMEP would be likely candidates for monitoring progress toward each of these NMEP goals as they could be used in a longitudinal pretest and post test design. A model for using knowledge to evaluate progress toward achievement of NMEP goals is displayed in ***Exhibit 1***.

Exhibit 1. Logic Model for Evaluating Achievement of NMEP Goals

Lack of Knowledge → NMEP Activities → Increased Knowledge → Desired NMEP Outcomes

We constructed potential measures of knowledge from individual MCBS questions to develop single or multi-item knowledge indices designed to measure achievement of NMEP goals. We then analyzed data for each of the knowledge indices constructed to provide estimates of their internal consistency (reliability) and construct validity. These two characteristics are important in determining whether scores yielded by a knowledge index are repeatable and whether they provide important information about beneficiary knowledge. We then used the results of these psychometric analyses to make recommendations of which knowledge indices to use as MCBS baseline measures for monitoring the achievement of NMEP goals.

2.2 Candidates for Baseline Measures

Only four measures appear in both pre- and post-NMEP rounds of the MCBS and can be considered for evaluation as potential baseline knowledge measures. Other measures that we considered as potential baseline measures focus on a need for information or satisfaction. While these measures may provide information that could be used for other purposes, they are not recommended as knowledge measures by which one could monitor the effects of NMEP activities. The four measures we used are:

(1) ***perceived understanding of Medicare.*** A single yes or no dichotomous question that asks whether Medicare is understandable, but only in the 1995 to 1997 MCBS. This is a global indicator of understanding of the Medicare program, but it does not continue past 1997, and its presumed "replacement" in the 1998 and 1999 MCBS is quite a bit different.

(2) ***Medicare benefits knowledge in 1996.*** A knowledge index about benefits covered by Medicare found in the 1996 MCBS. The index is a true-false quiz composed of four questions. This quiz is limited in its use as a knowledge index to measure NMEP progress over time as it has so few questions. This measure of program knowledge is also limited to benefits available in the Medicare program and does not include questions about Medicare options and choices.

(3) ***Medicare benefits knowledge in 1998.*** A knowledge index about benefits covered by Medicare found in the 1998 MCBS. This index is also a true-false quiz composed of three questions, only one of which is the same as the four-item quiz in the 1996 MCBS. This quiz is also limited in its use as a knowledge index as it has even fewer questions and focuses on benefits and not on options or choices of beneficiaries. The 1998 MCBS items have been repeated in the 1999 MCBS.

(4) ***perceived knowledge of aspects of Medicare.*** A knowledge measure derived from five out of a series of seven questions (one item that applies only to Medicaid recipients and another that refers to staying healthy were not included in the index), each with 5 levels of response. This knowledge measure reflects how much beneficiaries perceive they know about particular aspects of the Medicare program. Each question in the index appeared in the 1996, 1998 and 1999 MCBS. It does not measure "knowledge" in a direct manner but attempts to capture how much the beneficiaries think they know about multiple aspects of the Medicare program. One would expect the NMEP to increase the level of perceived knowledge of the program over time. Measured knowledge is likely to be moderately related to perceived knowledge.

Changes in these measures over time could serve as outcomes that are used to evaluate progress toward achievement of NMEP goals. In the following section the ability of each of these measures to effectively monitor the NMEP is evaluated. The items used to create the indices are presented in ***Exhibit 2***.

Exhibit 2. Items from the 1995-1998 MCBS Used to Construct Knowledge Indices to Serve as Baseline Measures to Monitor Impact of NMEP

1	**Perceived understanding of Medicare (Found in the 1995, 1996 and 1997 MCBS in the PR section of rounds 14, 17 and 20.)**
(1)	In general, do you think the Medicare program is understandable?
2	**Medicare Benefits Knowledge (Found in the 1996 MCBS in the OL section of round 18.)**
(1)	Medicare pays for flu shots.
(2)	Medicare pays for an annual physical exam.
(3)	A doctor who accepts assignment can't charge more than Medicare allows for covered services.
(4)	If you do not agree with a decision Medicare makes on a claim from a hospital or doctor, such as whether it will cover the service or how much it will pay, you can appeal the decision.
3	**Medicare Benefits Knowledge (Found in the 1998 MCBS in the BN section of round 24.)**
(1)	Medicare covers colorectal cancer screening.
(2)	Medigap or supplemental insurance is the same as a Medicare managed care plan.
(3)	Medicare covers an annual flu shot.
4	**Perceived Knowledge of aspects of Medicare (Found in the 1996, 1998 and 1999 MCBS in the OL/BN section of rounds 18, 24 and 27.)**
(1)	How much do you feel you know about the Medicare program, such as what services Medicare covers or does not cover?
(2)	How much do you feel you know about how much you have to pay for medical services covered by Medicare?
(3)	How much do you feel you know about supplemental or Medigap insurance, such as what it covers or how it works with Medicare to pay medical claims?
(4)	How much do you feel you know about the availability and benefits of Medicare Health Maintenance Organizations?
(5)	How much do you feel you know about choosing or finding a doctor or other healthcare provider?

3.0 Index Construction and Psychometric Testing of Candidate Measures

In this section we describe how each of the knowledge indices was constructed, and provide a summary of the results of psychometric tests conducted. Based on these tests, we recommend baseline knowledge measures drawn from MCBS questions that can be used for evaluating the achievement of NMEP goals.

3.1 Scoring Algorithms

Knowledge indices were created for each series of MCBS questions described above. A knowledge index aggregates responses to individual questions in each set, resulting in a metric used for recording a single score across all questions in the set. A total of four different knowledge indices were created. The first index measures perceived understanding of the Medicare program in general and appears only in 1996. The second and third indices are drawn from questions about Medicare benefits, with four questions in the index for the 1996 MCBS, and three questions for the index in the 1998 MCBS. The fourth index measures perceived knowledge of specific aspects of the Medicare program. This index is the same in the 1996 and the 1998 MCBS. The construction of each of these as knowledge indices is discussed more fully in the following sections.

Medicare Understandability Question

This knowledge index is a single question from the PR sections of the 1995 through 1997 MCBS and asks whether respondents perceive that they understand the Medicare program as a whole. Affirmative ("Yes") responses to this question were coded as "1," while responses of "No" were coded as "0." Responses of "Don't Know," "Refused," and "Not Ascertained" were coded as missing.

Four-Item Quiz

In the 1996 MCBS Round 18, four questions were asked of respondents in the form of a quiz on Medicare benefits and processes. Correct responses to each of the four quiz questions were coded as "1," while all other responses (incorrect responses and don't know) were coded as "0." A fifth potential quiz question addressing Medicare coverage for mammograms was excluded from the score calculation because it was only asked of women. The recorded responses were then summed to create the quiz scores. For example, the score for a respondent who answered two out of the four quiz questions correctly would be calculated as

$$0 + 1 + 1 + 0 = 2.$$

An advantage of this scoring method is that it produces scores that have a meaningful interpretation, specifically, the number of questions for which the respondent knew the correct answer. Scores range from 0 to 4, with higher quiz scores reflecting more correct responses about Medicare benefits coverage.

Three-Item Quiz

Similar scoring methods were used for a three-item quiz concerning Medicare benefits in the 1998 MCBS Round 24. As with the four-item quiz, a potential quiz question concerning Medicare coverage of mammograms was excluded because it was asked only of women. The responses to the three remaining quiz questions were recoded so that correct responses were coded as "1" and all other responses (incorrect responses and don't know) were coded as "0." The quiz score was computed by summing the recoded responses to the three quiz questions. This produces a score representing the total number of questions answered correctly. For example, a respondent who had only one correct response and two incorrect responses received a score of 1 as follows:

$$1 + 0 + 0 = 1$$

This scoring system produces scores ranging from 0 to 3 with higher scores indicating more knowledge of the Medicare system.

Know-All-Need-to-Know Index

This knowledge index is calculated from round 18 of the 1996 MCBS and represents a respondent's perceived knowledge about whether they think they know all they need to know about certain aspects of the Medicare program. The items in this index were also included in the 1998 and 1999 MCBS. The know-all-need-to-know index was created by reverse scoring each of the five response categories across the questions. For example, in the original coding of the variables, knowing "Just about everything I need to know…" was coded as "1" and knowing "Almost none of what I need to know…" was coded as "5." The former response was recoded as "5" while the latter was recoded as "1." Responses for "2" and "4" were also switched. Responses were then summed.

If a respondent's recoded answers to the original questions were "3," "4," "2," "1," and "5", the knowledge score would be calculated as follows:

$$3 + 4 + 2 + 1 + 5 = 15.$$

Higher scores on this index reflect beneficiaries reporting that they knew more of what they thought they needed to know across five different topics. This scoring system produces scores that may theoretically range from 5 to 25, thus providing greater variability in scores and more power to discriminate among and within beneficiaries.

Where data were missing, the know-all-need-to-know index was calculated by imputing values rather than altogether eliminating a respondent's answers. Imputation was only used for respondents who answered at least three of the know-all-need-to-know items by substituting the mean value of the answered items for the missing items (Chapman, 1976). Individuals with missing responses for more than two of the know-all-need-to-know questions were assigned a value of missing for this index.

3.2 Psychometric Testing of Knowledge Indices

Psychometric analyses were conducted on the knowledge indices described above to determine their reliability and validity as measures of knowledge. (The Knowledge Index Technical Note dated May 5, 2000 contains a full report of all psychometric testing conducted on these and other knowledge indices and serves as a companion deliverable to this report.) The reliability of the scales was assessed using internal consistency. Internal consistency measures the degree to which items on a scale are related to each other and therefore appear to be measuring the same construct. The internal consistency reliability of all multi-item indices was estimated using Cronbach's alpha coefficient (Cronbach, 1951). Coefficient alpha was not calculated for the scale measuring perceived understanding of Medicare because it contains only one item. Test-retest reliability of the knowledge indexes was not conducted as the time period between responses was approximately two years, and test-retest reliability is usually measured over much shorter intervals.

Construct validity was assessed by determining if scale scores discriminated among groups of Medicare beneficiaries who would be expected to differ in their knowledge of Medicare. Based on previous research (McCall, Rice and Sangl, 1986; Hibbard, Jewett, Englemann, and Tusler, 1998; McCormack, Garfinkel, Hibbard, Keller, Kilpatrick, and Kosiak, 2000), it was expected that the following groups of beneficiaries would have higher levels of knowledge about the Medicare system:

- male beneficiaries,
- white beneficiaries,
- beneficiaries with higher incomes,
- beneficiaries with more education, and
- beneficiaries with supplemental insurance.
- beneficiaries between 65 and 74 years of age
- beneficiaries with more health care utilization.

In addition, construct validity was assessed by examining the correlation between the knowledge indices. A high correlation with other knowledge scales provides additional evidence for the construct validity of a knowledge scale.

A summary of the psychometric properties of these knowledge measures is presented in ***Table 1***. (The results of the reliability and validity analyses are presented in pages 10-21 of the Knowledge Index Technical Note.) Of the four different knowledge indices analyzed, only the 4-item quiz in Round 18 and the Know All Need To Know Index in Rounds 18 and 24 were found to be acceptable for both internal consistency reliability and construct validity. The 3-item quiz in Round 24, while similar in construction to the 4-item quiz in Round 18, was found not to be internally consistent. Increasing the number of items on the 3-item and 4-item quizzes would likely increase their reliability. The Medicare understandability question was found not to be correlated with the other indices tested, so it may be measuring a somewhat different construct than the other three scales.

Table 1. Psychometric Properties of Knowledge Scales

Knowledge Scale	Internal Consistency (Reliability)	Validity – Known Groups Comparisons	Validity – Correlations with Other Scales
Medicare understandability question	N/A	+	–
Four-item quiz	*	+	+
Three-item quiz	–	+	+
Know-all-need-to-know index	+	+	+

Note: A notation of "+" indicates that the scale met the acceptable level for this criterion, and an "–" denotes the failure of the scale to reach an acceptable level. The "*" for the four-item quiz indicates that this scale has an alpha lower than 0.70, which is often used as a rule of thumb for acceptable internal consistency. However, the scale has an alpha greater than 0.50, which may be considered promising internal consistency for a scale under development.

3.3 Recommended MCBS Baseline Measures

These psychometric tests indicate that only two of the four knowledge indices tested are acceptable and recommended for use as baseline measures for monitoring the effects of the NMEP in future years:

- the know-all-need-to-know index in Round 18 of the 1996 MCBS, and
- the 4-item quiz also in Round 18 of the 1996 MCBS.

While the know-all-need-to-know index (to be called the Level of Perceived Medicare Knowledge Index hereafter) can be analyzed over MCBS years 1996 and 1998 and future years, the index based on the 4-item quiz (hereafter the Level of Medicare Knowledge Index) cannot be used over time as the number of useable similar questions decreased from 4 in the 1996 MCBS round 18 to 3 in the 1998 MCBS round 24, and only one of the original questions carried over from 1996 to 1998. The Level of Medicare Knowledge Index in 1996 did have acceptable psychometric properties and could conceivably be used for comparisons with quizzes containing larger numbers of items over time beginning with the 1999 MCBS (if these items or similar ones are administered in future years).

4.0 Descriptive Analyses Performed on Recommended Measures

To investigate the potential for the NMEP to have an effect on beneficiary knowledge, we conducted descriptive analyses of the measures from the 1996 and 1998 MCBS. First, we performed frequency distributions for the Level of Medicare Knowledge and Level of Perceived Medicare Knowledge items for years 1996 and 1998. Preliminary assessments of whether beneficiaries have increasing knowledge about the Medicare program over time can be made only for the Level of Perceived Medicare Knowledge measure by presenting the distributions for each year side by side because the questions in the index for both years are the same. The Level of Medicare Knowledge index cannot be compared between the two years in this fashion as questions in the measure differ between 1996 and 1998.

We performed bivariate analyses to explore how knowledge varies across beneficiary characteristics. Chi-square analyses indicate significant differences in the distribution of knowledge for any one of the characteristics analyzed. Results from these analyses may be used to make suggestions in how the NMEP is implemented in order to increase beneficiary knowledge among subgroups who may score substantially lower on a given knowledge measure. Selective targeting of these subgroups may be a cost-effective way of improving beneficiary knowledge among those beneficiaries whose level of knowledge needs the most improvement.

We have identified several conceptually distinct domains that we tested for an association with the need for information about aspects of the Medicare program. These domains (shown in ***Table 2***) consist of (1) demographic and socio-economic measures; (2) health status indicators; (3) health insurance sources; and (4) extent of health services utilization. Various studies have tested for a significant association between variables representing these domains and knowledge of Medicare beneficiaries about their insurance. Demographic and socio-economic factors commonly associated with higher levels of knowledge include being male (Lambert, 1980), being of younger age (Lambert, 1980; Caffereta, 1984; McCall, Rice, and Sangl, 1986), being white (Marquis, 1983; McCall, Rice, and Sangl, 1986), being of higher income (Lambert, 1980; Marquis, 1983; McCall, Rice, and Sangl, 1986; Rice, McCall, and Boismier, 1990; Hibbard, et al., 1998), and having higher education (Caffereta, 1984; McCall, Rice, and Sangl, 1986; Hibbard, et al., 1998; Lambert, 1980; Marquis, 1983; McCall, Rice, and Sangl, 1986).

Although health status has not been previously found to be a significant predictor of knowledge, we explored this relationship using the MCBS data. We used three different health status indicators—self-reported health status, deficits in the activities of daily living, and whether a proxy answered questions for the beneficiary. This effort will help in understanding what to expect when we include health status variables in multivariate modeling in the Phase 2 report.

Several studies have explored the effect of types of insurance coverage on knowledge. Marquis (1983) found knowledge to be significantly associated with being offered a choice of health plans and adversely affected by plan complexity. Caffereta (1984) found that having supplemental insurance was positively related to knowledge. She also found that the use of services was positively associated with knowledge in a model subset to the privately insured, while other studies have not found such an effect. In addition, three utilization variables from the MCBS—Part A use, Part B use, and total covered charges—will be used in these analyses to determine their effect on knowledge.

Based on findings in the literature previously noted, we hypothesize that persons who are married, male, ages 65-75, white, of higher income, from smaller households, and with higher education will have higher knowledge scores. We hypothesize that persons who do not have a proxy respondent, report fewer deficits in the activities of daily living, and present better self-reported health status will have higher knowledge scores. We also expect that persons who age into Medicare, have both Medicare and private insurance, and have managed care enrollment will have higher knowledge scores. Finally, we hypothesize that persons with any Part A or Part B use and higher total charges will have higher knowledge scores.

Table 2. MCBS Variables Used in the Analysis of Characteristics

Domain and Variable Name	Response Levels of Variables
Demographic and Socio-Economic Characteristics	
Marital Status	1 = Married 2 = Widowed 3 = Divorced/Separated 4 = Never married
Gender	1 = Male 2 = Female
Age Group	1 = Under 65 years of age 2 = 65-75 3 = Over 75
Race/Ethnicity	1 = White, non-Hispanic 2 = Non-white, non-Hispanic 3 = Hispanic
Income Level	1 = Under $25,000 2 = $25,000 or more
Household Size	1 = 1 person 2 = 2 persons 3 = 3-4 persons 4 = 5 or more persons
Educational Level	1 = 8th grade or less 2 = Some/completed high school 3 = Some/completed college or more
Health Status	
Proxy Status	1 = Not a proxy interview 2 = Proxy
Activities of Daily Living	1 = No limitations 2 = Limitations in one or two activities 3 = Limitations in three activities
Perceived Health Status	1 = Excellent/Very good 2 = Good 3 = Fair/Poor
Health Insurance Coverage	
Medicare Entitlement Status	1 = Aged 2 = Disabled
Type of Health Insurance	1 = Medicare only 2 = Medicare and private 3 = Medicare and Medicaid
Managed Care Enrollment	1 = No enrollment 2 = Enrolled at some time
Health Services Utilization	
Institutional Utilization	1 = Any utilization 2 = No utilization
Medicare Part B Utilization	1 = No claims 2 = Some claims
Total Covered Charges	1 = $ 0 2 = $ 1 - $ 499 3 = $ 500 - $ 4,999 4 = $ 5,000 or more

A word is in order about the utilization variables as they have some limitations. Because claims data do not typically exist for beneficiaries enrolled in Medicare HMOs, and since there are no self-report data in the MCBS Access to Care file indicating whether there has been utilization of health services, we have no choice but to rely upon the utilization variables that are based on administrative data. We believe it is important to retain managed care participants in the analysis, but concede that utilization variables based on administrative data are somewhat crude measures and only incompletely represent utilization.

5.0 Results

5.1 Frequency Distributions

Weighted frequency distributions for the 1996 and 1998 MCBS are presented in ***Table 3*** below with associated 95% confidence intervals for the Level of Medicare Knowledge Index.

Table 3. Distribution of the Level of Medicare Knowledge Index Scores (Four and Three Item Quizzes) in the 1996 and 1998 MCBS

Level of Medicare Knowledge (Four and Three Item Quizzes)	1996 MCBS	1998 MCBS
High (All items correct)	18.7% (17.0-19.7%)	26.3% (24.2-28.4%)
Medium (One item incorrect)	39.2% (37.9-40.5%)	34.8% (33.6-36.0%)
Low (Two or more items incorrect)	42.1% (40.3-43.8%)	38.9% (37.0-40.8%)

Without controlling for any beneficiary characteristics, more respondents scored in the low category than in any other category in both years. Though more respondents gave correct answers to all questions in the 3-item quiz in the 1998 MCBS than in the 4-item quiz in the 1996 MCBS, one can not compare the two years directly as the number and content of the questions differed between the two years (i.e. it is possible that the 1998 quiz was easier and that is why a higher percentage got all items correct).

Frequency distributions of the Level of Perceived Knowledge of Medicare Index are presented in ***Table 4***. The results presented are the sum of the Likert values given to five questions about beneficiary perceived knowledge of the Medicare program. While relatively few persons scored high in either year (24.7 percent in 1996 compared to 22.0 percent in 1998), the persons who scored at least high or medium high in each year was 49.0 percent, suggesting that the level of perceived knowledge has remained about the same over time.

Table 4. Distribution of the Level of Perceived Medicare Knowledge (Know-All-Need-to-Know) Index Scores in the 1996 and 1998 MCBS

Level of Perceived Medicare Knowledge (Five Item Knows All Needs to Know Index)	1996 MCBS	1998 MCBS
High (20 to 25)	24.7 % (22.5-26.8%)	22.0% (20.1-23.8%)
Medium High (16 to 19)	25.2 % (23.7-26.7%)	27.9% (26.8-29.1%)
Medium Low (12 to 15)	23.8 % (22.8-24.9%)	25.9% (24.7-27.2%)
Low (5 to 11)	26.3 % (24.4-28.1%)	24.2% (22.4-25.9%)

A test of significance between the distribution of scores in 1996 and 1998 for this index using a chi-square showed a significant difference between the years. It appears that regression to the mean may be occurring as the middle two categories combined increased by about 5 percent in 1998 and the extreme categories each decreased by about 2 percent from their values in 1996.

5.2 Cross Tabulations of Knowledge Measures with MCBS Beneficiary Characteristics

The Medicare Knowledge Index and the Perceived Medicare Knowledge Index were each compared with the 16 beneficiary attributes described in ***Table 2*** using Chi-square analyses to test for statistically significant differences at a conventional level of significance ($p<=0.05$). Only significant differences are discussed in the text.

5.2.1 Tests of Significance between Level of Medicare Knowledge Index and MCBS Respondent Characteristics

For the Medicare Knowledge Index, bivariate associations with beneficiary characteristics were analyzed using three response levels that were created for this knowledge measure. In order to have a common metric for each of the two years analyzed, we created a categorical response variable with three levels:

- 1=high (all questions in the knowledge index were answered correctly),
- 2=medium (only one incorrect response was given), and
- 3=low (two or more incorrect responses were given).

While this metric is common to both years, one cannot compare directly the results across the years as the 1996 version of the index contains four items and the 1998 version contains only three items. Further, only one of the questions was common between the two years.

Table 5 shows that there are significant differences between the levels of Medicare knowledge for all but one of the beneficiary characteristics examined for both 1996 and 1998 for the Level of Medicare Knowledge Index. Gender was the only characteristic for which there was not a significant difference among beneficiaries for this measure, and this was only in 1996. It is not surprising that so many characteristics were significant from the Chi-square analyses given the large sample size. Small percentage differences for frequency distributions among such a large sample can lead to findings of statistical significance that might otherwise not be found in smaller samples.

Table 5. Summary of Chi-square Significance Tests between Medicare Beneficiary Characteristics and Level of Medicare Knowledge in the 1996 and 1998 MCBS

Year of MCBS	1996			1998		
Variable	Chi-square value	Degrees of freedom	p-value	Chi-square value	Degrees of freedom	p-value
Demographic and Socio-Economic Characteristics						
Marital Status	179.20	6	< .001	210.95	6	< .001
Gender	4.42	2	n.s.	7.28	2	.027
Age Group	141.74	4	< .001	214.57	4	< .001
Race/Ethnicity	214.47	4	< .001	172.49	4	< .001
Income Level	127.89	2	< .001	247.55	2	< .001
Household Size	213.52	6	< .001	216.67	6	< .001
Education Level	232.02	4	< .001	339.39	4	< .001
Health Status						
Proxy Status	7.83	2	.020	7.13	2	.029
Activities of Daily Living	31.73	4	< .001	37.06	4	< .001
Perceived Health Status	106.62	4	< .001	66.42	4	< .001
Health Insurance Coverage						
Medicare Entitlement	130.63	2	< .001	137.07	2	< .001
Type of Insurance	505.81	4	< .001	330.66	4	< .001
Managed Care	39.48	2	< .001	17.55	2	< .001
Health Services Utilization						
Institutional Utilization	94.22	2	< .001	24.84	2	< .001
Part B Utilization	278.21	2	< .001	74.16	2	< .001
Total Covered Charges	226.61	6	< .001	93.32	6	< .001

In Tables 6 through 9 we present detail about the magnitude of these results for the Medicare Knowledge Index grouped by each of the four domains: demographic and socio-economic characteristics, health status, health insurance coverage, and health services utilization. Given that almost all of the Chi-Square tests were significant as a result of the large sample size, absolute differences in magnitude may be more important for policy implications. Following presentation of all distributional analyses for the Medicare Knowledge Index, the distributional analyses for the Perceived Medicare Knowledge Index are presented in Tables 10 through 14.

Demographic and Socio-Economic Characteristics

All seven of the Medicare beneficiary demographic and socio-economic characteristics analyzed were significant in both 1996 and 1998, except for gender that was only significant in 1996. The distributions of levels of Medicare knowledge for each Medicare beneficiary demographic and socio-economic characteristic are presented in ***Table 6***.

Table 6. Percentage Distributions of Beneficiary Demographic and Socio-economic Characteristics and Levels of Medicare Knowledge Index Scores in the 1996 and 1998 MCBS

Year of MCBS	1996			1998		
Variable	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**
Marital Status						
Married	22.18	41.68	36.14	30.72	35.72	33.56
Widowed	15.83	37.76	46.41	21.81	34.82	43.38
Divorced/ Separated	11.68	33.54	54.78	18.83	32.45	48.72
Never Married	13.19	32.48	54.33	19.33	30.40	50.27
Gender						
Male	19.54	38.15	42.32	27.32	33.43	39.25
Female	18.11	40.01	41.88	25.45	35.87	38.69
Age Group						
Under 65 years	11.37	30.74	57.89	17.09	29.59	53.31
65 to 75 years	20.28	41.39	38.33	29.93	35.99	34.09
Over 75 years	18.81	38.65	42.55	24.44	34.94	40.62
Race/Ethnicity						
White Non-Hispanic	20.86	41.05	38.08	29.18	36.25	34.56
Non-White Non-Hispanic	6.75	31.41	61.85	13.77	27.53	58.70
Hispanic	11.32	27.91	60.77	12.23	29.01	58.76
Income Level						
Less than $25,000	15.93	37.77	46.30	21.61	33.99	44.40
$25,000 or more	25.08	42.41	32.51	35.89	36.43	27.68
Household size						
1 person	15.76	37.28	46.96	22.67	34.73	42.59
2 persons	22.15	41.83	36.02	30.29	36.15	33.56
3-4 persons	14.19	35.35	50.47	21.58	30.85	47.58
5 or more persons	10.33	30.12	59.55	13.69	29.29	57.02
Education Level						
College	24.88	41.74	33.37	35.70	35.63	28.67
High School	18.76	40.72	40.51	25.07	36.03	38.90
8^{th} grade or less	10.89	32.59	56.52	15.08	30.47	54.45

In both years, married persons scored higher on Medicare knowledge than other persons and persons who were divorced/separated scored the lowest. Gender was only significant in 1998, where there is a larger variation in response for males than females, though there is little difference between the groups. In both years, persons aged 65-75 scored higher than other persons, and persons under age 65 scored the lowest.

In both years, white non-Hispanic persons scored higher than other persons, and both non-white non-Hispanic and Hispanic persons scored very close together for the lowest. In both years, persons with $25,000 or more in income scored higher than persons with less than $25,000 in income. In both years, persons in households with two persons scored higher than persons in other categories, and persons with five or more persons in the household scored the lowest. In both years, persons with college experience scored higher than other persons, and persons finishing 8^{th} grade or less scored the lowest.

Health Status Characteristics

All three of the Medicare beneficiary health status characteristics analyzed were significant in both 1996 and 1998. The results for each Medicare beneficiary health status characteristic are reported below in ***Table 7***.

Table 7. Percentage Distributions of Beneficiary Health Status Characteristics and Levels of Medicare Knowledge Index Scores in the 1996 and 1998 MCBS

Year of MCBS	1996			1998		
Variable	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**
Proxy Status						
Sample Person	18.98	39.38	41.64	26.34	35.11	38.55
Proxy	16.22	37.20	46.58	25.56	31.32	43.12
Activities of Daily Living						
No limitations	20.07	39.21	40.72	27.51	35.04	37.45
Limitations in one or two activities	15.58	39.69	44.73	24.72	33.78	41.51
Limitations in three or more activities	14.09	39.28	46.62	18.97	35.87	45.16
Perceived Health Status						
Very Good/Excellent	20.78	40.43	38.79	29.26	35.72	35.02
Good	19.39	39.56	41.05	26.41	35.30	38.29
Fair/Poor	14.39	36.59	49.02	21.50	32.75	45.75

In both years, sample persons scored higher on Medicare knowledge than proxy persons. In both years, persons with no limitations scored higher than other persons, and persons with limitations in three or more activities scored the lowest. In both years, persons reporting very good or excellent health scored higher than other persons, and persons reporting fair or poor health scored the lowest. These consistent findings suggest that persons who are in better health have greater knowledge of the Medicare program.

Health Insurance Coverage Characteristics

All three of the Medicare beneficiary health insurance coverage characteristics analyzed were significant in both 1996 and 1998 as shown in ***Table 8***.

Table 8. Percentage Distributions of Beneficiary Health Insurance Coverage Characteristics and Levels of Medicare Knowledge Index Scores in the 1996 and 1998 MCBS

Year of MCBS	1996			1998		
Variable	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**
Medicare Entitlement						
Aged	19.69	40.29	40.02	27.65	35.57	36.78
Disabled	11.42	30.79	57.79	16.98	29.51	53.52
Type of Insurance						
Medicare Only	12.37	31.63	56.00	20.60	32.84	46.56
Medicare and Private	22.73	42.43	34.84	31.10	36.49	32.42
Medicare and Public	8.82	33.70	57.48	15.07	30.76	54.17
Managed Care						
Not Enrolled	19.50	39.00	41.49	26.17	34.19	39.63
Enrolled	11.16	41.07	47.77	26.95	38.63	34.42

In both years, beneficiaries receiving Medicare because they are aged scored higher on Medicare knowledge than beneficiaries whose program entitlement resulted from being disabled. In both years, persons with Medicare and private insurance scored higher than other persons, and persons with Medicare and public insurance scored the lowest. In 1996, persons not enrolled in managed care scored higher on Medicare knowledge than persons enrolled in managed care. However, in 1998, persons enrolled in managed care scored slightly higher than persons not enrolled in managed care, but the scores were very close.

Health Services Utilization Characteristics

All three of the health services utilization characteristics of Medicare beneficiaries analyzed were significant in both 1996 and 1998, and their distributions are shown in ***Table 9***.

Table 9. Percentage Distributions of Beneficiary Health Services Utilization Characteristics and Levels of Medicare Knowledge Index Scores in the 1996 and 1998 MCBS

Year of MCBS	1996			1998		
Variable	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**
Institutional Utilization						
Yes	21.07	41.33	37.59	27.72	35.70	36.58
No	15.42	36.16	48.41	24.34	33.56	42.10
Medicare Part B Utilization						
No Claims	8.76	31.31	59.93	21.09	33.32	45.59
Some Claims	20.60	40.67	38.74	27.77	35.21	37.01
Total Covered Charges						
$0	9.17	31.43	59.39	21.11	33.28	45.61
$1-499	20.25	38.93	40.83	25.31	33.05	41.63
$500-4,999	20.60	41.72	37.68	28.50	36.65	34.85
$5,000 or More	20.78	40.85	38.38	28.37	34.74	36.89

In both years, persons with institutional utilization (Part H) scored higher on Medicare knowledge than persons without institutional utilization. In both years, persons with some Part B claims scored higher than persons without Part B claims. In both years, persons with charges in any category scored higher than persons without charges. The consistent findings suggest that persons who have experience using Medicare are better informed about it.

5.2.2 Tests of Significance between Levels of Perceived Medicare Knowledge and MCBS Respondent Characteristics

Table 10 shows the tests of significance for the Perceived Medicare Knowledge Index. Most of the beneficiary characteristics were significant in both years, with the exception of institutional utilization that was not significant in either year, gender that was not significant in 1998, and proxy status that was not significant in 1998.

Table 10. Summary of Chi-square Significance Tests between Medicare Beneficiary Characteristics and Level of Perceived Medicare Knowledge in the 1996 and 1998 MCBS

Year of MCBS	1996			1998		
Variable	Chi-square value	Degrees of freedom	p-value	Chi-square value	Degrees of freedom	p-value
Demographic and Socio-Economic Characteristics						
Marital Status	160.79	9	< .001	265.75	9	< .001
Gender	24.30	3	< .001	4.71	3	n.s.
Age Group	140.95	6	< .001	161.16	6	< .001
Race/Ethnicity	109.22	6	< .001	131.58	6	< .001
Income Level	301.67	3	< .001	357.35	3	< .001
Household Size	145.73	9	< .001	249.73	9	< .001
Education Level	283.21	6	< .001	315.16	6	< .001
Health Status						
Proxy Status	9.41	3	.025	5.94	3	n.s.
Activities of Daily Living	88.74	6	< .001	89.74	6	< .001
Perceived Health Status	135.93	6	< .001	193.66	6	< .001
Health Insurance Coverage						
Medicare Entitlement	121.57	3	< .001	132.33	3	< .001
Type of Insurance	342.50	6	< .001	346.96	6	< .001
Managed Care	55.24	3	< .001	46.48	3	< .001
Health Services Utilization						
Institutional Utilization	5.40	3	n.s.	2.16	3	n.s.
Part B Utilization	31.75	3	< .001	23.03	3	< .001
Total Covered Charges	54.11	9	< .001	32.01	9	< .001

Tables 11 through 14 show the distribution of results for each of the four domains of beneficiary characteristics in the analysis: demographic and socio-economic characteristics, health status, health insurance coverage, and health services utilization.

Demographic and Socio-Economic Characteristics

All seven of the beneficiary demographic and socio-economic characteristics analyzed were significant in both the 1996 and 1998 MCBS, except for gender, that was only significant in 1996. The results for each of these characteristic are described below in ***Table 11***.

Table 11. Percentage Distributions of Beneficiary Demographic and Socio-economic Characteristics and Levels of Perceived Medicare Knowledge Index Scores in the 1996 and 1998 MCBS

Year of MCBS	1996				1998			
Variable	High	Medium High	Medium Low	Low	High	Medium High	Medium Low	Low
Marital Status								
Married	27.17	27.91	23.74	21.18	24.83	30.82	25.10	19.24
Widowed	23.00	22.42	23.61	30.97	19.73	25.81	26.40	28.06
Divorced/ Separated	17.49	22.42	24.78	35.31	15.66	22.85	27.03	34.47
Never Married	21.18	19.50	24.68	34.64	16.77	20.14	29.61	33.48
Gender								
Male	26.51	25.55	21.93	26.02	22.96	27.71	25.37	23.96
Female	23.24	24.95	25.36	26.45	21.18	28.09	26.42	24.31
Age Group								
Under 65 years	17.25	18.77	25.26	38.72	14.16	20.73	29.69	35.42
65 to 75 years	25.76	27.30	23.75	23.19	24.19	29.90	25.16	20.74
Over 75 years	25.44	24.13	23.56	26.87	21.62	27.69	25.74	24.95
Race/Ethnicity								
White Non-Hispanic	26.19	27.12	23.60	23.08	24.41	30.09	25.57	19.93
Non-White Non-Hispanic	18.28	16.39	25.65	39.69	12.00	19.00	26.98	42.02
Hispanic	15.55	15.00	24.05	45.40	9.17	17.04	28.85	44.94
Income Level								
Less than $25,000	21.16	23.00	24.61	31.23	18.10	25.11	27.32	29.48
$25,000 or more	32.57	30.17	22.15	15.10	29.93	33.71	23.14	13.22
Household size								
1 person	22.91	22.86	23.73	30.49	19.63	26.17	26.17	28.04
2 persons	26.48	27.78	23.50	22.24	24.81	30.37	25.25	19.57
3-4 persons	22.71	21.20	25.52	30.56	17.53	24.27	28.08	30.11
5 or more persons	19.89	22.22	23.86	34.04	15.70	19.18	26.60	38.52
Education Level								
College	33.39	29.09	21.75	15.77	28.50	33.61	23.20	14.69
High School	23.46	26.38	24.76	25.40	21.93	28.08	27.03	22.96
8^{th} grade or less	16.25	17.68	24.54	41.53	12.23	18.98	27.45	41.33

In both years, married persons scored higher on perceived Medicare knowledge than other persons, and persons who were divorced/separated or never married scored the lowest. The highest frequency reported for the high response category was 27.2 percent which was reported by married persons in 1996. Gender was only significant in 1996, where males scored only slightly higher than females, though there is little difference between the groups. The highest frequency reported by gender for the high response category was 26.5 percent which was achieved by males in 1996. In both years, persons aged 65 to 75 scored higher than other persons, and persons under age 65 scored the lowest. The highest frequency reported in the high perceived Medicare knowledge response category was 25.8 percent which was scored by persons aged 65 to 75 in 1996.

In both years, white non-Hispanic persons scored higher than other persons, and Hispanic persons scored the lowest. The highest frequency reported in the high perceived Medicare knowledge category was 26.2 percent and it was scored by white non-Hispanic persons in 1996. In both years, persons with $25,000 or more in income scored higher on perceived Medicare knowledge than persons with less than $25,000 in income. The highest frequency reported for the high perceived knowledge category was 32.6 percent and it was scored by persons with $25,000 or more in income in 1996. In both years, persons in households with two persons scored higher than persons in other categories, and persons with five or more in their household scored the lowest. The highest frequency reported in the high perceived knowledge category was 26.5 percent and it was scored by persons in households with two persons in 1996. In both years, persons with college experience scored higher than other persons, and persons finishing 8th grade or less scored the lowest. The highest frequency reported in the high perceived knowledge category was 33.4 percent which was scored by persons with college experience in 1996.

The direction of association between perceived Medicare knowledge and beneficiary demographic and socio-economic characteristics as consistent across the two years. It is also worth noting that the proportions in the high category of perceived Medicare knowledge for each characteristic were higher in 1996 than in 1998, the only exception being for married persons. The results suggest that with respect to perceived knowledge of Medicare, the proportions of persons scoring at the highest level have fallen over the two years.

Health Status Characteristics

All three of the beneficiary health status characteristics analyzed were significant in both the 1996 and 1998 MCBS except for proxy status, that was only significant in 1996. The results for each characteristic are described below in ***Table 12***.

Table 12. Percentage Distributions of Beneficiary Health Status Characteristics and Levels of Perceived Medicare Knowledge Index Scores in the 1996 and 1998 MCBS

Year of MCBS	1996				1998			
Variable	High	Medium High	Medium Low	Low	High	Medium High	Medium Low	Low
Proxy Status								
Sample Person	24.80	25.47	23.85	25.88	22.16	28.02	25.93	23.89
Proxy	23.38	22.45	23.90	30.27	19.93	26.88	26.19	27.01
Activities of Daily Living								
No limitations	26.53	26.26	23.17	24.03	24.16	28.90	24.90	22.04
Limitations in one or two activities	20.10	23.70	26.71	29.48	17.25	26.18	27.58	28.99
Limitations in three or more activities	18.86	19.77	24.69	36.69	14.69	23.27	31.14	30.90
Perceived Health Status								
Very Good/Excellent	28.32	27.23	23.69	20.77	26.35	31.30	23.49	18.86
Good	23.74	26.02	24.09	26.16	21.54	27.64	27.16	23.66
Fair/Poor	19.30	20.85	23.79	36.06	15.65	23.02	28.36	32.97

Proxy status was only significant in the 1996 MCBS where sample persons scored higher on perceived knowledge than proxy persons. The highest proportion reported for the high perceived knowledge category was 24.8 percent that was reported by sample persons in 1996. In both years, persons with no limitations scored higher than other persons, and persons with limitations in three or more activities scored the lowest. The highest frequency reported for the high perceived knowledge category was 26.5 percent that was reported by persons with no limitations in 1996. In both years, persons reporting very good or excellent health had a higher proportion in the high perceived knowledge category than other persons, and persons reporting fair or poor health had the largest proportion in the low category. The highest proportion reported for the high perceived knowledge category was 28.3 percent that was achieved by Medicare beneficiaries in 1996 reporting very good or excellent health. Quite consistently, larger proportions of persons in better health scored higher on perceived Medicare knowledge in the 1996 MCBS than in the 1998 MCBS.

Health Insurance Coverage Characteristics

All three of the health insurance coverage characteristics analyzed were significant in both 1996 and 1998. The results for each characteristic are described below in ***Table 13***.

Table 13. Percentage Distributions of Beneficiary Health Insurance Coverage Characteristics and Levels of Perceived Medicare Knowledge Index Scores in the 1996 and 1998 MCBS

Year of MCBS	1996				1998			
Variable	High	Medium High	Medium Low	Low	High	Medium High	Medium Low	Low
Medicare Entitlement								
Aged	25.63	26.03	23.67	24.67	23.12	28.98	25.39	22.50
Disabled	17.30	18.84	25.27	38.60	14.15	20.72	29.74	35.38
Type of Insurance								
Medicare Only	21.48	19.66	22.54	36.32	18.66	25.21	25.44	30.69
Medicare and Private	27.50	28.70	24.20	19.60	25.43	31.31	26.03	17.24
Medicare and Public	16.19	16.43	23.80	43.57	12.86	18.26	26.36	42.52
Managed Care								
Not Enrolled	23.71	25.18	23.97	27.13	21.09	27.21	26.53	25.17
Enrolled	34.22	25.47	22.66	17.64	27.00	32.49	22.23	17.61

In both years, persons who were receiving Medicare because they were aged (65 years of age or older) scored significantly higher than those under 65 whose entitlement was due to being disabled. The highest proportion reported in the high perceived Medicare knowledge category was 25.6 percent that was reported by aged Medicare beneficiaries in 1996. In both years, persons with Medicare and private insurance scored significantly higher than other persons, and persons with Medicare and public insurance scored the lowest. The highest proportion reported in the high perceived Medicare knowledge category was 27.5 percent that was achieved by persons with Medicare and private insurance in 1996. In both years, persons enrolled in managed care scored higher on perceived Medicare knowledge than persons not enrolled in managed care. The highest proportion reported in the high perceived Medicare knowledge category was 34.2 percent that was attained by persons enrolled in managed care in 1996. Consistently, respondents to the insurance characteristic items in the 1996 MCBS had higher proportions reporting a high level of perceived knowledge than those responding in the 1998 MCBS.

Health Services Utilization Characteristics

Only two of the three health services utilization characteristics analyzed were significantly associated with perceived Medicare knowledge in both 1996 and 1998—Part B Utilization and Total Covered Charges. Institutional Charges did not differ significantly by level of perceived Medicare knowledge in either year. The results for each characteristic are described below in ***Table 14***.

Table 14. Percentage Distributions of Beneficiary Health Services Utilization Characteristics and Levels of Perceived Medicare Knowledge Index Scores in the 1996 and 1998 MCBS

Year of MCBS	1996				1998			
Variable	High	Medium High	Medium Low	Low	High	Medium High	Medium Low	Low
Institutional Utilization								
Yes	25.63	25.40	23.61	25.35	21.90	27.93	26.45	23.72
No	23.31	24.93	24.19	27.56	22.07	27.91	25.28	24.74
Medicare Part B Utilization								
No Claims	21.11	22.50	22.87	33.52	20.92	26.06	24.60	28.42
Some Claims	25.33	25.71	24.03	24.92	22.27	28.46	26.34	22.93
Total Covered Charges								
$0	22.27	22.88	22.39	32.46	21.17	26.13	24.69	28.02
$1-499	24.56	24.21	24.76	26.47	20.97	27.26	26.62	25.15
$500-4,999	25.72	26.71	24.58	22.99	22.89	29.39	26.19	21.52
$5,000 or More	24.77	25.50	22.66	27.07	22.12	27.79	26.14	23.94

In both years, Medicare beneficiaries with some Part B claims scored higher on perceived Medicare knowledge than those without any Part B claims. The highest frequency reported for the high category of perceived Medicare knowledge was 25.3 percent which was attained by persons with some Part B claims in 1996. In both years, persons with total charges between $500 and $4,999 scored higher than persons in other categories. The highest frequency reported for the high perceived Medicare knowledge category was approximately 25.7 percent which was reported by persons with total charges between $500 and $4,999 in 1996. As with most of the other characteristics, higher proportions of beneficiaries in the 1996 MCBS were in the higher perceived Medicare knowledge category than in the 1998 MCBS.

5.3 Summary of Analyses

There were significant differences in almost all distributions tested when comparing knowledge measures with beneficiary characteristics. The significance of these differences may be the result of the large MCBS sample sizes for which small differences in a percentage distribution will yield a statistically significant test result. Persons who were hypothesized to be more knowledgeable generally had the most favorable knowledge outcomes. Persons who were: married, male, 65 to 75 years of age, white non-Hispanic, with more than $25,000 in income, in households with two persons, and college educated had greater knowledge about Medicare. In addition, persons who did not have a proxy, had no limitations in the activities of daily living, and reported very good or excellent health status were more knowledgeable about Medicare. Finally, persons without disabilities, who had Medicare and private insurance, and had utilization of some kind also had more Medicare knowledge.

In general, persons who were: divorced, separated, or otherwise living alone; under age 65; of minority group status; with lower income; in larger households; with less than an 8th grade education; with several limitations in activities of daily living; in fair or poor health; disabled, with both Medicare and Medicaid; and not using health services had less favorable Medicare knowledge index scores. These persons may be the most appropriate persons toward which to target knowledge improvement efforts. Changes to the NMEP as currently implemented would

more likely be beneficial with respect to characteristics where there was a large variance in the distribution of responses, and then targeted to those individuals who scored much lower than other persons. An example of a characteristic with a large variance is Type of Health Insurance, where persons with both Medicare and Medicaid scored substantially lower on Medicare knowledge measures than persons in other insurance categories.

6.0 Related Knowledge Indices and Questions Available for Monitoring NMEP

6.1 Cross-Project Knowledge Indices

RTI is conducting two other studies for HCFA in which it has created and evaluated indices to measure knowledge in the Medicare population. These studies include the *Evaluation of Medicare CAHPS and the Medicare & You 1999 Handbook in Kansas City* and the *Expanded (National) Evaluation of the Medicare & You 2000 Handbook*. For each of these evaluations, RTI created a knowledge index to assess how well beneficiaries understood the Medicare program and related health insurance options. The Kansas City knowledge index contained 15 items and the National Evaluation index contained 23 items. The indices were tailored to reflect the information in the handbook during the respective year as well as the key messages HCFA was promoting at the time.

Both indices proved valid and reliable using standard psychometric tests and have been used as dependent variables in multivariate analysis to determine the factors statistically associated with higher and lower levels of knowledge (McCormack, Ross, Daugherty, and Garfinkel, 2000; McCormack, Garfinkel, Hibbard, Keller, and Kilpatrick, in review). For this project, we look to these indices as sources of questions for future rounds of the MCBS. There is, however, one other MCBS knowledge measure, the 8-item quiz appearing for the first time in round 23 of the 1998 MCBS[1], that was found to have the best psychometric properties of the MCBS measures of *demonstrated* knowledge[2]and is therefore used here for comparison with the Kansas City and National Evaluation measures.

Two sets of psychometric analyses were conducted: a) scale-level analyses and b) item-level analyses. The scale-level analyses were designed to determine whether any of the existing scales by themselves could provide the set of core knowledge questions for future rounds of the MCBS. For these analyses, the knowledge indices from the Kansas City and National Evaluation were assessed according to their reliability and construct validity and compared to the 8-item quiz from the 1998 MCBS. In addition, factor analyses were conducted to examine the possibility of creating sub-scales. In contrast to the scale-level analyses, the item-level analyses examined the knowledge questions individually to determine which items might be useful for future rounds of the MCBS. For these analyses, the individual knowledge questions were evaluated with respect to their difficulty, number of response options, and percentage of don't know responses.

[1] This 8-item quiz is introduced here for the first time because no comparable items were included in earlier years of the MCBS and thus it could not be considered as part of a pre-NMEP baseline period.

[2] Note that the MCBS perceived Medicare knowledge index also had good psychometric properties but it is not presented here because it is a measure *of perceived* knowledge, see Bann et al., 2000.

6.1.1 Scale-Level Analyses

6.1.1.1 Reliability

The reliability of the scales was estimated using the internal consistency method which assesses the degree to which the items on a scale are related to each other and therefore appear to be measuring the same construct. Internal consistency reliability was computed using Cronbach's coefficient alpha (Cronbach, 1951). ***Table 15*** illustrates how the three indices compare in terms of reliability. The National Evaluation index demonstrated the greatest internal consistency. However, it should be noted that the National Evaluation scale has the largest number of items of the three scales and all things being equal, reliability will improve as the number of items is increased.

Therefore, in order to "level the playing field," we used the Spearman-Brown prophecy formula to project the coefficient alphas for the other two scales if they were to be increased to 23 items, the same number of items as the National Evaluation index (Nunnally & Bernstein, 1994). Using this formula, the alpha for the Kansas City index would increase slightly to 0.74, however, the alpha for the MCBS would increase dramatically to a value of 0.91. Comparing these projected alphas to the value of alpha for the National Evaluation index indicates that the MCBS quiz is the most homogeneous of the three scales. Therefore, the greatest reliability relative to number of items would be achieved by adding like items to the MCBS quiz. The comparatively lower homogeneity of the National Evaluation and Kansas City indices is also evidenced in the results of the factor analysis described below which suggests that these indices contain subscales.

Table 15. Reliability of Various Knowledge Indices

	Kansas City 15-item Index	**National Evaluation 23-item Index**	**MCBS Round 23 8-item Quiz**
Cronbach's Alpha	0.72	0.81	0.77

6.1.1.2 Construct Validity

Evidence for the construct validity of an index score is obtained by observing how that score is associated with separate measures of the same attribute. A high correlation between the score and other measures of the same attribute is evidence of validity. Using general linear models, we evaluated the validity of the indices by comparing index scores with self-reported measures of knowledge. The following question was used to measure self-reported understanding for both the Kansas City and the National evaluation:

> *"How would you rate your understanding of the different types of health insurance options for people with Medicare?" (Poor/Fair/Good/Very good/Excellent)*

In the Kansas City data, self-rated understanding of Medicare was positively related to the knowledge index ($p<0.0001$) and the ordering of means by self-rated level of knowledge was monotonic. Duncan's Multiple Range test (Duncan, 1975) detected significant differences between the mean index scores at each level of self-rated understanding, with one exception:

there was not a significant difference in index scores between those who rated their understanding "very good" and "excellent," although the mean index score for those in the excellent group was higher.

Using the National Evaluation data, self-rated understanding was positively related to the knowledge index ($p < 0.0001$), and the ordering of the means by self-rated knowledge was also monotonic with one exception: those respondents who identified themselves as having an excellent understanding of Medicare had a lower average index score than those who identified themselves as having a very good understanding. A Duncan's multiple range test found that the mean knowledge index was significantly higher for those whose self-reported knowledge was fair than for those who reported it was poor, for good compared to fair, and for very good compared to good, but excellent was significantly lower than very good and not significantly different from fair to good.

We used the following question from the 1998 MCBS Round 23 to evaluate the validity of the 8-item quiz:

> *"How much do you think you know about the Medicare program?" (Just about everything/Most/Some/A little/Almost none)*

The ordering of the means was monotonic with the exception of the last two categories, "most" and "just about everything." The Duncan's multiple range test indicated no significant difference in the 8-item quiz scores between these two levels. There were significant differences between all other levels.

Overall, these associations support the construct validity of all three indices equally and do not suggest that one index is better than another. An interesting result from these analyses is that the highest response choices (e.g., "excellent" and "just about everything") do not appear to be behaving as would be expected. We suggest cognitive testing of these response scales to determine how the higher response choices are being interpreted by respondents.

6.1.1.3 Factor Analysis.

Factor analysis may be used to provide additional evidence for the construct validity of a scale. Examining the clustering of the items into factors provides information about the underlying constructs being measured by the scale. Factor analysis results may also be used to determine if the scale can be divided into separate sub-scales.

Principal factor analyses with promax rotation were conducted on each of the three knowledge indices. For the Kansas City index, a three-factor solution was appropriate**.** ***Table 16*** contains the factor loadings, with loadings greater than 0.30 in bold. The first factor reflects beneficiaries' knowledge of the Original Medicare program which included questions 6-9 and 15-17. The second factor reflects awareness of the different Medicare insurance options and the third factor reflects knowledge of Medicare managed care.

Table 16. Factor Loadings for the Three Factor Solution of the Kansas City Knowledge Index

Item #	Description	Factor 1: Original Medicare	Factor 2: Awareness of Insurance Options	Factor 3: Medicare Managed Care
6	As far as you know, can people on Medicare still get Original Medicare today?	**0.44**	0.17	-0.02
7	As far as you know, does Original Medicare pay for all health care costs for people on Medicare?	**0.47**	0.11	0.04
8	As far as you know, are there different types of private health insurance plans that people on Medicare can get to pay for things that Medicare doesn't pay for?	**0.54**	0.06	0.09
9	Have you ever heard of a Medicare supplemental health insurance plan, sometimes called a "Medigap" plan?	0.20	**0.40**	0.07
10	Have you ever heard of a Medicare HMO?	-0.20	0.20	**0.90**
11	Have you ever heard of a Medicare managed care plan?	-0.06	**0.64**	0.17
12	Are there Medicare [HMO/managed care plans] in the Kansas City area?	0.07	-0.17	**0.76**
13	Have you ever heard of an MSA or medical savings account for people on Medicare?	0.11	**0.87**	-0.10
15	If a person signs up for any of these Medicare health insurance plans, is he or she still in the Medicare program?	**0.59**	-0.01	0.09
16	If a person signs up for any of these Medicare health insurance plans, does he or she still get at least the same health care benefits as someone in the Original Medicare plan?	**0.66**	-0.08	0.01
17	Do people who are happy with the health insurance plan they have now have to change plans this year?	**0.52**	0.14	0.04
19	In this type of Medicare health insurance plan, a person needs to go to doctors and hospitals from a list given by the plan. Does this statement best describe…(Original Medicare/A Medicare HMO/Both/Neither)	0.18	0.00	**0.63**
21	Which type of Medicare health insurance plan is more likely to pay for most prescription drugs? Would you say…(Original Medicare/A Medicare HMO/Both/Neither)	0.28	0.06	**0.43**
23	Which type of Medicare health insurance plan only allows a person to leave the plan and change to another plan once a year? Would you say…(A Medicare HMO/An MSA/Both/Neither)	0.03	**0.82**	-0.06
35	Is there a local service in the Kansas City area that offers free and unbiased counseling to people on Medicare about choosing a health insurance plan?	0.19	0.02	0.04

Next, we used the results of the factor analysis to create three sub-scales, representing the three factors (Original Medicare, Awareness of Insurance Options, and Medicare Managed Care). The sub-scales were created by unit-weighting and summing the items with factor loadings greater than 0.30. We then calculated coefficient alphas for the sub-scales to assess their reliability and determine if any sub-scale by itself reached an acceptable level of reliability (See ***Table 17***). The third factor — Medicare managed care — had the highest alpha of 0.62, with the others being 0.52 and 0.58.

Table 17. Alphas for Sub-scales: Kansas City Knowledge Index

Factor	Description of Factor	Questions Comprising Factor	Coefficient Alpha
1	Original Medicare	6, 7, 8, 15, 16, 17	0.58
2	Awareness of Insurance Options	9, 11, 13, 23	0.52
3	Medicare Managed Care	10, 12, 19, 21	0.62

For the National Evaluation index, five factors were noted: Awareness of Medicare insurance options, knowledge of Original Medicare, awareness of information sources and other resources, knowledge of Medicare managed care, and knowledge of Medigap insurance (See ***Table 18***).

Table 18. Factor Loadings for Five Factor Solution of National Evaluation Knowledge Index*

Item #	Description	Factor 1: Awareness of Insurance Options	Factor 2: Original Medicare	Factor 3: Information and Resources	Factor 4: Medicare Managed Care	Factor 5: Medigap insurance
3	As far as you know, are there different types of health insurance options that people with Medicare can get?	**0.78**	-0.01	0.04	-0.03	-0.08
4	Have you ever heard of a Medicare supplemental health insurance plan, which is also sometimes called a "Medigap" policy?	**0.59**	0.07	0.00	-0.09	0.23
5	Have you ever heard of a Medicare managed care plan, for example, a health maintenance organization or HMO?	**0.78**	0.05	-0.05	0.01	-0.06
7	If a person signs up for any of these – Medigap, a Medicare Managed Care Plan, or an Inclusive Provider Organization – do they still have Medicare?	**0.62**	-0.11	0.10	0.05	0.21
8	As far as you know, can you still get the Original Medicare plan today?	0.25	**0.36**	0.12	0.11	-0.12
9	The Medicare program has recently begun to offer more information and help in order to answer questions about the Medicare program.	0.18	0.12	**0.45**	0.03	-0.05
10	As far as you know, will out-of-pocket costs differ depending on which health insurance option a person signs up for?	**0.49**	0.08	0.06	0.06	0.06
11	Which one of the following statements is true about what the Original Medicare plan pays for? It pays for… (All health care costs/Some health care costs/Only emergency health care/Only prescription drugs)	0.28	**0.30**	-0.17	-0.09	0.26
12	If you were enrolled in a Medicare Managed Care Plan and wanted to leave it, which one of the following statements is true? You can … (Leave any time but won't be covered by Medicare/Leave under special circumstances/Leave any time)	**0.34**	0.10	0.09	**0.32**	-0.04
13	Which one of the following is a reason for contacting your state's Peer Review Organization (PRO)? (Find support group of peers/Complaint about quality of Medicare care/Change health insurance option/None of the above)	0.02	0.17	0.19	0.18	**0.32**
14	Which one of the following is likely to happen when you go to a doctor who "accepts assignment?" (Save money/Pay more money/Save money only on services not normally covered)	0.04	**0.50**	0.04	0.05	0.08
15	Which one of the following is paid for if you only have the Original Medicare Plan? (Yearly dental exams/Pneumonia shot/Medical care outside US/Long-term care)	-0.01	**0.52**	-0.08	-0.03	0.24
16	Which type of health insurance option gives you more freedom to choose the doctors or hospitals you want to go to? (Original Medicare plan/Medicare managed care plan/Inclusive Provider organization/all about the same)	-0.04	**0.67**	0.08	-0.03	-0.02
17	Which type of health insurance option is least likely to pay for prescription drugs? (Original Medicare/Medicare managed care plan/Medigap/All about the same)	0.08	**0.59**	-0.02	-0.01	0.11

18	Which type of health insurance option can refuse to sell you a policy after age 65 and a half because of poor health? (Original Medicare/Medicare managed care plan/Medigap/None of the above)	0.07	0.10	0.03	-0.07	**0.51**
19	Which type of health insurance option will cover a 6-month stay in a nursing home? (Original Medicare/Medicare managed care plan/Both/Neither)	-0.04	0.22	-0.03	0.07	**0.36**
20	Emergency health care is paid for wherever you are in the US under which type of insurance option? (Original Medicare/Medicare managed care plan/Both/Neither)	0.07	0.00	-0.13	**0.72**	0.11
21	The following statement is true for which type of health insurance option: "Medicare gives you the right to appeal decisions about what a Medicare plan pays for?" (Original Medicare/Medicare managed care plan/Both/Neither)	0.01	-0.07	-0.01	**0.69**	0.21
22	The Original Medicare Plan now pays for more preventive health care services like breast x-rays and diabetes monitoring. Is this also true for all, some, or none of the other different types of insurance options?	-0.07	0.03	0.14	**0.54**	-0.21
23	If you had a Medigap policy and dropped it, when could you get it back? (Any time/Only under some conditions/Never)	-0.02	0.04	**0.33**	0.02	**0.51**
39	Is there an information and counseling service that people with Medicare can use to get help understanding and comparing health insurance options?	0.09	-0.04	**0.67**	0.01	0.04
41	Does the Medicare program have its own Internet website?	-0.07	-0.03	**0.71**	-0.03	0.10

Notes:

* Excludes question six which asked about awareness of a fictitious plan. This question was used to assess potential social desirability bias.

The five factors had alphas ranging from 0.48 to 0.72 (See ***Table 19***). The Original Medicare sub-scale had an alpha of 0.72, which is fairly high, particularly for a five-item scale. The next highest alpha was for the awareness of insurance options sub-scale. These two sub-scales address basic knowledge of the Medicare systems (i.e., Original Medicare and Awareness of Insurance Options) and achieve good reliability for the small number of items comprising them. Therefore, these questions may be leading contenders for a set of core MCBS items.

Table 19. Alphas for Sub-scales: National Evaluation Knowledge Index

Factor	Description of Factor	Questions Comprising Factor	Coefficient Alpha
1	Awareness of Insurance Options	8, 11, 14, 15, 16, 17	0.64
2	Original Medicare	3, 4, 5, 7, 10, 12	0.72
3	Information and Resources	9, 23, 39, 41	0.55
4	Managed Care	12, 20, 21, 22	0.55
5	Medigap Insurance	13, 18, 19, 23	0.48

The factor analysis of the 1998 MCBS eight-item quiz (Round 23) revealed that the quiz items compose only one factor (See ***Table 20***). This suggests that the items are all highly related and appear to be measuring the same underlying construct. Because the items form one factor, no sub-scales were created.

The results of the scale-level analyses suggest that one useful source of knowledge questions may be the National Evaluation index. The coefficient alphas suggest that the National Evaluation index had the highest reliability (although it should be noted that this index also had the largest number of items). The results of the factor analysis indicate that the National Evaluation index had the greatest number of factors and therefore covered the widest variety of topics among the three scales. This suggests that this scale is better able to assess the variety of information that beneficiaries need to understand the Medicare program. The National Evaluation index also contained a sub-scale, "Original Medicare," which demonstrated good reliability.

The scale-level analyses allowed us to examine the properties of each scale as a whole. However, the results of these analyses do not provide information about the psychometric properties of the individual items that comprise a scale. The next step in identifying candidates to be included in future rounds of the MCBS is to evaluate the properties of each item individually.

Table 20. Factor Loadings for One Factor Solution of 1998 MCBS (Round 23) 8-item Quiz

Item #	Description	Factor 1: Managed Care
43	Most people covered by Medicare can select among different kinds of health plan options within Medicare.	0.51
44	Medicare without a supplemental insurance policy pays for all of your health care expenses.	0.44
45	If you are happy with the way you currently receive health care, you do not have to make any changes in the way you get your Medicare services.	0.52
46	The Medicare program has recently begun to offer more information and help in order to answer your Medicare questions.	0.43
47	People can report complaints to Medicare about their Medicare managed care plans (HMOs) or supplemental plans if they are not satisfied with them.	0.53
48	If someone joins a Medicare managed care plan (HMO) that covers people on Medicare, they have limited choices about which doctors they can see.	0.62
49	If someone joins a Medicare managed care plan (HMO) that covers people on Medicare, they can change or drop the plan and still be covered by Medicare.	0.64
50	Medicare managed care plans (HMOs) that cover people on Medicare often cover more health services, like prescribed medicines than Medicare without a supplemental policy.	0.58

6.1.2 Item-Level Comparisons

Please note that it is not possible to make direct comparisons between items in the different questionnaires because different groups of respondents filled out each questionnaire. In this case we can not tell whether differences in the item parameters are due to differences in the items or differences in the respondents. For example, a difficult question may seem easy if it is administered to respondents with a high level of knowledge while it may seem very difficult if it is administered to respondents with very little knowledge. Therefore, for these analyses, items may only be compared to other items on the same scale. For example, we will determine whether a particular item is more difficult than other items on the same scale. It will be possible to compare all of the items to each other if, in the future, all of these knowledge items are administered to the same sample of beneficiaries.

The results of the item-level analyses are presented separately for each index in ***Tables 21*** to ***23***. The number of response options, the percent of correct responses, and the percent of don't know responses are presented for each item.

6.1.2.1 Item Difficulty

An important characteristic of an item designed to measure knowledge is the difficulty of the item. One indicator of an item's difficulty is the proportion of respondents who correctly answered the item. Items with greater difficulty will have a lower proportion of correct responses while easier items will have more correct responses.

The percentage distribution of correct responses for the items included in the Kansas City evaluation is displayed in ***Table 21***. Clearly, item 23 was the most difficult question on the scale with only 4 percent of respondents answering this item correctly. In contrast, item 8 was a very easy item with 92 percent of respondents answering it correctly. Overall, with the exception of

item 23, the items on the Kansas City index have difficulty levels ranging from moderate to easy. The ability of the scale to detect respondents with higher levels of knowledge could be enhanced by adding some additional difficult items to the scale.

The percentage of correct responses for each knowledge question included in the National Evaluation are displayed in ***Table 22***. The most difficult item in the National evaluation was question 18 with only an 11 percent correct response rate. Item 11 was the easiest knowledge question with 82 percent of respondents answering this question correctly. Overall, the National Evaluation contained questions with a variety of difficulty levels.

Table 23 displays the proportion of correct responses for each of the eight items included in Round 23 of the MCBS. Of the eight items, item 44 was the easiest and item 50 was the most difficult. Overall, the quiz contained items with a medium level of difficulty. None of the items on the quiz were either extremely easy or extremely difficult. These items would be useful for measuring knowledge of beneficiaries with an average level of knowledge.

Ideally, a knowledge measure should include items with a wide range of difficulty levels. This is necessary to adequately assess the knowledge of beneficiaries at all levels of ability. For example, a scale containing only very difficult items can only discriminate between respondents at the very highest knowledge levels. Conversely, very easy items are only useful for measuring knowledge of respondents with very little knowledge. Therefore, because the MCBS is designed to assess knowledge among a diverse population of beneficiaries, future rounds of the MCBS should include items with a variety of difficulty levels.

6.1.2.2 Percentage of Don't Know Responses.

For each of the knowledge indices, respondents were given the option of indicating that they did not know the answer to a question. Examining the frequency of don't know responses is useful for identifying items that may be particularly confusing or difficult for respondents. ***Table 21*** contains the percentage of don't know responses for the Kansas City knowledge questions. The majority of questions had a low percentage of don't know responses with one exception: 51 percent of respondents indicated that they did not know the answer to item 35. This question concerns the availability of free counseling on health insurance plans in Kansas City. The high percentage of don't know responses for this question suggests that approximately one-half of respondents were unaware of this service.

The proportions of don't know responses for the National Evaluation items are presented in ***Table 22***. Nine of the 23 items included in the National Evaluation index have don't know response rates of more than 50 percent. Generally, more difficult questions had a higher percentage of don't know responses, suggesting that there was some tendency for respondents to indicate that they did not know the answer to a question rather than responding incorrectly. The percentage of don't know responses may also suggest potential problems with an item. For example, half of the respondents indicated that they did not know the answer to item 7. This question includes the name of a fictitious plan, the Inclusive Provider Organization, which may have confused respondents. Another question, item 41, asked whether the Medicare program has its own website. This question had the highest percentage (81%) of don't know answers. A

possible explanation for this is that many Medicare beneficiaries may not have access to the Internet or have tried to find a Medicare website.

Several of the MCBS quiz questions have a large percentage of don't know responses (See ***Table 23***). For example, approximately one-half of the respondents indicated that they did not know the correct answer to item 50. This item also had the smallest percentage of correct responses, suggesting that this item may have been particularly difficult for respondents. In contrast to the other items on the quiz, this item asks respondents to compare two types of insurance plans (managed care and Medicare without a supplement). This task is more challenging than simply knowing the feature of one particular plan which may explain the greater difficulty of this question for respondents.

6.1.2.3 Number of Response Options

Another property of questionnaire items is the number of response choices available to respondents. If an item has very few response options, there is a higher probability that a respondent will choose the correct response just by chance. For example, if a question has only two response choices then a respondent who does not know the answer to the question has a 50 percent chance of choosing the correct answer. However, if the question has four response options, this probability is reduced to 25 percent.

Tables 21 to ***23*** contain the number of response options for the items on each of the knowledge indices. The majority of items on the Kansas City index have two response choices, yes or no. There are, however, three items (19, 21, and 23) that have four response options. Because these items allow the respondents to choose between four possible options rather than just two, there is a lower probability of respondents simply guessing the correct response.

The items on the National evaluation index have a variety of response options. Four of the items (12, 14, 22, and 23) have four response options and nine items (11, 13, 15-21) have three options. The remaining items have only two response options.

All of the items on the MCBS quiz have two response options (true or false). Therefore, for these items, there is a higher probability that a respondent who does not know the answer will select the correct answer than for the items on the Kansas City and National Evaluation scales that contain 3 or 4 response categories.

Overall, the National Evaluation scale had the largest number of items with more than two response options. It is important to note, however, that an item will not necessarily be improved by simply adding more response choices. Adding response options that are obviously incorrect will not necessarily decrease the probability of respondents guessing the correct answer. Also, it is important to consider the topic area when deciding on the number of response options. In some cases, two or three response options may be the most appropriate.

Table 21. Item Characteristics for Questions Included in the Kansas City Knowledge Index

Item #	Description	% Correct	% Don't Knows	Number of Response Categories
6	As far as you know, can people on Medicare still get Original Medicare today?	76%	21%	2
7	As far as you know, does Original Medicare pay for all health care costs for people on Medicare?	84%	8%	2
8	As far as you know, are there different types of private health insurance plans that people on Medicare can get to pay for things that Medicare doesn't pay for?	92%	6%	2
9	Have you ever heard of a Medicare supplemental health insurance plan, sometimes called a "Medigap" plan?	78%	1%	2
10	Have you ever heard of a Medicare HMO?	87%	1%	2
11	Have you ever heard of a Medicare managed care plan?	63%	4%	2
12	Are there Medicare [HMO/managed care plans] in the Kansas City area?	57%	30%	2
13	Have you ever heard of an MSA or medical savings account for people on Medicare?	33%	2%	2
15	If a person signs up for any of these Medicare health insurance plans, is he or she still in the Medicare program?	71%	22%	2
16	If a person signs up for any of these Medicare health insurance plans, does he or she still get at least the same health care benefits as someone in the Original Medicare plan?	58%	31%	2
17	Do people who are happy with the health insurance plan they have now have to change plans this year?	76%	19%	2
19	In this type of Medicare health insurance plan, a person needs to go to doctors and hospitals from a list given by the plan. Does this statement best describe…(Original Medicare/A Medicare HMO/Both/Neither)	56%	18%	4
21	Which type of Medicare health insurance plan is more likely to pay for most prescription drugs? Would you say…(Original Medicare/A Medicare HMO/Both/Neither)	42%	21%	4
23	Which type of Medicare health insurance plan only allows a person to leave the plan and change to another plan once a year? Would you say…(A Medicare HMO/An MSA/Both/Neither)	4%	14%	4
35	Is there a local service in the Kansas City area that offers free and unbiased counseling to people on Medicare about choosing a health insurance plan?	32%	51%	2

Table 22. Item Characteristics for Questions Included in National Evaluation Knowledge Index*

Item #	Description	% Correct	% Don't Knows	Number of Response Options
3	As far as you know, are there different types of health insurance options that people with Medicare can get?	76%	19%	2
4	Have you ever heard of a Medicare supplemental health insurance plan, which is also sometimes called a "Medigap" policy?	70%	9%	2
5	Have you ever heard of a Medicare managed care plan, for example, a health maintenance organization or HMO?	70%	9%	2
7	If a person signs up for any of these – Medigap, a Medicare Managed Care Plan, or an Inclusive Provider Organization – do they still have Medicare?	45%	50%	2
8	As far as you know, can you still get the Original Medicare plan today?	74%	25%	2
9	The Medicare program has recently begun to offer more information and help in order to answer questions about the Medicare program.	64%	31%	2
10	As far as you know, will out-of-pocket costs differ depending on which health insurance option a person signs up for?	67%	31%	2
11	Which one of the following statements is true about what the Original Medicare plan pays for? It pays for… (All health care costs/Some health care costs/Only emergency health care/Only prescription drugs)	82%	11%	4
12	If you were enrolled in a Medicare Managed Care Plan and wanted to leave it, which one of the following statements is true? You can … (Leave any time but won't be covered by Medicare/Leave under special circumstances/Leave any time)	29%	60%	3
13	Which one of the following is a reason for contacting your state's Peer Review Organization (PRO)? (Find support group of peers/Complaint about quality of Medicare care/Change health insurance option/None of the above)	32%	52%	4
14	Which one of the following is likely to happen when you go to a doctor who "accepts assignment?" (Save money/Pay more money/Save money only on services not normally covered)	63%	25%	3
15	Which one of the following is paid for if you only have the Original Medicare Plan? (Yearly dental exams/Pneumonia shot/Medical care outside US/Long-term care)	51%	36%	4
16	Which type of health insurance option gives you more freedom to choose the doctors or hospitals you want to go to? (Original Medicare plan/Medicare managed care plan/Inclusive Provider organization/all about the same)	59%	25%	4
17	Which type of health insurance option is least likely to pay for prescription drugs? (Original Medicare/Medicare managed care plan/Medigap/All about the same)	52%	33%	4

18	Which type of health insurance option can refuse to sell you a policy after age 65 and a half because of poor health? (Original Medicare/Medicare managed care plan/Medigap/None of the above)	11%	63%	4
19	Which type of health insurance option will cover a 6-month stay in a nursing home? (Original Medicare/Medicare managed care plan/Both/Neither)	20%	58%	4
20	Emergency health care is paid for wherever you are in the US under which type of insurance option? (Original Medicare/Medicare managed care plan/Both/Neither)	19%	26%	4
21	The following statement is true for which type of health insurance option: "Medicare gives you the right to appeal decisions about what a Medicare plan pays for?" (Original Medicare/Medicare managed care plan/Both/Neither)	19%	32%	4
22	The Original Medicare Plan now pays for more preventive health care services like breast x-rays and diabetes monitoring. Is this also true for all, some, or none of the other different types of insurance options?	14%	49%	3
23	If you had a Medigap policy and dropped it, when could you get it back? (Any time/Only under some conditions/Never)	20%	70%	3
39	Is there an information and counseling service that people with Medicare can use to get help understanding and comparing health insurance options?	31%	54%	2
41	Does the Medicare program have its own Internet website?	16%	81%	2

Notes:

* Excludes question six which asked about awareness of a fictitious plan. This question was used to assess potential social desirability bias.

Table 23. Item Characteristics for Knowledge Questions Included in the 1998 MCBS (Round 23) 8-item Quiz

Item #	Description	% Correct	% Don't Knows	Number of Response Options
43	Most people covered by Medicare can select among different kinds of health plan options within Medicare.	47%	42%	2
44	Medicare without a supplemental insurance policy for all of your health care expenses.	75%	18%	2
45	If you are happy with the way you currently receive health care, you do not have to make any changes in the way you get your Medicare services.	72%	23%	2
46	The Medicare program has recently begun to offer more information and help in order to answer your Medicare questions.	45%	45%	2
47	People can report complaints to Medicare about their Medicare managed care plans (HMOs) or supplemental plans if they are not satisfied with them.	58%	35%	2
48	If someone joins a Medicare managed care plan (HMO) that covers people on Medicare, they have limited choices about which doctors they can see.	62%	31%	2
49	If someone joins a Medicare managed care plan (HMO) that covers people on Medicare, they can change or drop the plan and still be covered by Medicare.	47%	46%	2
50	Medicare managed care plans (HMOs) that cover people on Medicare often cover more health services, like prescribed medicines than Medicare without a supplemental policy.	40%	49%	2

6.1.2.4 Summary of Findings and Implications for Future Research

Both the scale-level and item-level analyses provided some insight regarding which questions might serve as a pool of questions for measuring beneficiary knowledge in future rounds of the MCBS. ***Table 24*** provides a summary of the key findings from the comparisons of the three indices.

Table 24. Summary of Findings from Psychometric Analysis

	Kansas City 1999 *Medicare & You*	**National *Medicare & You* 2000**	**1998 MCBS Round 23 8-item quiz**
Number of Items in Index	15	23	8
1. Scale-Level Analysis			
Reliability		Highest internal consistency	
Construct Validity	All scales found to have comparable degree of construct validity.		
Factor Analysis	3 factors found with alphas ranging from 0.52 to 0.62	5 factors found with alphas ranging from 0.48 to 0.70	1 factor found with alpha of 0.77
2. Item-Level Comparisons			
Item Difficulty	Moderate to easy difficulty levels % correct = 4% (item 23) -92% (item 8)	Variety of difficulty levels % correct = 11% (item 18) – 82% (item 11)	Moderate level of difficulty % correct = 40% (item 50) – 75% (item 43)
Percent of Don't Know (DK) Responses	% DK = 1% (items 9 and 10) to 51% (item 35)	% DK = 9% (items 4 and 5) to 70% (item 23)	% DK = 18% (item 44) to 49% (item 50)
Number of Response Options	2 responses = 12 3 responses = 0 4 responses = 3	2 responses = 9 3 responses = 4 4 responses = 9	2 responses = 8 3 responses = 0 4 responses = 0

Based on the results of the scale-level and item-level analyses, the National Evaluation index performed better than the knowledge questions from the MCBS. The National Evaluation index met several of the criteria evaluated in this report. The index had the highest reliability of the three scales and demonstrated evidence of construct validity. The index also contains a variety of difficulty levels, allowing it to measure the knowledge of beneficiaries with a wide range of ability levels. Finally, the National Evaluation index also performed well with respect to item content. The results of the factor analyses as well as the content of the items suggest that this scale measures a wider range of topics in comparison to the other two knowledge scales. This diversity allows the scale to more accurately assess the knowledge beneficiaries need to successfully navigate the Medicare program.

Nineteen of the items (questions 3-5, 7, 8, 10-14, 16-18, 20, 21, 23, 39, and 41) on the National Evaluation index address basic concepts that beneficiaries need to know to navigate the Medicare program. These topics tend to remain constant from year to year. Therefore, these items may be considered core knowledge questions that could be administered each year. The remaining items (questions 9, 15, 19, and 22) address concepts, such as benefits, that could possibly change (although some changes are less likely than others). These questions may be

considered supplemental items that could be administered periodically. Ultimately, the value of each question would need to be evaluated given recent legislative and policy changes.

The MCBS 8-item quiz and the Kansas City 15-item knowledge index also contain potential candidate items for inclusion in future rounds of the MCBS. In particular, item 16 on the Kansas City index asks whether a beneficiary will receive the same benefits with other health plans as he/she would on Original Medicare. This question addresses a basic Medicare concept and may be a good candidate as a core knowledge item. Most of the other items on the Kansas City index overlap in item content with items on the National Evaluation index. For example, item 21 on the Kansas City index asks which plan is more likely to pay for prescription drugs while item 17 on the National Evaluation index asks which plan is least likely to pay for prescription drugs. These items could be interchanged on the two surveys. In this case, the best item of the two might be determined by desired difficulty level (see ***Tables 21*** and ***22***).

Items 47 and 50 from the MCBS 8-item quiz may also be useful core knowledge questions. Both of these items demonstrated a moderate level of difficulty (although item 47 is easier than item 50). Item 47 concerns whether beneficiaries can report complaints about their managed care plans while item 50 compares the coverage of managed care plans and Original Medicare. These two questions address basic concepts related to managed care and are good candidates to be added to the pool of core knowledge items. Item 45 from the MCBS 8-item quiz (which is essentially the same as item 17 in the Kansas City index) should probably be dropped from consideration as this is no longer one of HCFA's key messages to beneficiaries because of the number of Medicare HMOs that have withdrawn from the market.

Several possible modifications could improve the National Evaluation index. First, the large percentage of don't know responses for question 7 suggests that it may be confusing for respondents. This item contains the name of a fictitious health plan, the Inclusive Provider Organization. Removing this plan from the question should make it easier for respondents to understand. Similarly, question 6 asks whether the respondent has heard of the fictitious plan; this question was designed to measure social desirability bias. This item could be removed and replaced with another knowledge question. Also, item 16 contains the fictitious plan as a response option and that option should be removed.

Examining the item-level analyses for the National Evaluation index revealed that item 22 was also one of the most difficult items on the scale with only 14 percent of respondents providing the correct response and approximately half of respondents indicating that they did not know the answer to the question. Item 22 addresses coverage of preventive health care services and therefore may be an important item to include on the knowledge scale. A potential source of the high don't know response rate for this question may be due to the response categories that refer to "other different types of insurance options." The question does not specify to which particular types of insurance options it refers, potentially causing some respondents to react to this question with uncertainty that they know the benefits of all possible insurance options. The question could be improved by specifying particular types of insurance plans in the response options.

If the intention of the knowledge index is to measure understanding of the Medicare program, it is suggested that the two awareness questions, items 4 and 5, be removed from the index. These items do not specifically address understanding and they contain yes/no response options which may be affected by a tendency among some respondents to exhibit an acquiescence response bias (Nunnally & Bernstein, 1994). These items could then be replaced with other items that require respondents to demonstrate their knowledge. However, the new replacement items should also have a relatively easy level of difficulty to keep the distribution of item difficulty levels the same.

Finally, it is critical that if the knowledge index in the MCBS will be used to monitor the Understanding/Knowledge goal of the NMEP, that the questions *directly* reflect the content of the version of the *Medicare & You* handbook distributed to beneficiaries just prior to fielding the MCBS. As the content and focus of *Medicare & You* changes, so too must the knowledge index questions. It is reasonable to assume that if an issue is obscurely mentioned in the handbook, that many beneficiaries may miss it. All main messages or critical knowledge issues should be repeated more than once in the handbook in different locations. This type of layering approach has been found to be successful in educating beneficiaries (McCormack, et al, 1996). Many beneficiaries still have a rudimentary understanding of the Medicare program. They must first understand the basics about Medicare benefits and coverage before being expected to compare various options. Thus, it may be wise to focus on educating beneficiaries about the basics in the short run, with increased diversity of knowledge in the longer term.

6.2 Comparison of Responses to Questions Found in Both the MCBS and the *Medicare & You 2000* Evaluation Instrument

6.2.1 Comparison of Questions About Use of the Handbook

We compared responses to questions on the use of the *Medicare & You* handbook drawn from both the 1998 MCBS (Round 23) and the *National Evaluation* survey to assess how respondents answered questions that were similar across the two surveys. Round 23 of the MCBS contained 5 questions regarding use of the handbook while the *National Evaluation* survey contained 16 questions on this topic. Only two questions are compatible for comparison as shown in ***Tables 25*** and ***26***. We compared a sub-group of MCBS respondents in the five states who received the pilot demonstration version of the *Medicare & You* handbook to the national sample of respondents from the *National Evaluation* survey. Persons responding in the *Medicare & You* evaluation are persons in the treatment group only of that survey.

Table 25. Comparison of How Much of the Handbook Was Read

Survey	Item #	Question	Response Analyzed	Frequency
MCBS	BK 30	Would you say you have read (it). . .?	Thoroughly or part of it	63%
M&Y 2000	Treat.65	How much of (it) did you read?	Most or all or parts of it	74%

A greater percentage of respondents in the Medicare & You survey indicated that they had read parts or all of the handbook than respondents in the MCBS survey.

Table 26. Comparison of Whether Beneficiary Kept the Handbook

Survey	Item #	Question	Response Analyzed	Frequency
MCBS	BK 40	Do you still have (it)?	Yes	89%
M&Y 2000	Treat.78	Did you keep (it)?	Yes	99%

Likewise, a greater percentage of respondents in the Medicare & You survey indicated that they still had the handbook when compared to the MCBS sample respondents.

Four issues affect a straight-forward comparison of these results:

- The sample populations are different. The MCBS sample analyzed above is only for five states in 1998 which had received the handbook, whereas the *Medicare & You* sample is a nationally representative sample. Differences in the samples may have contributed to the difference in the responses.

- The version of the handbook differed between samples. The MCBS sample received the 1998 version of the handbook while the *Medicare & You* sample received the 1999 version of the handbook. Differences in the handbook itself may have contributed in part to whether sample persons read and kept their handbook.

- The *Medicare & You* results may be higher because the sampled population was participating in the evaluation. As a result, they may have been sensitized to the experiment and wanted to "pass the test" concerning the handbook, which may have contributed to the differences in response.

- The timeframes of each survey are different. The MCBS Round 23 was fielded in early 1999 while the Medicare & You evaluation was fielded in November 1999 – March 2000. Temporal differences may in part have affected whether sample persons read and kept their handbook.

6.2.2 Comparison of 8 Quiz Questions

Rounds 23 and 24 of the MCBS and the survey for the national evaluation of the *Medicare & You* handbook also contained 8 similar questions on a variety of issues pertaining to knowledge of the Medicare program and actions beneficiaries have taken. Five of these eight questions were exactly the same in the MCBS and the Medicare & You evaluation and are shown in ***Table 27*** below with weighted frequencies for each question in both surveys.

Table 27. Comparison of Responses to the 1998 MCBS (Round 23) and the Medicare &You Evaluation Survey Questions

MCBS #	M&Y #	Question/Statement	Response Analyzed	MCBS %	M&Y %
BK 46	Treat. 9	The Medicare program has recently begun to offer more information and help in order to answer your Medicare questions. (True/False)	True/Correct	45.9	92.2
BK 11	Treat 31	In the past year, have you tried to find information about what medical services Medicare covers and does not cover?	Yes	8.0	31.6
BK 2	Treat. 30	How satisfied are you in general with the availability of information about the Medicare program when you need it?	Persons responding "Very satisfied" and "Satisfied"	93.0	79.1
BK 1	Treat. 32	How much do you think you know about the Medicare program?	Persons responding "just about everything," "most," and "some" of what they need to know	63.4	67.1
BN 1	Treat. 33	How much do you feel you know about what medical services Medicare covers or does not cover?	Persons responding "just about everything," "most," and "some" of what they need to know	70.7	68.0
BN4	Treat. 35	How much do you feel you know about the availability and benefits of. . . . . .Medicare managed care plans (Remainder in MCBS) . . .other health plan choices available under Medicare (Remainder in *M&Y*)	Persons responding "just about everything," "most," and "some" of what they need to know	41.2	46.2

Responses to the first three questions in the table (MCBS BK 46, 11, and 2) differed markedly between the two populations. In the first question, substantially more people in the *Medicare & You* sample responded that there was more information available in the Medicare program to answer questions. This difference in part may be attributed to respondents' participation in the evaluation study.

In the second question above (MCBS BK 11), a larger percentage of people in the *Medicare & You* sample tried to find information about what medical services Medicare covers and does not cover. Again, *Medicare & You* respondents may have been tempted to use the handbook to find information about certain issues because of their participation in a study. In the third question (MCBS BK 2), more persons in the MCBS sample were satisfied with the availability of information about the Medicare program when they needed it. It is difficult to determine why the differences are so large between the samples on this question.

In the fourth question (MCBS BK1) and the fifth question (MCBS BN 1) in the table, roughly the same percentage of people in the two samples answered they knew just about everything, most, or some of what they needed to know. These questions about perceived knowledge of the Medicare program and the services it covers may serve as proxies for the amount of knowledge these persons have.

A sixth question (MCBS BN 4) asked respondents about their knowledge of other health plan choices in Medicare but with slightly different language. Approximately 41.2% of respondents in the MCBS sample responded "just about everything, most, and some" of what they needed to know, whereas 46.2% of respondents in the *Medicare &You* sample reported the same, not a very substantial difference in terms of perceived knowledge.

The responses from the remaining two (out of the eight questions that were similar between the surveys) could not be compared directly. A general question about understandability of the Medicare program was exactly the same in the MCBS and the *Medicare & You* surveys, but the question has not been asked in the MCBS since 1997. In addition, psychometric analyses performed on this measure in Section 3.2 of this report found that the question was not correlated with the other knowledge indices tested, so it may be measuring a somewhat different construct than the other three scales analyzed which measured knowledge. Given the large temporal difference and the psychometric analysis, comparisons should not be made using this question.

Question BK 15 in the MCBS asks respondents if they "tried to find out about the availability and benefits of Medicare managed care plans, such as HMOs." A similar, but not exactly the same question from the Medicare & You survey asks respondents how much they "feel they know about the availability and benefits of HMOs." While the topic is the same, the MCBS question asks about an action, whereas the Medicare & You question asks about perceived knowledge. Given this difference, the two questions should not be compared.

7.0 Conclusions and Policy Recommendations

Two knowledge measures were identified to have sufficient internal consistency reliability and construct validity to warrant use as baseline measures—the Medicare Knowledge index (the 4-item quiz) contained in the 1996 MCBS and the Perceived Medicare Knowledge index found in the 1996 and 1998 MCBS. Other measures investigated and tested were not sufficiently reliable or valid.

Chi-square analyses were performed on both of these knowledge measures using 16 MCBS beneficiary characteristics to determine if there were differences in the distribution of knowledge for any given characteristic. For many beneficiary characteristics, there was little meaningful variance in the distribution although the tests were significant. Changes to the NMEP as currently implemented may be beneficial when there is a larger variance in responses, and the changes are targeted at those individuals who scored much lower than their counterparts. Selective targeting of any given suggested change in NMEP implementation would be more cost effective than sending the intervention to the entire population.

Based on the results of the scale-level and item-level analyses, the knowledge index from *National Evaluation of the Medicare & You 2000 Handbook* performed better than the knowledge questions from the MCBS. The *National Evaluation* index met several of the criteria evaluated in this report. The index had the highest reliability of the three scales and demonstrated evidence of construct validity. The results of the factor analyses as well as the content of the items suggest that this scale measures a wider range of topics in comparison to

other knowledge evaluated, in part because it has more questions. This diversity allows the scale to more accurately assess the knowledge beneficiaries need to navigate the Medicare program successfully. The MCBS 8-item quiz and the Kansas City 15-item knowledge index also contain potential candidate items for inclusion in future rounds of the MCBS. Questions used in the MCBS to evaluate knowledge should *directly* reflect the content of the version of the *Medicare & You* handbook distributed to beneficiaries just prior to fielding the MCBS. As the content and focus of *Medicare & You* changes, so too must the knowledge index questions.

On questions that were found in both the MCBS and the National Evaluation of the *Medicare & You* handbook, participants in the *Medicare & You* sample may have scored more favorably in general on various questions because they knew they were participating in the national evaluation.

8.0 Recommendations for Future Research

8.1 Methods for Conducting Longitudinal Analyses

Future work is needed to develop longitudinal analyses to more accurately monitor the effect of the NMEP in the same population as opposed to comparing the effects across different samples using cross sectional analyses. Longitudinal analyses focused on the MCBS population will be beneficial particularly beginning with the 1999 and 2000 MCBS rounds. Several technical issues concerning a methodology to be employed for longitudinal analyses must be resolved before the MCBS measures can be used to provide useful policy information for the NMEP over time. In part these issues include:

- whether data should be pooled for measuring certain outcomes over time,
- how predictions should be made for changes in beneficiary attributes, and
- what types of statistical tests should be used for measuring certain outcomes over time.

8.2 Potential Measures of the Impact of the NMEP

The goals of the NMEP include (a) Access, (b) Awareness, (c) Understanding, and (d) Use/Impact/Trust. The knowledge indices evaluated in this report address only the first three goals. Although an increase in understanding (knowledge) might be thought of as an "impact" of the NMEP, it is an intermediate prerequisite to the improvement in other outcomes. Future studies should investigate possible measures of knowledge use, confidence in one's ability to make the right choices or to understand the system, and trust. For example, the MCBS Perceived Medicare Knowledge index may be appropriate as a measure of the impact of the NMEP. This index allows respondents to express how much they feel they know about a particular topic and may be useful for evaluating whether the NMEP has an effect on beneficiaries' confidence in their knowledge of the Medicare program. In addition, we found the Perceived Medicare Knowledge index to have good psychometric properties (see Bann et al, 2000).

8.3 Direct Comparisons Among Knowledge Questions

In Section 6 we evaluated the questions from three different knowledge indices: the MCBS 8-item quiz, the National Evaluation index, and the Kansas City index. However, because the knowledge indices were administered to different groups of respondents, we were unable to make direct comparisons between the items. This prevented us from determining whether differences in the item parameters were due to differences in the items or differences in the respondents. For example, if a larger percentage of respondents got high knowledge scores in the Kansas City than in the National Evaluation data sets, we cannot know whether this is because the beneficiaries who responded to the National Evaluation survey were less informed or whether they received more difficult items. To more effectively compare the three sets of knowledge questions, all of the items should be administered to the same group of respondents in future data collections. The psychometric properties of the items could then be evaluated and compared to determine which items most effectively measure knowledge and the best performing items could then be selected and assembled into a new, more effective knowledge index.

8.4 Development of a Knowledge Index Using Item Response Theory

Traditionally, questions on the Medicare Current Beneficiary Survey (MCBS) have changed from year to year to address the newest features of Medicare health plans and to adapt to the changing priorities and goals of HCFA. However, the changing content makes it difficult to measure improvement or decline in beneficiary knowledge from year to year and therefore to evaluate the effectiveness of interventions designed to increase beneficiary knowledge. For example, due to the changing content, we found that the MCBS could provide only a limited amount of information on the effectiveness of the National Medicare Education Program (NMEP) interventions. Item Response Theory (IRT) can be used to remedy this problem by assigning a comparable metric to knowledge item sets that will differ from year-to-year in future rounds of the MCBS. IRT enables the creation of equivalent scores from two forms of a scale that contain only some items in common (Wainer, 1990).

The use of IRT to develop and evaluate measures of knowledge has been well established in the field of educational testing. For example, many large-scale testing programs, such as the Law School Admission Test (LSAT) and Graduate Record Examination (GRE), use IRT to equate different test forms. Using IRT allows these educational testing programs to change test items frequently to prevent item memorization while still assuring that respondents receiving different forms have comparable test scores. Increasingly, IRT methods are also being applied to health services research. For example, on September 16 and 17, 1999, the Agency of Healthcare Research and Quality and the National Cancer Institute hosted an invitation-only health outcomes measures methodology symposium for which seven papers were commissioned. Two of these papers addressed the use of Item Response Theory to develop and evaluate health measures.

The process for developing the MCBS knowledge index via IRT would consist of three steps: (1) establishment of content categories, (2) development of a "pool" of candidate items, and (3) pre-testing of the items. The first step would be to decide which topics or content

categories should be included in the knowledge scale, as well as the proportion of items that should address a particular topic. These content categories should cover both core knowledge areas that generally remain consistent from year to year as well as supplemental topics that may change more frequently. One possible set of content categories could be the seven topic areas listed in the National *Medicare & You* evaluation report: (1) awareness of Medicare options, (2) access to traditional Medicare, (3) cost implications of insurance choices, (4) coverage/benefits, (5) plan rules/restrictions, (6) availability of information, and (7) beneficiary rights (McCormack, Ross, Daugherty, & Garfinkel, 2000).

After finalizing the content categories, the next step would be to develop a pool of items that address the relevant topics. Possible sources of these items may be previous rounds of the MCBS, the Kansas City *Medicare & You* evaluation, or the National *Medicare & You* evaluation. If needed, additional items would also be developed to assure that there was a large pool of items covering each of the content categories. If new items were created, they would also need to be cognitively tested on a small sample of Medicare beneficiaries. This technique can detect potential problems with respondent understanding or interpretation of the items that may not be uncovered by other review processes (Forsyth & Lessler, 1991). If problems were discovered, items would be modified after the interviews.

Finally, a pretest would be conducted in which the knowledge questions would be administered to a sample of Medicare beneficiaries. Data from the pre-test would be analyzed using IRT methods to select the items for the final knowledge scale. The IRT analyses would provide information on the psychometric properties of the questions, such as the level of difficulty and discrimination, as well as detect possible problems with the items that may not be uncovered using traditional item analyses. Items would be selected if they demonstrate high levels of discrimination and low levels of guessing. Also, items with varying levels of difficulty would be chosen to assure that the scale would be appropriate for beneficiaries with different levels of knowledge.

After the knowledge measure had been developed, it could be adapted in future years to fit possible changes in the Medicare program by replacing outdated items with new items that address these changes. Because IRT can produce comparable scores from different forms of a scale when the two forms contain common items, the scores from the different years could then be used to evaluate changes in knowledge over time.

A knowledge index developed using this technique would provide many benefits. First, the knowledge scale would be flexible, allowing a proportion of items to be replaced or changed. Therefore, it could be adapted to reflect new aspects of the Medicare program as well as changes in existing features. At the same time, this knowledge index would allow HCFA to monitor the knowledge of Medicare beneficiaries and determine whether knowledge levels increase or decrease. This information could then be used to determine when it is necessary to create new educational efforts and to evaluate the effect of these efforts once they were implemented.

References

Bann, C., Lissy, K.S. ,Keller, S.D., Garfinkel, S.A., & Bonito, A.J. (April, 2000). Analysis of Medicare beneficiary baseline knowledge data from the Medicare Current Beneficiary Survey: Knowledge Technical Note. Unpublished report to HCFA, Research Triangle Institute, RTP, NC.

Caffereta, C. 1984. Knowledge of Their Health Insurance Coverage by the Elderly. *Medical Care* 22(9):835-47.

Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16(3), 297-334.

Duncan, D.B. (1975). T-tests and intervals for comparisons suggested by the data. Biometrics, 31, 339-359.

Forsyth, B.H. & Lessler, J.T. (1991). Cognitive laboratory methods: A taxonomy. In Biemer, P., et al. (Eds.), Measurement Error in Surveys. New York: Wiley.

Hibbard, J.H., J.J. Jewett, S. Englemann, and M. Tusler. 1998. Can Medicare Beneficiaries Make Informed Choices? *Health Affairs* 17(6):181-93.

Lambert, Z.V. 1980. Elderly Consumers' Knowledge Related to Medigap Protection Needs. *The Journal of Consumer Affairs* 14(2):434-51.

Marquis, M.S. 1983. Consumers' Knowledge About Their Health Insurance coverage. Health Care Financing Review 5(1):65-80.

McCall, N., T. Rice, and J. Sangl. 1986. Consumer Knowledge of Medicare and Supplemental Health Insurance Benefits. Health Services Research 20(6):633-57.

McCormack, L., S. Garfinkel, J. Schnaier, A.J. Lee, and J. Sangl (1996). "Consumer Information Development and Use." *Health Care Financing Review*, Vol. 18, No. 1, pp. 15-30.

McCormack, L.A., Ross, K., Daugherty, S.E., & Garfinkel, S.A. (2000). *Preliminary results from the national evaluation of the Medicare & You 2000 handbook.* Research Triangle Park, NC: Research Triangle Institute.

McCormack, L.A., S.A. Garfinkel, J.H. Hibbard, S.D. Keller, K.E. Kilpatrick, B. Kosiak. 2000. *Health Insurance Knowledge Among Medicare Beneficiaries*. Research Triangle Park, NC: Research Triangle Institute.

McCormack, L.A., Ross, K., Daugherty, S.E., & Garfinkel, S.A. (2000). *Preliminary results from the national evaluation of the Medicare & You 2000 handbook.* Research Triangle Park, NC: Research Triangle Institute.

McCormack, L.A., Garfinkel, S.A., Hibbard, J.H., Keller, S., & Kilpatrick, K.E. (Under review). Health Insurance Knowledge Among Medicare Beneficiaries. Manuscript submitted to Health Services Research.

Nunnally, J.C. & Bernstein, I.H. (1994). *Psychometric Theory* (3rd ed.). New York: McGraw-Hill.

Rice, T., N. McCall, and J.M. Boismier. 1991. The Effectiveness of Consumer Choice in the Medicare Supplement Health Insurance Market. Health Services Research 26(2):223-46.

Wainer, H. (2000). Computerized adaptive testing: A primer. Hillsdale, NJ: Erlbaum.