

Case Mix of Home Health Patients under Capitated and Fee-for-Service Payment

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Objective. We compare case mix of Medicare home health patients under HMO and FFS payment.

Study Design. A pseudo-experimental design was employed to study case mix using three types of Medicare-certified home health agencies (HHAs): HMO-owned agencies, pure FFS agencies that admit few Medicare HMO patients (less than 5 percent of admissions are Medicare HMO patients), and mixed (or contractual) agencies that admit at least 15 Medicare FFS patients and 15 Medicare HMO patients per month.

Samples of Providers and Patients. Random samples of Medicare-aged patients (≥ 65 years) were selected at admission between June 1989 and November 1991 from the 38 study HHAs. Sample sizes by agency type were: 308 patients from 9 HMO-owned agencies; 529 patients from 15 pure FFS agencies; and 381 HMO patients and 414 FFS patients from 14 contractual agencies.

Data. Primary longitudinal data were prospectively collected at admission for all patients on health status indicators, demographics, admission source, and home environment.

Measures. The most important case-mix measures were functional and physiologic indicators of health status, including (instrumental) activities of daily living ([I]ADLs). Selected indicators of demographic variables, prior location, living situation, characteristics of informal caregivers, mental/behavioral factors, and resource needs were also used.

Principal Findings. (a) The case mix of Medicare FFS patients compared with Medicare HMO patients was more intense in terms of impairments in ADLs, IADLs, and various physiologic conditions. Pressure ulcers as well as neurological and orthopedic impairments requiring rehabilitation care were also more prevalent among FFS patients. (b) Relative to HMO patients admitted to contractual agencies, HMO patients admitted to HMO-owned agencies were moderately more dependent in ADLs and IADLs. However, only 62 percent of HMO patients admitted to HMO-owned agencies, in contrast to 77 percent of HMO patients admitted to contractual agencies, had been hospitalized during the 30 days prior to home health admission. (c) In all, the case mix of patients receiving care from HMO-owned agencies is more heterogeneous than the case mix of HMO patients receiving care from contractual agencies.

Conclusions. The case-mix (and selected utilization) findings indicate that HMOs use home health care differently than does the FFS sector. The greater diversity of case mix for HMO-owned agencies and the narrower or less diverse case mix that characterizes HMO patients receiving home care on a contractual basis point to the likelihood of cost differences among the two types of HMO patients and FFS patients, and raise the question of possible outcome differences.

Key Words. Home health care, case mix, Medicare, HMOs, fee-for-service

MEDICARE HOME HEALTH CARE

Several Medicare policy changes have affected home health care over the past 15 years. Among the more important was the Omnibus Budget Reconciliation Act of 1980 (OBRA, 1980 PL 96-499), which removed the 100-visit limit for Medicare Part A home health patients, allowed proprietary agencies to be reimbursed by Medicare even in states without home health licensure laws, and removed the requirement for a three-day prior hospital stay (Bishop and Karon 1989; Silverman 1990). Medicare's prospective payment system (PPS) for hospitals, implemented in late 1983, led to dramatic reductions in hospital lengths of stay and increased use of home health care (Silverman 1990). In addition, home health services provided after PPS were found to be of greater intensity and longer duration than in the past (Shaughnessy and Kramer 1990; Wood and Estes 1990; Bishop and Karon 1989; Morrisey, Sloan, and Valvona 1988). During the mid-1980s, intensified claims review by Medicare fiscal intermediaries (FIs) and increased payment denial rates constrained the growth in Medicare home

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health care. As a result of the Stagers lawsuit (*Duggan vs. Bowen*) over HCFA's interpretation of intermittent care for home health patients, HCFA issued revised guidelines to fiscal intermediaries for home health coverage decisions effective July 1, 1989 (NAHC 1991). This change contributed to increasing Medicare home health utilization in the early 1990s (NAHC 1992, 1993). The Medicare Catastrophic Coverage Act (MCCA, PL 100-360), in effect during 1989, provided encouragement for home health utilization (Monk and Cox 1991; Gornick and Hall 1988; Kent and Hanley 1990; Rowland 1989). Even though the MCCA was repealed after 1989, it increased the use of and familiarity with home health care on the part of beneficiaries and providers, possibly contributing to the higher level of home health use experienced in the early 1990s.

In 1982, the Tax Equity and Fiscal Responsibility Act (TEFRA, PL 97-248) constituted the enabling legislation for HMOs that are now termed "TEFRA-risk HMOs" (or simply "risk" HMOs) under the Medicare program. Unlike cost-based HMOs that are reimbursed by Medicare on the basis of cost, TEFRA-risk HMOs are reimbursed using an adjusted average per capita cost (AAPCC) for each Medicare beneficiary enrolled in the HMO. Thus, the HMO is at risk to gain or lose financially, depending on the cost of care relative to AAPCC revenues for its Medicare enrollees. Most Medicare HMOs are now TEFRA-risk HMOs, although several HMOs are reimbursed on a cost basis. As of June 1993, there were 97 HMOs with risk contracts and 22 cost HMOs. Regardless of whether an HMO is cost-based or TEFRA-risk, it is free to use home health care services in any way it wishes for its Medicare beneficiaries. That is, several requirements that must be met in providing home health care to Medicare beneficiaries not enrolled in HMOs, such as the restriction of homebound status, the specific types of services that can be provided, and the requirement that only intermittent care can be provided, need not be satisfied. Thus, (TEFRA-risk) HMOs have considerably greater flexibility in using and adapting home care services than is the case with providers in the fee-for-service (FFS) sector.

STUDY ISSUES AND OBJECTIVES

Virtually no systematic evidence is available on the types of patients HMOs admit to home health care and, hence, how HMOs use home care services. The opportunity to substitute home care for hospital care would suggest

that in managed care environments, we would expect to see a more complex mix of patients receiving home care. However, HMOs tend to be oriented toward medical care, with the pervasive philosophy that physician-based outpatient care can be substituted for hospital care to lower acute care costs (Davis et al. 1990; Retchin, Clement, Rossiter, et al. 1992). If outpatient physician care is the predominant substitute or deterrent for inpatient hospital care, it is possible that home health care would compete with instead of complementing physician care. Therefore, home health care case mix might be less intense in HMO settings than in FFS settings if the managed care philosophy translates into the expectation that physician-based outpatient care should substitute for or minimize the use of home health care as well as hospital care (although physician care can be more expensive than home health care under various circumstances). Further, if skimming or favorable risk selection by HMOs takes place, then a selection bias resulting in enrollees less disabled than those typically found in the fee-for-service sector might also result in a less intense HMO than FFS home health case mix.

The case mix of HMO home health patients can be influenced by the organizational and payment arrangements between HMOs and home health agencies. Such arrangements serve to both shape and reflect HMO policies regarding home health care. For example, if an HMO owns an HHA, in contrast to contracting for home health care, it would be expected to make greater use of such an agency to curtail or avoid hospitalizations. However, if it is committed largely or exclusively to using physician services to lessen hospital utilization, an HMO might be more inclined to use an HMO-owned home health agency (HHA) to care for less (acutely) disabled or even chronic care patients than would be the case for agencies that provide care exclusively or predominantly to FFS patients. When HMOs contract for home health care (which the vast majority of HMOs do—Schlenker and Shaughnessy 1992), case mix may be influenced by the nature of the payment arrangements with HHAs. Since most such contracts are based on (discounted) payment per unit of service (as opposed to some form of capitation), it is likely that HMOs that do not own agencies would seek to curtail use of home health services, admitting a less complex case mix to contracting agencies than such agencies would normally admit under FFS payment. This may not be the case if the HMO expects home health care, provided by an external agency with whom the HMO is contracting, to serve as a deterrent to hospitalization. This expectation appears unlikely, however, since so little is known about the effectiveness of home health care

at the present time. Rather, it appears likely that more complex patients with intense care needs will be treated as outpatients by physicians in HMOs that contract for home health care on a (discounted) FFS basis.

The study described here was designed to compare Medicare home health case mix in HMO and FFS settings. The goal was to test the null hypotheses that admitting case mix does not differ (1) between HMO and FFS patients in general, (2) between patients admitted to HMO-owned agencies and FFS home health patients admitted to agencies that do relatively "small amounts of business with HMOs," and (3) between HMO and FFS home health patients admitted to HHAs that contract with HMOs and provide services to Medicare beneficiaries on an FFS basis. Consequently, our primary purpose was to assess whether HMO versus FFS case-mix differences exist. It was beyond the scope of this study to specifically determine reasons for such differences, if found (although potential reasons were just given to demonstrate the importance of the hypothesis and its rationale).

METHODS AND DATA

DESIGN

A pseudo-experimental design was employed to compare admitting case mix in HMO and FFS payment environments by selecting and recruiting three different types of HHAs to participate in the study. In keeping with the foregoing hypotheses, the three types consisted of (1) HHAs owned by HMOs, (2) HHAs that admit substantial portions of (contract) HMO and FFS patients, and (3) agencies that admit exclusively or nearly exclusively FFS patients. These three types of agencies are termed, respectively, HMO-owned, mixed (or contractual), and pure FFS agencies. To be eligible to participate in the study as a mixed agency, a Medicare-certified HHA was required to have a minimum of 15 FFS Medicare admissions per month and 15 HMO Medicare admissions per month from their largest contracting HMO. Pure FFS agencies could not have any more than 5 percent (typically less than 2 percent) of their total Medicare admissions accounted for by Medicare HMO patients. A total of 38 agencies participated in the study: 9 HMO-owned, 14 mixed, and 15 pure FFS agencies. All HMO plans studied were TEFRA-risk HMOs.

The study was designed so that the primary comparisons would entail patients from HMO-owned versus pure FFS agencies, and HMO patients versus FFS patients within mixed agencies. Thus, one comparison entails

HMO versus FFS patients from two different types of agencies (HMO-owned versus pure FFS), while the other entails HMO versus FFS patients within the same (mixed) agencies. The pooled or summary analyses involve comparing all HMO patients pooled (from HMO-owned and mixed agencies) and all FFS patients pooled (from pure FFS and mixed agencies).

SAMPLES AND DATA COLLECTION

Most analyses were conducted at the patient level. The overall (final) random sample of 1,632 patients consisted of 308 patients from HMO-owned agencies, 529 patients from pure FFS agencies, 381 HMO patients from mixed agencies, and 414 FFS patients from mixed agencies—for a total of 689 HMO patients and 943 FFS patients. Due to differential staff availability at each study agency, as well as attrition, it was not possible to collect data on the same numbers of patients per agency. Agency-specific sample sizes for FFS patients ranged between 11 and 41 (two agencies had sample sizes lower than 20). The range for HMO patients was from 9 to 48 (five agencies had sample sizes lower than 20). The original study design consisted of 45 agencies, but seven were later excluded from the analyses since complete data were obtained on five or fewer patients at each agency. As noted below, a nonparametric analysis was undertaken to assess whether agencies that contributed larger numbers of patients to the patient-level samples biased the study findings.

Subject to the conditions required by the study design (e.g., the need to have the three different types of home health agencies noted earlier), study agencies were selected geographically so that their distribution paralleled the location of Medicare risk HMOs in the United States. Dividing the United States into three areas according to federal regions, the Northeast (Regions I–III), South Central (Regions IV–VI), and West (Regions VII–X), 24 percent, 36 percent, and 40 percent of Medicare risk HMOs were found in these regions, respectively, during the study time period. Analogously, 19 percent, 31 percent, and 50 percent of our study's home health agencies were selected from these respective regions.

All sample patients were Medicare patients admitted to study agencies between November 1989 and June 1991. Because Medicare claims data are not typically available for HMO patients, it was not possible to use the Medicare statistical files for patient-level analyses comparing HMO and FFS patients (except for general Medicare beneficiary data pertaining to global measures such as mortality). Further, claims data do not contain sufficiently detailed patient status information to measure long-term care case mix. To

assess the representativeness of the primary data, we compared certain parameters of the length of stay distributions for FFS study patients with those of a random sample of Medicare home health admissions. In general, the distributions were highly similar. For example, 71 percent of study FFS patients were discharged from home health care within 60 days and 68 percent of Medicare FFS patients were discharged within 60 days in 1990. Analogously, study FFS patients received an average of 18.8 visits during the first 60 days compared with 19.0 visits for all Medicare FFS patients. Medicare claims data for individual study patients also were examined in order to assess the comparability of the home health utilization statistics obtained through primary data collection and those obtained from claims. Overall, the disagreement rate between claims and primary data on number of visits per admission averaged less than 1 percent.

All agency admissions of Medicare beneficiaries age 65 and over were eligible for inclusion in the random sample of admissions from each study agency. For mixed agencies, all Medicare FFS patients were considered eligible for sampling, while only those Medicare HMO patients enrolled in the agency's largest contracting HMO (or two largest HMO contractors in selected agencies) were eligible. This restriction for HMO patients was due to the necessity of securing approval from HMOs in order to collect certain patient-level information from the HMO business office—such approvals are time-consuming and administratively complex. A Research Center staff nurse conducted a training session on site at each agency, involving agency administrative staff and data collectors (primary care nurses and therapists), and appropriate support personnel chosen by the agency. All instruments and directions for their use were reviewed separately. A number of agencies videotaped the training session. When this was not done, the Research Center nurse researcher recorded the session on audiocassette and left the tape with the agency at the end of the training session. Agency data collectors were instructed to sample randomly from each week's admissions until the random sample quota (40 patients at HMO-owned and pure FFS agencies, and 40 HMO and 40 FFS patients at mixed agencies) was filled. Due to time constraints and patient attrition, many agencies did not reach their sample quotas, and we therefore permitted agencies to contribute additional patients if their quota was exceeded by admitting patients to the sample before the notification to stop sampling (the largest agency sample size was 48).

A small group of nurses/therapists was chosen by each agency to serve as data collectors for the study. They completed each instrument (described next) by interviewing the primary care providers for the patient

and conducting some record review. Prior feasibility studies had shown that clinical records alone were inadequate to collect the specific types of case-mix data needed for this study. There was also a data collection coordinator at each agency who kept track of the entire study from the agency's perspective and served as a liaison between the agency and the Research Center study team. In view of the rigors of the data collection methods, the fact that data collectors were not apprised of the study hypotheses, and the nearly 100 percent enrollment rate (i.e., nearly all sampled patients consented to participate), we have no reason to believe that data collectors differentially selected HMO versus FFS patients (according to case-mix characteristics) or that a patient-level self-selection bias (to participate in the study) occurred.

Baseline questionnaires providing data on health status, diagnoses, treatments, complications, admission source, household characteristics, and demographics were completed at the start of care. For other components of the study requiring longitudinal data (Shaughnessy, Schlenker, and Hittle 1994), follow-up questionnaires on health status, treatments, complications, and services provided were completed at four time points: three weeks, six weeks, nine weeks, and twelve weeks after admission—or until the patient was discharged from the agency. Agencies were reimbursed monthly based on data received. Along with payment, a letter was mailed to each agency regarding any missing data. If the agency did not respond, the letter was followed by phone calls to the data collection coordinator until needed data were provided. Agency personnel were also provided with tracking forms for their use in maintaining records on data, due dates, and dates forms were mailed. Prior to optical scanning of the completed answer sheets, all forms were reviewed by a study team member to ascertain consistency of various types of identifying information and appropriateness of answers to single- and multiple-response questions.

VARIABLES

All demographic and case-mix variables analyzed correspond to characteristics of individual patients at the time of admission to the study home health agencies. The variables analyzed fall into six general categories: (1) demographic factors and prior location; (2) living situation and informal caregivers; (3) functional measures; (4) physiologic, diagnosis, and prognosis measures; (5) mental and behavioral factors; and (6) resource need index.

The demographic and prior location variables consist of basic descriptive factors such as age, gender, marital status, and location prior to admission to home health care (e.g., private residence or hospital). The variables related to living situation and informal caregiver characteristics consist of

indicators of whether the patient lives in his or her own home, a family member's home, and alone or with spouse, and who provides informal assistance in activities of daily living (ADLs). The functional measures consist of ADL and instrumental activity of daily living (IADL) variables. The ADL measures involve scales ranging from 0 to 4, 5, or 6, with 0 denoting independence in a given functional area and higher numbers denoting greater degrees of dependence. For example, in the scale used for grooming

- 0 denotes that patient is able to comb and brush hair, shave, apply makeup, clean teeth or dentures, and manage nail care without assistance and without adaptations or modifications.
- 1 denotes that patient is able to complete grooming activities unaided, using assistive devices or adapted methods for grooming. (Patient may use long-handled combs or brushes, suction brushes for cleaning nails or dentures, adapted shaving equipment, or adapted key for rolling toothpaste tubes.)
- 2 denotes that someone must place grooming utensils within reach before patient is able to complete grooming activities.
- 3 denotes that someone must help the patient comb and brush hair, shave, apply makeup, clean teeth or dentures, or manicure nails.
- 4 denotes that patient depends on someone else entirely for grooming needs.

The five ADL measures used in this study included bathing, grooming, eating, toileting, and transferring. Three IADL scales were also used, including management of oral medications, light meal preparation, and shopping. The scales for each of the IADL variables took on three values, 0, 1, and 2, ranging from independence to substantial dependence. In addition to the scale variables, certain dichotomies and aggregate measures were constructed for the ADL and IADL variables using different levels of each scale to denote mild versus moderate versus severe levels of dependency. For example, for the grooming scale just noted, a mild grooming dichotomy was defined to be 0 if the patient's value on the grooming scale was 0 or 1, and for scale values 2–4 it was defined to be 1; the moderate dichotomy was defined to be 0 if the patient's scale value was 0, 1, or 2 (otherwise it was 1) and the severe dichotomy was defined to be 0 if the patient's scale value was 0–3, and defined to be 1 if the scale value was 4.

The mild, moderate, and severe dichotomies were used for ADLs (mild and severe were used for IADLs) both as individual variables and as

combined aggregate indexes of the number of (mild, moderate, or severe) ADL or IADL dependencies. The ADL and IADL scale variables were measured using ordinal scales, not interval scales. Therefore, when means are presented for such variables, they should be considered descriptive, although they are typically meaningful and complement the results using dichotomies and aggregate count indicators, which are the most appropriate measures in this respect. Means for all three types of variables (scales, dichotomies, and aggregate indexes) are presented in the results section to demonstrate the patterns of differences between HMO and FFS patients.

The physiologic, diagnostic, and prognostic variables correspond to a variety of patient status indicators such as pressure ulcers, incontinence, presence of urinary catheters, vision and hearing impairments, orthopedic conditions, open wounds, pulmonary conditions, and good or moderate rehabilitation potential and recovery potential. Most measures in this group of variables are dichotomous with 1 indicating the presence of the particular condition and 0 indicating its absence. The mental and behavioral variables include a depression scale (three levels), a general indicator of mental/behavioral conditions (dichotomy), lethargic mental state (dichotomy), and verbal disruptiveness (dichotomy).

Finally, an overall resource need index based on home health resource utilization groups (RUGs) was used to reflect resource needs quantitatively, with higher values of the index indicating greater resource needs. The index is a modest variation of the New York home health RUGs system developed by Foley, Schneider, Dowling, et al. (1986), and modeled after a similar system designed for nursing home care (Schneider, Fries, Foley, et al. 1988). The system is based on classifying each patient into one of 27 individual groups, with each group having a resource weight that reflects the expected resource need for patients of this type. Thus, the actual value taken on by an individual patient is the weight that corresponds to the group into which the patient is classified. This system is not a pure case-mix system (Smits 1984) in that it depends, like its nursing home predecessor, on services provided (e.g., patients receiving physical therapy services are classified into certain rehabilitation groups). Nonetheless, it yields a useful indicator of resource needs that is strongly related to case mix (in a pure sense, case-mix measures consist only of those variables that reflect an individual's health and functional status, not services received).

The variables just described and presented in the Findings section comprise a subset of the case-mix variables analyzed. They were selected because they span the total set of variables in a substantive sense, and the

statistical results for these variables typify the overall patterns of results that were obtained using all variables.

RELIABILITY

The reliability findings reported in this section are based on patient status data collected at admission. An interrater reliability test was conducted using data on 43 patients using the baseline questionnaire that provided the case-mix data. Due to the cost of training and travel, reliability testing occurred at 7 of the 38 study agencies. To minimize the burden on patients, two data collectors independently interviewed the home health agency staff member responsible for the patient's admission assessment. These interviews occurred within five days of the initial assessment visit and within two days of each other. Thus, the reliability testing protocol assessed the degree of reliability between successive administerings of the questionnaire items by different data collectors.

In general, interrater reliability coefficients were greater than .60 (both Cohen's kappa and Pearson's r) for all case-mix variables used in this analysis. Variables with substantially lower reliability coefficients were eliminated from the analysis while those (few) with reliability coefficients between (.40 and .60) either were not used or were used only to assess the pervasiveness of case-mix patterns exhibited by other reliable variables. The case-mix variables and associated interrater reliability coefficients presented in Table 1 typify results from the overall reliability analysis.

COMPARATIVE AND STATISTICAL METHODS

For the three primary comparisons of interest (pooled HMO versus pooled FFS patients, HMO-owned versus pure FFS patients, and mixed HMO versus mixed FFS patients), profiles of case-mix variables were compared using statistical tests for mean differences or shift parameters. The statistical test used for each difference was either the t -test or Wilcoxon test for interval or ordinal variables, depending on whether the distribution was normal, and the chi-square test or Fisher's exact test for dichotomous variables. The basic comparative results presented in the Findings section use these tests, although additional steps were taken to examine the effects of simultaneous testing, agency-level covariates, certain patient-level covariates, potential outliers, and differing patient-level sample sizes by agency. To examine the effects of simultaneous testing (i.e., high probabilities of error rates resulting from conducting relatively large numbers of individual statistical tests), k-group discriminant function analyses and k-group logistic regression

Table 1: Interrater Reliability Results for Illustrative Variables

<i>Variable</i>	κ	r	<i>Variable</i>	κ	r
Bathing disability			Oral medications dependency		
Scale (0-5)	.63	.89	Scale (0-2)	.88	.95
Dichotomy (severe)	.89	.90	Light meal preparation disability		
Grooming disability			Scale (0-2)	.70	.84
Scale (0-4)	.78	.88	Hearing impairment: Scale (0-3)	.88	.94
Dichotomy (moderate)	.94	.94	Urinary incontinence: Scale (0-2)	.93	.93
Feeding disability			Indwelling catheter	1.00	1.00
Scale (0-6)	.61	.84	Rehabilitation potential: Scale (0-2)	.85	.93
Dichotomy (mild)	.69	.69	Marital status	1.00	1.00
Toileting disability			Resides in own home	.86	.86
Scale (0-4)	.77	.85	Living situation: Alone	.88	.88
Dichotomy (severe)	.72	.72			

Note: Reliability results are based on 43 patients from seven agencies. The reliability coefficients are Cohen's unweighted kappa (κ) and Pearson's correlation (r). All coefficients are significantly different from zero ($p < .01$). (For ordinal or interval scales, Cohen's kappa is a conservative measure of agreement.)

analyses were conducted. These analyses entailed simultaneous comparisons of four profiles (i.e., $k = 4$) of 68 case-mix variables corresponding to patients from HMO-owned agencies, pure FFS agencies, and mixed agencies (mixed agencies provided two groups of patients, HMO and FFS patients). The primary method was 4-group logistic regression, although 4-group discriminant function analysis was also used as a data analytic procedure (its underlying assumption of multivariate normality of the profile variables was obviously not satisfied) to complement the logistic regression results, since discriminant analysis uses an alternative computational method to assess overall profile differences and variable-specific differences within profiles. Further, and as an additional method to compensate for the effects of simultaneous testing, final inferences and conclusions are based only on patterns of findings using several variables rather than a single variable.

Since certain agency-level characteristics differed among the basic comparison groups (e.g., hospital affiliation, profit status, and regional location), ordinary least-squares regression and logistic regression were used to adjust for such factors. This entailed estimating separate regression models for each case-mix variable, using logistic regression or ordinary regression depending on whether the variable was dichotomous or (approximately) continuous, with the independent variables consisting of the group membership dichotomy (HMO versus FFS) and the agency-level covariates.

Differences in age and gender were found in the several case-mix comparisons. To ascertain whether these factors and prior hospital stay accounted for the overall patterns of case-mix differences, separate analyses were carried out for older (≥ 75) versus younger patients, male versus female, and posthospital versus non-posthospital cases. Since length of stay and mortality can also be strongly related to case mix, the profile comparisons were conducted first using all admissions, then restricting the analyses to short-stay (three weeks or less) versus longer-stay (greater than three weeks) patients, and finally eliminating from the analyses patients who died.

It is possible that any case-mix differences found between HMO and FFS patients might be due primarily to differences between agencies that contributed larger patient-level samples. If this were the case, then the results would be less pervasive and we would be less able to generalize from them. Testing the pervasiveness of the pattern of case-mix findings at the agency level therefore required assessing whether the average case mix in each HMO-owned agency (for example) tended to differ from the average case mix in each pure-FFS agency. Our procedure entailed calculating the mean for each case-mix variable at the agency level, ranking the agencies from highest to lowest on the mean value of the case-mix variable, and statistically assessing whether the ranks for the HMO-owned agencies tended to be generally higher or lower than those for the pure FFS agencies. A Wilcoxon two-sample rank sum test was used for this purpose. This approach permitted an assessment of whether agencies of one type (i.e., HMO-owned) tended to have a different case-mix distribution from agencies of another type (e.g., pure FFS), independent of sample sizes at the agency level. This approach was used as a confirmatory method on a variable-by-variable basis. Mean values for each case-mix variable by individual agency were also examined graphically to assess for outliers. The rank sum test just mentioned was used to test for the possible effects of outliers. Relative to standard "parametric" procedures, it is insensitive to outliers since it relies only on relative rankings among means, not on the magnitude of the differences among agency-level means.

FINDINGS

Findings are presented here in tabular and narrative form, reserving until the end an overview of patterns of results. Inferences and conclusions based on the findings are presented in the final section.

DISCHARGE RATES BY LENGTH OF STAY

Table 2 contains discharge rates within the first three weeks of admission and after twelve weeks of admission for FFS and HMO patients. Noteworthy are the three-week discharge rates for HMO patients from mixed agencies and the greater-than-twelve-week discharge rate for HMO patients from HMO-owned agencies. It is apparent that considerably more HMO patients, 41 percent, are discharged within three weeks from mixed agencies than are other types of patients. The average discharge rate for the other three types of patients combined is approximately 33 percent. More pronounced is the high proportion of home health patients from HMO-owned agencies who are discharged later than twelve weeks after admission. This figure, 20.0 percent, is approximately 1.6 times higher than the corresponding discharge rates for the other three types of patients. Thus, for reasons addressed in the ensuing case-mix comparisons, HMO patients who receive home health care on a contractual basis are discharged more frequently within three weeks than are other types of home health patients, and HMO patients who receive home health care from HMO-owned agencies are retained longer than twelve weeks with greater frequency than are other types of home health patients.

DEMOGRAPHIC FACTORS, PRIOR LOCATION, LIVING SITUATION, AND INFORMAL CAREGIVERS

Table 3 contains three comparisons: pooled HMO versus pooled FFS patients, HMO versus FFS patients from mixed agencies, and HMO-owned

Table 2: Discharge Rates for Study HMO and FFS Home Health Patients

<i>Type of Discharge</i>	<i>Discharge Rates*</i>			
	<i>FFS Patients</i>		<i>HMO Patients</i>	
	<i>Mixed Agencies</i>	<i>Pure FFS Agencies</i>	<i>Mixed Agencies</i>	<i>HMO-Owned Agencies</i>
Discharged within 3 weeks of admission	31.4%	34.5%	40.9%	32.8%
Discharged later than 12 weeks after admission	11.4%	13.6%	12.8%	20.0%

*For 3-week discharge rates, the mixed agencies' HMO rate is significantly different from the other three ($p < .10$ for all three comparisons using a chi-square test), while the other three are not significantly different. For the 12-week rates, the HMO-owned agencies' HMO rate is significantly different from the others ($p < .05$ all three comparisons), while the other three are not significantly different.

versus pure FFS patients (these comparisons are termed the “pooled,” “mixed,” and “pure” comparisons, respectively). In terms of demographics, HMO home health patients generally tend to be approximately two years younger than FFS patients. A substantially smaller proportion of HMO patients are females and a considerably greater proportion of HMO home health patients are married. While a slightly higher proportion of patients in HMO-owned compared with pure FFS agencies are nonwhite (approximately four percentage points), this difference is of borderline significance ($.05 \leq p < .10$), and neither the mixed or pooled comparisons show significant differences. Relative to patients from HMO-owned HHAs, a significantly greater proportion of pure FFS patients are admitted to home care from hospital settings within 30 days prior to admission (72 percent versus 62 percent). A reverse pattern holds for the mixed comparison (71 percent versus 77 percent). No significant differences were found for the proportion of patients admitted to home health from private residences. The modest differences that exist in terms of admissions from nursing homes and rehabilitation units are significant for the pure comparisons (the difference for admissions from nursing homes also is significant for the pooled comparison)—although these differences do not appear to be consequential.

As also shown in Table 3, proportionately more HMO home health patients live in their own home, and more FFS patients reside in a family member’s home. Analogously, a greater percentage of mixed FFS patients live with children than is the case for mixed HMO patients. While a greater percentage of pure FFS patients live alone, a considerably greater proportion of HMO patients live with a spouse—as would be expected in view of the marital status differences noted earlier. Consistent with the living situation findings, spouses provide a considerably greater proportion of informal ADL assistance for HMO patients than for FFS patients. Unpaid family members tend to provide informal ADL assistance more commonly for FFS patients, with this finding being of borderline significance for both the pooled and pure comparisons.

In all, based on the demographic and living situation variables, it would appear that HMO home health patients are more independent in that they are younger, more often live in their own homes, and more frequently have spouses to assist them in areas of informal ADL care and support. Further, a substantial difference exists between the two HMO patient groups in terms of prior hospitalization, with a considerably greater proportion of mixed-agency HMO patients admitted from hospitals relative to patients served by HMO-owned agencies. Also, proportionately more

Table 3: A Comparison of Demographic Factors, Prior Location, Living Situation, and Informal Caregivers for Medicare HMO Patients and Medicare Fee-for-Service Patients

Variables (Range in parentheses)‡	Patient-Level Means§					
	Pooled HMO (N = 689)	Pooled FFS (N = 943)	Mixed HMO¶ (N = 381)	Mixed FFS (N = 414)	HMO-Owned (N = 308)	Pure FFS (N = 529)
Demographics						
Age (years)	77.4	79.5***	77.7	79.2**	77.0	79.7***
Gender (% female)	55.7	63.1***	56.6	66.5***	54.5	60.3*
Marital status (% married)	57.0***	43.5	51.5***	40.6	63.8***††	45.9
Race (% nonwhite)	10.4	9.8	9.8	12.6	11.3*	7.5
Location Prior to Home Care Admission ¶						
Private residence (0-1)	.22	.20	.19	.20	.25†	.20
Nursing home (0-1)	.10**	.07	.08	.06	.12*	.08
Rehab unit/facility (0-1)	.04	.04	.04	.06	.04**	.01
Hospital (0-1)	.70	.72	.77†††	.71*	.62	.72***
Current Residence						
Own home (0-1)	.84**	.79	.84*	.78	.85*	.80
Family member's home (0-1)	.10	.15***	.12†	.18**	.08	.14**
Current Living Situation						
Alone (0-1)	.27	.30	.32†††	.33	.21	.29**
With spouse (0-1)	.52***	.40	.47***	.36	.58***†††	.42
With child(ren) (0-1)	.19	.22*	.17	.25***	.21	.20

Who Provides Informal ADL Assistance

Spouse (0-1)	.50***	.37	.46***	.34	.55***††	.39
Unpaid family member-nonspouse (0-1)	.33	.38*	.37††	.42	.28	.35*
Unpaid (nonfamily) (0-1)	.05	.03	.04	.04	.07**	.03

Note: All samples are random samples of admission. Sample totals are given under column headings. Sample sizes for specific measures may vary due to missing data or applicability of indicators to individual patients.

‡The range of possible values taken on by each variable is indicated in parentheses after the variable name.

§Significance levels correspond to comparisons within each pair of columns and are based on Fisher's exact test, the chi-square test, the two-sample *t*-test with separate or pooled variance estimates, or the Wilcoxon test, whichever was appropriate in view of the measurement scale and underlying probability distribution. An * represents $.05 \leq p < .10$; ** represents $.01 \leq p < .05$; *** represents $p < .01$. Asterisks superscript the larger of the two means being compared.

||Significance levels for comparisons between mixed HMO and HMO-owned samples are denoted with †. The significance levels were calculated in the same manner as explained in note §. Similarly, the number of †s denotes the level of significance, so that † represents $.05 \leq p < .10$; †† represents $.01 \leq p < .05$; ††† represents $p < .01$. Daggers superscript the larger of the two means being compared.

¶The four entries in each column sum to more than 100% since it is possible for a patient to have been in more than one of the four locations (within the 30-day period) prior to home health admission.

patients admitted to HMO-owned agencies are married and receive spouse-assisted ADL care.

FUNCTIONAL MEASURES

Findings on functional disabilities are presented in Table 4. The means for the five ADL disability scales are consistently higher for FFS patients in both the mixed and pure comparisons. The differences tend to be more pronounced and significant for the mixed comparison, with two of the five differences insignificant for the pure comparison. Similar results occur for the second group of variables corresponding to (dichotomous indicators of) moderate ADL disabilities for the same five functional areas. Both the number of mild and the number of severe ADL disabilities are consistently greater for FFS patients relative to HMO patients in the third set of variables. Analogously, the IADL disability scales generally indicate greater dependence in IADLs for FFS patients. This pattern of greater dependence in FFS patients with respect to IADLs is further reinforced by the results on the severe IADL dichotomies and the number of severe IADL disabilities. In all, it is apparent that a consistent pattern of greater dependence in ADLs and IADLs exists for FFS patients relative to HMO patients. Further, the mixed HMO patients tend to be somewhat less dependent than patients from HMO-owned agencies in terms of both ADLs and IADLs.

PHYSIOLOGIC, DIAGNOSIS, PROGNOSIS, MENTAL/BEHAVIORAL, AND RESOURCE NEED MEASURES

Comparisons for these variables are presented in Table 5. A significantly higher proportion of FFS patients are characterized by urinary incontinence or a catheter in mixed agencies and in total. Further, although the difference is not significant for the pure comparison, it is in the same direction as for the mixed comparison. Severe urinary incontinence refers to 24-hour, day and night incontinence and is also more prevalent among FFS patients than HMO patients, although the difference is nonsignificant for both the mixed and the pure comparison, and is of borderline significance for all patients combined. The results for pressure ulcer grade indicate that greater proportions of FFS patients have stage 2, 3, and 4 pressure ulcers. The differences are significant for the mixed and pooled comparisons, and although they are smaller and not significant for the pure comparison, they tend to exhibit the same tendency (less prevalent in HMO patients).

Sensory impairments exhibit the same general trend of greater dependence among FFS patients. The vision and hearing impairments refer to disabilities in addition to corrective lenses or hearing aids. In general, HMO patients tend to be less impaired in both vision and hearing, with substantially greater proportions of FFS patients moderately impaired in vision and hearing. FFS patients are also characterized by a greater prevalence of neurologic or orthopedic conditions that require rehabilitation. This difference is significant and substantial for all three comparisons. Considerably more (25 percent versus 16 percent) mixed FFS patients have neuromuscular conditions that do not require rehabilitation than is the case for mixed HMO patients, although this difference does not appear for the pure FFS versus HMO-owned comparison. The only significant difference in the prevalence rate for hemiplegia is for the pure comparison where a slightly higher prevalence rate was found for HMO patients (the difference is of borderline significance).

No significant differences were found for open wounds, which include both surgical wounds and pressure ulcers. A significantly greater proportion of HMO patients in the pure and the pooled comparisons were receiving IV or continuous subcutaneous infusion therapy. This is very likely due to the fact that HMOs are free to provide such therapy in the home. With the exception of the period covered by the Medicare Catastrophic Coverage Act, Medicare does not cover this service for FFS patients. A substantially higher proportion of HMO patients in the pure comparison had terminal or end-stage conditions, in keeping with the emerging pattern that HMO-owned agencies may tend to admit more patients with chronic and/or terminal care needs. This may also be an artifact of the structure of the home health industry in that many freestanding HHAs are affiliated with separate freestanding hospices, a phenomenon that might be less likely to characterize HMO-owned agencies. Cardiac conditions and peripheral vascular disease are more prevalent for FFS patients in the pure comparison. No such difference is apparent for the mixed comparison, however. No significant differences were found for pulmonary conditions, diabetes, or gastrointestinal disorders.

With respect to primary or secondary diagnosis, no significant differences were found for endocrine/nutritional diagnoses. Mixed FFS (compared with mixed HMO patients) were characterized by a slightly higher proportion of mental disorders (borderline significance). Pure FFS patients had significantly more digestive system disorders and fractures than patients admitted to HMO-owned agencies. The prognosis variables demonstrate a

Table 4: A Comparison of Functional Measures of Case Mix at Admission for Medicare HMO Patients (N = 689) and Medicare Fee-for-Service Patients (N = 943)

Variables (Range in parentheses)†	Patient-Level Means‡					
	Pooled HMO	Pooled FFS	Mixed HMO‡	Mixed FFS	HMO- Owned‡	Pure FFS
ADL Disability Scales						
Bathing (0–5)	2.12	2.63***	2.10	2.44***	2.16	2.78***
Grooming (0–4)	.94	1.22***	.84	1.08**	1.07†	1.33***
Eating (0–6)	.37	.54***	.29	.52***	.48†††	.56
Toileting (0–4)	.57	.78***	.49	.73***	.68††	.82*
Transferring (0–6)	.84	1.07***	.69	1.05***	1.02†††	1.09
Prevalence of Moderate ADL Disabilities						
Bathing (0–1)	.38	.50***	.36	.45**	.40	.55***
Grooming (0–1)	.19	.26***	.14	.23***	.24†††	.29
Eating (0–1)	.09	.15***	.06	.14***	.13†††	.16
Toileting (0–1)	.14	.20***	.13	.20**	.16	.21*
Transferring (0–1)	.10	.13*	.07	.15***	.14†††	.12
Number of ADL Disabilities						
Mild (0–5)	1.71	2.16***	1.58	1.99***	1.89	2.29***
Severe (0–5)	.31	.46***	.24	.44***	.40††	.47*
IADL Disability Scales						
Management of oral medications (0–2)	.67	.80***	.59	.74**	.77†††	.86
Light meal preparation (0–2)	1.16	1.28***	1.12	1.15	1.20	1.38***
Shopping (0–2)	1.74	1.83***	1.76	1.83**	1.70	1.84***

Prevalence of Severe IADL Disabilities						
Management of oral medications (0-1)	.17	.25***	.13	.24***	.22†††	.26
Light meal preparation (0-1)	.40	.47***	.36	.40	.45†††	.53**
Shopping (0-1)	.78	.86***	.79	.86**	.76	.86***
Number of IADL Disabilities						
Severe (0-3)	1.33	1.55***	1.26	1.46**	1.41	1.63***

Note: All samples are random samples of admission. Sample totals are given under column headings. Sample sizes for specific measures may vary due to missing data or applicability of indicators to individual patients.

‡, §, || Footnotes are the same as those for Table 3.

Table 5: A Comparison of Physiologic, Diagnosis, Prognosis, Mental/Behavioral, and Resource Need Measures of Case Mix at Admission for Medicare HMO Patients (N = 689) and Medicare Fee-for-Service Patients (N = 943)

Variables (Range in parentheses)†	Patient-Level Means‡				
	Pooled HMO	Pooled FFS	Mixed HMO‡	Mixed FFS	Pure FFS
Incontinence/Catheter					
Urinary incontinence or catheter (0-1)	.14	.19**	.12	.17**	.20
Severe urinary incontinence (0-1)	.11	.14*	.09	.13	.15
Catheter (0-1)	.06	.09	.06	.08	.09
Pressure Ulcer Grade					
Stage 2 or higher (0-1)	.08	.11**	.06	.10**	.11
Stage 3 or higher (0-1)	.07	.10**	.05	.09**	.10
Stage 4 or higher (0-1)	.03	.05**	.02	.04**	.06
Sensory Impairments					
Vision impairment:					
Moderate (0-1)	.21	.27***	.20	.28**	.26
Severe (0-1)	.02	.03	.02	.03	.04*
Hearing impairment:					
Moderate (0-1)	.21	.30***	.23	.31**	.29***
Severe (0-1)	.03	.05*	.02	.05*	.04
Physiologic Conditions					
Rehab required: Neurologic or orthopedic (upper and lower limb) impairment (0-1)	.08	.15***	.08	.14***	.16***
Neuromusculoskeletal condition (nonrehab) (0-1)	.22	.27**	.16	.25***	.28
Hemiplegia (0-1)	.05	.04	.04	.05	.04
Open wounds (0-1)	.20	.21	.18	.20	.22
IV/Continuous subcutaneous infusion (0-1)	.03**	.02	.03	.02	.01
End-stage condition (0-1)	.14*	.11	.11	.10	.13

Cardiac/Peripheral vascular disease (0-1)	.58	.62	.63†††	.64	.52	.60**
Pulmonary conditions (0-1)	.26	.27	.28	.25	.25	.29
Diabetes mellitus (0-1)	.25	.23	.24	.25	.25	.21
Gastrointestinal disorder (0-1)	.21	.24	.20	.21	.22	.26
Primary or Secondary Diagnosis						
Endocrine, nutritional (0-1)	.29	.27	.28	.31	.29	.24
Mental disorder (0-1)	.06	.08	.05	.08*	.07	.08
Digestive system (0-1)	.13	.14	.15††	.13	.09	.15**
Fracture (0-1)	.07	.09*	.08	.08	.05	.10**
Prognoses						
Rehabilitation potential:						
Moderate (0-1)	.75	.80**	.83†††	.81	.65	.79***
Good (0-1)	.37	.40	.37	.33	.37	.45**
Recovery potential:						
Moderate (0-1)	.81	.86**	.86†††	.85	.74	.86***
Good (0-1)	.40	.46**	.42	.41	.38	.50***
Mental/Behavioral						
Depression scale (0-2)	.17	.18	.14	.17	.20	.20
Mental/Behavioral conditions (0-1)	.14	.16	.10	.13	.19†††	.18
Lethargic mental state (0-1)	.10	.12	.08	.12*	.13†	.11
Demonstrated verbal disruption (0-1)	.02	.02	.01	.02	.03††	.02
Resource Need Index (0.27-2.31)	.91	1.03***	.91	1.02***	.92	1.03***

Note: All samples are random samples of admission. Sample totals are given under column headings. Sample sizes for specific measures may vary due to missing data or applicability of indicators to individual patients.

‡, §, || Footnotes are the same as those for Table 3.

pattern of considerably less rehabilitation and recovery potential for patients admitted to HMO-owned agencies relative to pure FFS agencies and even compared with both HMO and FFS patients in mixed agencies. Thus, the prognosis variables also tend to suggest a greater likelihood of chronic care patients receiving home care in HMO-owned agencies. The mean differences within the mixed comparisons are not significant for the prognosis variables. No general pattern of mean differences is apparent for the mental and behavioral variables. The only significant difference (which is borderline) indicates a higher proportion of FFS patients in the mixed comparison with the condition of lethargic mental state.

The final variable in Table 5 represents a summary case-mix measure. The overall resource need index is directly related to expected cost on the basis of case-mix characteristics or service needs. The consistently greater values for FFS patients relative to HMO patients indicate that the expected resource consumption or cost for FFS patients is expected to be 12 percent greater on the basis of the case-mix differences captured by that measure.

In addition to the three HMO versus FFS comparisons (pooled, mixed, and pure) just explained, Table 5 also shows several differences between HMO patients admitted to mixed agencies versus those admitted to HMO-owned agencies. Compared with Medicare HMO patients admitted to mixed agencies, those admitted to HMO-owned agencies tended to be characterized by higher prevalence rates for urinary incontinence or catheter, pressure ulcers, neuromuscular conditions not requiring rehabilitation, terminal illness, and mental/behavioral conditions. In contrast, the HMO patients admitted to mixed agencies had higher prevalence rates for cardiac and peripheral vascular disease and digestive system disorders, and proportionately more HMO mixed agency patients had moderate or better rehabilitation and recovery potential.

ADJUSTMENTS FOR DEMOGRAPHIC FACTORS AND AGENCY-LEVEL COVARIATES

In view of the significant differences in age, gender, and admission from acute care noted in Table 3, the case-mix comparisons in Tables 4 and 5 were repeated stratifying according to different levels of those three factors. Separate analyses were conducted for the following subgroups: (1) age < 75; (2) age ≥ 75; (3) men; (4) women; (5) admitted from hospital; and (6) not admitted from hospital. These adjustments did little to reduce the magnitude of the differences exhibited in Tables 4 and 5, and the overall pattern of results was unchanged.

In view of the differences in discharge rates by length of stay (highlighted in Table 1) and the possible differences in mortality rates, additional two-group case-mix comparisons were conducted for patients discharged from home health care within three weeks, for patients with length of stay greater than three weeks, and for patients who died within 12 weeks. The results of these comparisons again exhibited the same general patterns as those in Tables 3–5.

Analogously, since the agencies that participated in the study could be hospital-based or freestanding, for-profit or nonprofit, located in various regions of the country, and located in rural or urban communities, regression models were estimated for each case-mix variable using these agency-level covariates as independent variables, along with dummy variables for the patient comparison groups. Once again, while a few case-mix differences were diminished, the general patterns and extent of case-mix differences observed in Tables 4 and 5 persisted.

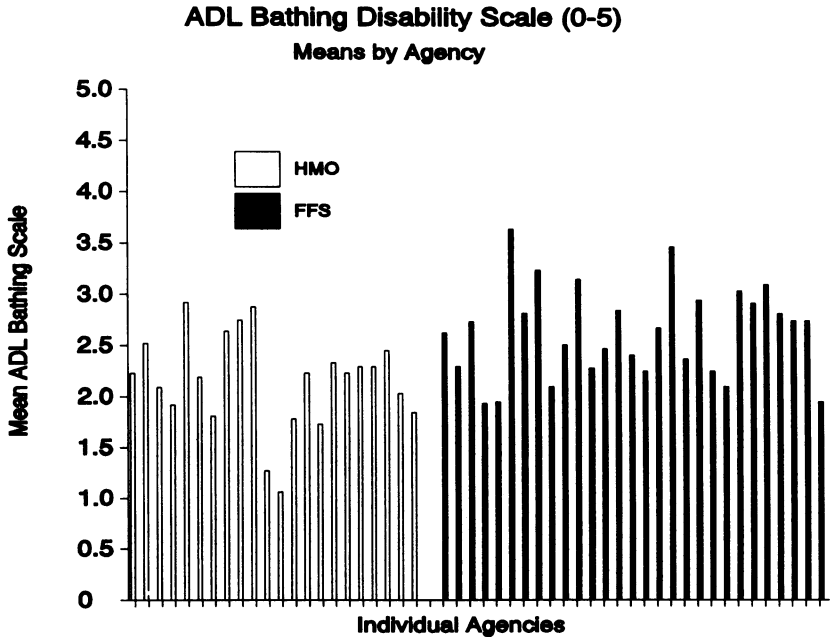
EFFECTS OF SIMULTANEOUS TESTING AND DIFFERING AGENCY-LEVEL SAMPLE SIZES

The four-group logistic regression analyses used to conduct a simultaneous comparison of the mixed HMO, mixed FFS, HMO-owned, and pure FFS case-mix profiles generally reduced the percentage of significant differences by about one-third (i.e., about one-third of the differences were no longer significant). The four-group discriminant function analyses substantiated the results of the logistic regressions. Although these simultaneous testing procedures tended to reduce the statistical significance of several variables, the overall patterns of demographic, living situation, and case-mix differences apparent in Tables 3–5 were unchanged. The variables that became insignificant were typically those highly correlated with variables that remained significant. Since (even multivariate) statistical methods are simply covariance-based (e.g., discriminant analysis) or influenced purely by statistical and not causative associations (logistic regression), we do not present the findings of which variables “survived” or which “made the cut” after the k-group multivariate analyses, because these distinctions are an artifact of statistical associations and not causative factors indicating that one variable is more important than another. Thus, it was judged appropriate to present the tables of mean differences rather than the results of the four-group simultaneous comparison analyses, since they are more intuitively clear and exhibit the same overall patterns of results as the multivariate procedures.

To examine the effects of differing agency-level sample sizes, Figure 1 depicts the agency-level mean values for the ADL bathing disability scale using bar charts, with each bar corresponding to an agency-level mean. The white bars depict the agency means for all sample HMO patients (for HMO-owned and mixed agencies), while the dark bars depict the means for FFS patients (for pure FFS and mixed FFS agencies). Consistent with the patient-level results presented in the first row of Table 4, the height of the bars corresponding to agency-level means for FFS patients tends to be greater than that for the bars corresponding to agency-level means for HMO patients. If the individual bars were ranked from lowest to highest, the average rank for HMO agencies would be 18.4, while the average rank for FFS agencies would be 31.8, a difference that is statistically significant ($p = .001$) as indicated in Figure 1. Thus, the patient-level result for the bathing disability scale presented in Table 3 is not due simply to a few high-end FFS-agency outliers or low-end HMO-agency outliers. Rather, the finding of greater bathing disability for FFS patients is reasonably pervasive across all study agencies. This type of analysis was done with a representative set of case-mix variables, with the result that the same pattern of patient-level findings persisted at the agency level.

To test the influence of differing agency-level sample sizes on the pattern of patient-level findings exhibited in the preceding tables, we divided our study agencies into large-sample and small-sample agencies, where large and small were defined in terms of median sample size. Figure 2 represents a refined version of Figure 1, where the HMO agencies and the FFS agencies are respectively subdivided into small- and large-sample agencies. Within the group of HMO agencies and the group of FFS agencies, each considered separately, a test for rank differences was conducted to ascertain whether potential shift differences exist in the distribution of the ADL bathing disability score for large- versus small-sample agencies. For both the FFS and HMO agencies, no significant differences were found, leading to the conclusion that large-sample versus small-sample agencies do not differ in terms of their distributional patterns for this particular case-mix variable. Several analogous comparisons were conducted, again with the same conclusion: that small-sample and large-sample agencies within the HMO and FFS groups did not differ. In those instances where the mixed comparison yielded different results from the pure comparison at the patient level, the types of analyses illustrated by Figures 1 and 2 were conducted separately for mixed versus pure agencies, again with the same findings.

Figure 1: A Rank Sum Test to Assess the Pervasiveness of Patient-Level Case-Mix Differences at the Agency Level, Illustrated with the ADL Bathing Disability Scale



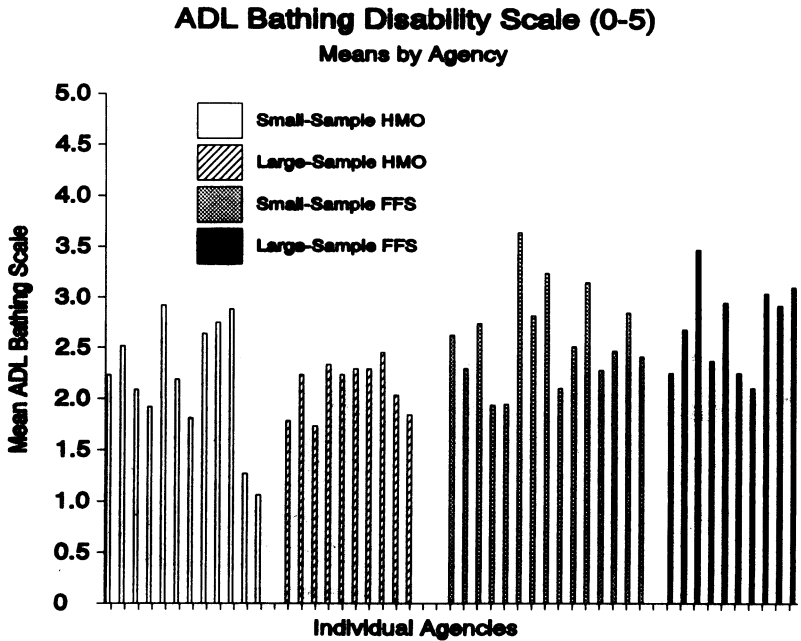
Average Rank for HMO agencies: 18.4
 Average Rank for FFS agencies: 31.8
 Wilcoxon Test for Rank Differences: $p = .001$

Note: White bars correspond to agency-specific means for HMO patients in HMO-owned and mixed agencies (one of the HMO-owned agencies was excluded from this particular analysis owing to missing data for the bathing scale measure). The dark bars correspond to agency-specific means for FFS patients in pure FFS and mixed agencies.

VISITS AND VISIT INTENSITY

Because HMO case mix is less intense, the number of visits per home health admission would be expected to be less in HMO settings. Table 6 contains the mean number of visits and visits per week until 60 days or discharge for the three comparisons presented in the preceding section. The pooled comparison demonstrates that both the total number of visits during the first 60 days and visit intensity (visits per week) are substantially greater

Figure 2: Rank Sum Tests to Assess Whether Large-Sample versus Small-Sample Agencies Differ in Terms of Case Mix, Illustrated with the ADL Bathing Disability Scale



Large- vs. Small-Sample Agencies Determined by Median Sample Size (35 for both HMO agencies and FFS agencies).	
Average Rank for Small-Sample HMO agencies: 12.2	Average Rank for Small-Sample FFS Agencies: 14.2
Average Rank for Large-Sample HMO agencies: 10.7	Average Rank for Large-Sample FFS Agencies: 15.8
Wilcoxon Test for Rank Differences: $p = .598$	Wilcoxon Test for Rank Differences: $p = .616$

for Medicare FFS than Medicare HMO patients. The mixed and pure comparisons also yield similar results for HMO versus FFS patients. However, there is a difference in total visits and visit intensity between HMO patients admitted to mixed agencies versus those admitted to HMO-owned agencies, with a lower number of total visits and visit intensity per case for patients admitted to HMO-owned agencies. Analogously, the FFS home health patients admitted to the pure FFS agencies (smaller agencies that tend not to contract with HMOs) have lower means for total visits and visit intensity within 60 days than do FFS patients admitted to mixed agencies.

Table 6: Total Visits and Visit Intensity until 60 Days after Admission, or until Discharge

	<i>Patient-Level Means†</i>					
	<i>Pooled HMO</i>	<i>Pooled FFS</i>	<i>Mixed HMO</i>	<i>Mixed FFS</i>	<i>HMO-Owned</i>	<i>Pure FFS</i>
Total visits until 60 days or discharge	12.7	18.8***	14.9	22.4***	8.7	16.0***
Visits per week until 60 days or discharge	3.1	4.4***	3.6	4.9***	2.3	3.9***

Note: Random samples of patients. The numbers of patients in the mixed HMO, mixed FFS, HMO-owned and pure FFS samples are 381, 414, 308, and 529, respectively. Sample sizes for specific measures may vary due to missing data or applicability of indicators to individual patients.

†Significance levels correspond to comparisons within each pair of columns and are based on Fisher's exact test, the chi-square test, the two-sample *t*-test with separate or pooled variance estimates, or the Wilcoxon test, whichever was appropriate in view of the measurement scale and underlying probability distribution. An * represents $.05 \leq p < .10$; ** represents $.01 \leq p < .05$; *** represents $p < .01$.

SUMMARY OF CASE-MIX PATTERNS

HMO/FFS Comparisons, Pooled Sample. Overall utilization statistics on per capita admissions to home health care, and on total visits and visit intensity within the first 60 days of home health care, provide useful contextual information in interpreting our case-mix findings. Summarizing the overall patterns of case-mix differences beginning with the pooled FFS versus HMO comparisons, the findings indicate that, relative to FFS Medicare beneficiaries, HMO patients admitted to home health care are characterized by:

- Fewer functional impairments measured in terms of ADLs;
- Fewer functional impairments measured in terms of IADLs;
- A lower prevalence rate of incontinent or catheterized patients;
- A lower proportion of patients with stage 2, 3, or 4 ulcers;
- A lower proportion of patients with sensory impairments;
- Proportionately fewer patients with conditions requiring rehabilitation;
- Proportionately fewer patients with neuromuscular (nonrehabilitative) conditions or fractures;
- A slightly higher proportion of IV and terminal patients;

- Lower rehabilitation and recovery potential;
- A lower overall resource need index;
- Lower numbers of visits during the first 60 days; and
- Fewer visits per week during the first 60 days.

A number of additional case-mix differences were found between HMO patients from mixed agencies or from HMO-owned agencies relative to FFS patients, but these are reserved for discussion further on, since several also pertain to case-mix differences between HMO-owned and mixed HMO patients. The facts that greater proportions of HMO home health patients are married, live with a spouse who assists with ADLs, reside in their own home, are younger, and are characterized by a higher proportion of men (despite the fact that the majority of HMO [and FFS] home health patients are women), tend to suggest a better home support network and possibly more advantageous socioeconomic status for HMO home health patients. Nonetheless, supplemental analyses show that these factors alone do not account for the case-mix differences between HMO and FFS patients.

HMO Patient Comparisons, Mixed versus HMO-Owned Agencies. Relative to Medicare HMO patients admitted to mixed agencies or agencies that contract with HMOs for home health care, Medicare HMO patients admitted to HMO-owned home health agencies are characterized by:

- Lower proportions of admissions from acute care hospitals;
- Moderately greater dependence in ADLs and IADLs;
- A higher proportion of patients with urinary incontinence or catheter;
- A higher proportion of patients with pressure ulcers;
- A higher proportion of patients with a nonrehabilitative neuromusculoskeletal condition;
- More patients with terminal illness;
- A lower proportion of patients with cardiac and peripheral vascular disease;
- A lower proportion of patients with a diagnosis of digestive system disorders;
- Proportionately fewer patients with moderate rehabilitation and recovery potential;

- A higher proportion of patients with mental and behavioral conditions;
- A higher proportion of admissions staying beyond 12 weeks;
- Lower numbers of visits during the first 60 days; and
- Fewer visits per week during the first 60 days (despite longer stays).

In addition, a higher proportion of patients receiving home health care at HMO-owned agencies were married and received spouse-assisted ADL care than HMO patients receiving home health care from mixed or contractual agencies. Especially noteworthy is the substantial difference in the proportions of patients admitted from acute care hospitals. Only 62 percent of HMO patients admitted to HMO-owned agencies, compared with 77 percent of HMO patients admitted to mixed agencies, had been hospitalized in the 30 days prior to home health admission. Also important is the finding that a considerably higher proportion of HMO patients admitted to mixed agencies were discharged within three weeks of admission (41 percent versus 33 percent for HMO patients admitted to HMO-owned agencies).

FFS Patient Comparisons, Mixed versus Pure FFS Agencies. Although significance levels were not provided earlier because this comparison was less important than those before, general findings based on statistically significant differences are summarized here. Relative to Medicare FFS patients admitted to agencies that contract substantially with HMOs (i.e., mixed agencies), FFS patients admitted to agencies that contract very little with HMOs (i.e., pure FFS agencies, which also tend to be smaller than mixed agencies) are characterized by:

- More functional impairments measured in terms of ADLs;
- Somewhat more functional impairments measured in terms of IADLs;
- A higher proportion of patients with good rehabilitation prognosis;
- A higher proportion of patients with good recovery potential;
- Fewer total visits per case within the first 60 days of admission; and
- Fewer visits per week during the first 60 days after admission.

In addition, a lower proportion of FFS patients admitted to pure FFS agencies were female, unmarried, or nonwhite than was the case for FFS patients admitted to mixed agencies.

DISCUSSION

The lower case-mix intensity we found for HMO home health patients is likely due to a combination of two factors, both of which are premised on the fact that HMOs are not bound by the patient-specific home health eligibility criteria for Medicare patients, and are free to admit less intensely ill patients to home care. First, the lower case-mix intensity for home health patients may be partially due to HMOs' "diluting" the standard Medicare case mix with additional patients who are less disabled than those typically admitted to home health care under the Medicare FFS program. This would be more likely to occur if the home health per capita admission rate for HMO enrollees was substantially higher than that for FFS patients (we were unable to estimate HMO admission rates precisely, since too few HMOs accurately maintain such statistics). Second, HMOs may use home health care differently (compared with the FFS sector), admitting proportionately more atypical (by FFS standards) patients with fewer functional disabilities and less complex needs for medical or skilled care. This factor is likely to be the more dominant one if the Medicare HMO per capita admission rate is about the same as (or possibly less than) the Medicare FFS per capita rate. Both factors may be operating simultaneously, since it is likely that some HMOs admit more patients per capita than others.

The utilization statistics and the pooled HMO versus FFS case-mix patterns indicate that HMOs are characterized by home health use patterns that are considerably different from those in the FFS sector. As noted, the home health admitting case mix of HMO patients tends to be less intense. The exception to this is the (relatively small) proportion of patients admitted for continuous IV or subcutaneous catheter care, a service that Medicare FFS home health patients are not eligible to receive since repeal of the Medicare Catastrophic Coverage Act, as mentioned earlier. It is possible that HMO patients with short-term near-acute care needs who meet the Medicare homebound criterion, but who can still travel or be transported to physician offices or clinics, receive such care in physician offices instead of home health agencies. This could result from a philosophy of managed care in HMOs that uses physician or outpatient-based care as a substitute for hospital care, certain types of postacute nursing home care, and possibly even some types of more medically intense home health care. The case-mix and utilization difference findings raise the issues of the potential cost and outcome differences. These issues were investigated further in this study and are documented elsewhere (Shaughnessy, Schlenker, and Hittle 1994).

The case-mix and utilization pattern differences are substantial between HMO patients receiving home health care from HMO-owned agencies versus those receiving such care from (mixed) agencies with which HMOs contract. A considerably higher proportion of HMO home health patients are admitted from hospitals to mixed agencies than is the case for HMO-owned agencies. In conjunction with this difference, a more intense case mix among patients admitted to contractual agencies is suggested by the lower prevalence rates for functional dependency, incontinence, terminal illness, and neuromuscular disorders among such patients—a case mix that suggests less need for paraprofessional and certain types of support services. This is further supported by the higher proportions of patients with more traditional medical problems such as cardiac and peripheral vascular disease, and higher proportions of patients with moderate rehabilitation and recovery potential among HMO contractual patients—a case mix that suggests a greater need for skilled and medical-oriented services. In all, it appears that when HMOs contract with home health agencies, they more typically refer patients with short-term medical problems who have proportionately higher rehabilitation and recovery potential, and are less functionally disabled or in need of more chronic types of care. Thus, in terms of (less) diversity characterized by a stronger pattern of skilled care needs, the case mix of HMO patients admitted to contractual agencies is closer to the case mix of FFS patients than to the case mix of HMO patients admitted to HMO-owned agencies.

Since we were unable to distinguish between HMO-owned and HMO contracting agencies in terms of per capita utilization, it is not possible to ascertain whether the narrower case-mix spectrum for HMO patients admitted to contractual agencies is due to lower per capita utilization of such agencies by HMOs (a plausible explanation, since this would be a means of controlling utilization of an “outside” provider). This hypothesis of more stringent utilization control is reinforced by the substantially higher discharge rates within three weeks of admission for HMO patients admitted to mixed/contracting agencies. Thus, the difference between admitting profiles for the two types of Medicare HMO patients suggests that the types of patients admitted to home health care provided by HMO-owned agencies is more diverse, very likely including not only patients with at least moderately intense needs in terms of medical and skilled nursing care, but also including patients with more personal care needs.

Differences in patient conditions between FFS patients admitted to larger agencies that do a substantial contracting business with HMOs (mixed

agencies) relative to smaller agencies that contract little with HMOs (pure FFS agencies) imply a narrower range of case mix for the latter types of agencies. In particular, Medicare-certified home health agencies that tend not to contract with HMOs appear to concentrate more on patients who are functionally dependent but with more rehabilitation and recovery potential. A stronger rehabilitation orientation on the part of such agencies may be the reason why they provide fewer total visits over the 60-day period following admission. However, they are also characterized by fewer visits per week, which may possibly be related to the greater efficiency that accrues from operating a smaller agency (these agencies had a median of 47 Medicare admissions per month relative to 105 Medicare admissions per month for mixed agencies), or it may be due to more extensive nonrehabilitation care needs on the part of Medicare FFS patients admitted to contractual agencies.

Unto themselves, the case-mix results indicate a substantial difference between the types of patients admitted to home health care under HMO and FFS payment approaches. Further research should be conducted to assess more precisely the reasons for such differences than we were able to ascertain. Nonetheless, the case-mix and utilization findings suggest considerable diversity in approaches and philosophies that underpin how home health care is used. This, in turn, highlights the potential versatility of home health care and, at the same time, the need to assess its effectiveness for different types of patients.

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