



MEMORANDUM

July 17, 1996

TO: Health Staff

FROM: Sandra Christensen

SUBJECT: BIASED SELECTION IN MEDICARE'S HMOs

A recent study commissioned by the Association of American Health Plans and done by Price Waterhouse (PW) claims to show that health maintenance organizations (HMOs) in 1992 experienced very little biased selection among Medicare enrollees.¹ However, the findings in the PW study are not credible because of flaws in the data and methods used. Adjustment for obvious biases in the PW results would more than quadruple its estimate of favorable selection.

Although the quantitative extent of selection bias is uncertain, CBO's analysis of program data indicates that Medicare's HMOs continue to experience favorable selection not fully accounted for by the risk adjusters used to set payment rates. Research underway at the Office of Research in the Health Care Financing Administration and at the Physician Payment Review Commission will add to current information on this issue in the near future.

BACKGROUND

Medicare beneficiaries may opt to receive care from HMOs instead of the fee-for-service (FFS) sector, and HMOs may choose to enroll Medicare beneficiaries either on a risk basis or a cost basis. Because cost-based HMOs are reimbursed by Medicare much like fee-for-service providers, the discussion of HMOs here excludes cost-based plans. Risk-based HMOs are paid a predetermined amount for each

¹ Jack Rodgers and Karen Smith, "Is There Biased Selection in Medicare HMOs?" Health Policy Economics Group, Price Waterhouse LLP, Washington, D.C. (March 14, 1996).

Medicare enrollee to provide all Medicare-covered services. The capitation amount is set at 95 percent of the adjusted average per capita cost (AAPCC), which is Medicare's projected per capita cost for FFS enrollees in each county, adjusted for certain individual risk factors among the plan's Medicare enrollees.² As of May 1996, 11 percent of Medicare beneficiaries opted to enroll in an HMO; of these, nearly 85 percent (or 9 percent of all Medicare enrollees) were in risk-based plans.

If Medicare beneficiaries enrolled in risk-based HMOs were, on average, very like those who remained in the FFS sector, Medicare's costs for HMO enrollees would be only 95 percent of what its costs for that group of enrollees would have been had they stayed in the FFS sector. However, if--within the risk categories used to adjust the AAPCCs--the health characteristics of HMO enrollees differ from those remaining in the FFS sector, then HMOs experience biased selection and Medicare's savings may be less or more than 5 percent for each HMO enrollee, depending on whether the selection is favorable or adverse. If selection is favorable, meaning that HMOs tend to enroll people who are less costly than the average FFS enrollee in the same risk category, Medicare will save less than 5 percent for each HMO enrollee and may actually spend more than it would have if they had stayed in the FFS sector. If adverse selection occurs, meaning that HMOs tend to enroll people who are more costly than the average FFS enrollee in the same risk category, Medicare will save more than 5 percent for each HMO enrollee.

Whether Medicare's HMOs experience favorable or adverse selection is an empirical question because the theoretical arguments do not all point in the same direction. On the one hand, there are a number of factors that would tend to generate favorable selection. New enrollees for any health plan with a restricted panel of providers are likely to be relatively healthy because people with ongoing health problems are often reluctant to leave their current physicians. HMOs can encourage favorable selection by targeting their marketing to preferred groups of Medicare enrollees (such as those in high-income areas, or who are still working, or who attend a fitness fair). Medicare's provisions that permit beneficiaries to enroll or disenroll from HMOs on a monthly basis, together with provisions that permit HMOs to switch between cost-based and risk-based reimbursement each year, further contribute to favorable selection for risk-based HMOs. As a result of these provisions, HMO enrollees with costly conditions who are not satisfied with their treatment options may disenroll and seek care in the FFS sector. And HMOs who find they cannot profitably treat their Medicare enrollees at Medicare's risk-based payment rate are free to change to a cost basis for the next contract year.

² Separate payment rates are set for Medicare Part A and Part B, by reason for eligibility (aged, disabled, or ESRD). For the aged and disabled rates, the risk adjusters used include 2 sex categories, 10 age categories, and 3 risk categories (institutionalized, noninstitutionalized Medicaid, and other). For aged rates only, an additional "working aged" category was recently added.

On the other hand, there are also considerations that might tend to generate adverse selection for HMOs. Medicare's HMOs typically offer more comprehensive coverage than Medicare's FFS sector does, including very low cost-sharing requirements and coverage for prescription drugs. Because the value of more comprehensive coverage is greater for them, sicker beneficiaries have more financial incentive to join an HMO than healthy people do. In addition, because the supplementary premiums charged by Medicare's HMOs are generally well below the cost of medigap coverage (are often zero, in fact), HMOs may be the only way low-income beneficiaries who are not eligible for Medicaid can afford to supplement Medicare's coverage. Because low-income people tend to have poorer health than higher income people do, HMOs may experience adverse selection if they enroll a disproportionately large number of low-income beneficiaries.

PREVIOUS STUDIES OF SELECTION BIAS

Previous studies of Medicare's HMO enrollees have consistently found evidence of favorable selection even after adjusting for the risk factors used to set payment rates, when compared with enrollees in the FFS sector. Three kinds of evidence exist--use or cost of services prior to HMO enrollment, mortality rates and imputed FFS costs while enrolled in HMOs, and use or cost of services after disenrollment from an HMO. Compared with FFS enrollees in the same risk category, HMO enrollees had lower use of services prior to HMO enrollment. They also had lower mortality rates and imputed FFS costs while in HMOs. Both of these show favorable selection resulting from enrollment patterns. In addition, HMO enrollees who later returned to the FFS sector (disenrollees) had higher use of services and mortality rates, compared either with HMO enrollees who stayed in HMOs or with FFS enrollees, indicating favorable selection for Medicare's HMOs resulting from disenrollment patterns.³

The most comprehensive study of selection bias in Medicare's HMOs to date was one done by Mathematica Policy Research (MPR), using a sample of FFS and risk-based enrollees selected in 1990, based on their use of services during the preceding year.⁴ That study concluded that Medicare's payments to HMOs were 5.7 percent higher than those HMO enrollees would have cost Medicare had they remained in the FFS sector. This would mean that the AAPCC--which is supposed to represent the expected cost in the FFS sector for HMO enrollees in a given risk category--was

³ For a summary of studies for time periods through 1990, see Physician Payment Review Commission, *Annual Report to Congress, 1996*, Chapter 15, Table 15-1.

⁴ R.S. Brown and others, "The Medicare Risk Program for HMOs--Final Summary Report on Findings from the Evaluation," Mathematica Policy Research, Inc., Princeton, N.J. (February 1993).

about 11 percent higher than that expected cost.⁵ It also would mean that the expected cost in the FFS sector for HMO enrollees in a given risk category was only 90 percent of actual costs for FFS enrollees in the same risk category.⁶ This 10 percent difference is a measure of the favorable selection experienced by Medicare's risk-based HMOs in 1989 that was not accounted for by Medicare's risk adjusters.

While few questioned MPR's finding of some favorable selection, there were doubts about the accuracy of the estimated amount by which Medicare overpaid for HMO enrollees. One reason for doubt was that MPR's sampling technique excluded all decedents from both the FFS and HMO samples. Health care costs tend to be very large in the last year of life for Medicare enrollees, so that excluding decedents would seriously bias any estimates of selection bias if mortality rates differ significantly between FFS and HMO enrollees. Because mortality rates are lower for HMO enrollees, the exclusion of decedents in the MPR study would tend to produce an underestimate of the favorable selection HMOs experienced in 1989.

On the other hand, some believe that the MPR results might overstate the degree of favorable selection bias now experienced by Medicare's HMOs. The MPR and earlier studies were done during a time when Medicare's risk-based sector was just getting started. The characteristics of HMO enrollees may have changed in recent years as enrollment has grown and the average duration of HMO enrollment has increased.

There are two plausible reasons to believe that the extent of favorable selection experienced by Medicare's HMOs might fall as the HMO sector grows in size and average duration of enrollment. First, because of the growing importance of HMOs in employment-based health plans, a growing proportion of people are already in an HMO at the time they become eligible for Medicare. If their employment-based HMO is Medicare-certified, they need not change providers at all. Thus, new Medicare enrollees who "age into" a Medicare HMO may include a more representative mix of healthy and sick people than those who must leave their current FFS providers to join an HMO.

Second, even though many new HMO enrollees may be healthier than the average Medicare beneficiary to start with, some regression toward the mean takes place--meaning that initially low use rates tend to rise toward the average over time. Research by the Health Care Financing Administration shows that health care costs for groups defined solely by a low level of use during a base year regress steadily

⁵ Since $0.95 \cdot \text{AAPCC} = 1.057 \cdot \text{FFS cost for risk enrollees}$, then the $\text{AAPCC} = (1.057/0.95) \cdot \text{FFS cost}$, or the $\text{AAPCC} = 1.11 \cdot \text{FFS cost of risk enrollees}$.

⁶ Since $\text{AAPCC} = \text{FFS cost for FFS enrollees}$, if $\text{AAPCC} = 1.11 \cdot \text{FFS cost for risk enrollees}$ then $\text{FFS cost for risk enrollees} = (1/1.11) \cdot \text{FFS cost for FFS enrollees}$, or $\text{FFS cost for risk enrollees} = 0.9 \cdot \text{FFS cost for FFS enrollees}$.

toward (but do not reach) the mean for their risk category over the next six years.⁷ Thus, the relatively low prior use rates of new HMO enrollees would overstate the extent of favorable selection for total HMO enrollment--more so in HMOs whose enrollees' average tenure is relatively long than in those whose enrollment is growing rapidly. Because Medicare's risk-based HMO enrollment is growing very rapidly currently--by 20-25 percent a year--prior use rates are more indicative of selection bias now than they would be once enrollment had stabilized.

THE PRICE WATERHOUSE STUDY

The PW study used data from the Medicare Current Beneficiary Survey (MCBS) for 1992 (round 4). The study compared predicted costs for risk-based HMO enrollees with costs for a group of FFS enrollees (the "risk subset") who were matched as closely as possible to the HMO sample in terms of geographic location and AAPCC risk factors. The study then assumed that any difference in average predicted costs between the HMO sample and the matched FFS group would represent risk selection. If predicted costs were lower for the HMO group, favorable selection would be inferred. If predicted costs were higher for the HMO group, unfavorable selection would be inferred.

Actual FFS costs could be observed for the matched FFS group, but for the HMO sample the authors had to impute what costs for this group would have been had they remained in the FFS sector. To impute costs for the HMO sample, the authors used data for FFS enrollees to estimate a two-part regression equation--one to predict whether the enrollee would use any services, and the second to predict how much spending would occur per enrolled month for those using services. In addition to the AAPCC risk factors and the county-level AAPCC, other explanatory variables in the equations included indicators for health status, chronic conditions, functional limitations, income, and race. Because estimates using only the matched FFS group were not robust (that is, they were very sensitive to model specification), PW used the entire FFS sample to estimate the cost equations.

Using these equations, the PW study estimated that average costs per enrolled month for the HMO sample would have been \$252 in 1992. In comparison, predicted costs for the matched FFS group were \$256, about 6 percent higher than the \$242 in actual costs reported for this group. The authors adjusted predicted costs for the HMO group down by the same 6 percent, to get an adjusted predicted cost for the HMO group of \$237. Thus, they concluded that predicted costs for the HMO sample were

⁷ James C. Beebe, "Medicare Reimbursement and Regression to the Mean," *Health Care Financing Review*, vol. 9, no. 3 (Spring 1988).

about 98 percent of costs for the matched FFS group (\$237/\$242).⁸ Hence, taken at face value, the PW study shows favorable selection among HMO enrollees, but the extent of that selection bias is small and not statistically significant.

Problems with the PW Study

The most fundamental problem with the PW study is that it used a data base that is poorly suited to analysis of selection bias in Medicare's HMOs. First, the HMO sample in the MCBS for 1992 is too small (at 371 respondents) to generate reliable estimates of costs for HMO enrollees.⁹ Second, the sampling frame for the MCBS was not designed to be representative of Medicare's HMO enrollment. Third, because the MCBS as currently available excludes all those in the original sampling frame who died during the first 9 months of the year, it is not representative for either HMO or FFS enrollees.¹⁰

There are at least two additional problems. First, the authors did not account for the effects of enrollment shifts between HMOs and the FFS sector during the year. Sample respondents were put into either the HMO or the FFS group based on whether they were enrolled in an HMO in January of 1992. Thus, sample respondents who moved to an HMO later in the year were nevertheless treated as FFS enrollees, and respondents who left their HMO for the FFS sector were treated as HMO enrollees.¹¹ Second, the information on chronic conditions used in the study

⁸ The results for HMO and FFS groups shown in Table 10 (p. 29) of the study are not appropriately compared because they show actual spending for FFS groups and unadjusted predicted spending for HMO groups.

⁹ The HMO sample would have to include at least 450 respondents to detect a 10 percent difference and at least 1800 respondents to detect a 5 percent difference in average costs between HMO and FFS enrollees with 90 percent confidence.

¹⁰ Improvements planned for the MCBS would make it somewhat more suitable for analysis of selection bias. The improvements would change the sample from an "always enrolled" to an "ever enrolled" concept for Medicare beneficiaries, so that those who died, became newly eligible, or disenrolled during the year would be retained. Further, self-reported responses about use of health care services would be added to the survey, so that there would be comparable information about use of services for HMO and FFS enrollees. Even without these changes, the HMO sample size in the MCBS will grow as Medicare's HMO enrollment grows. There were 863 HMO respondents in 1994, and about 1100 HMO respondents are expected for 1996.

¹¹ While it may be a legitimate question to assess the extent of selection bias for an HMO group defined at one point in time, as the PW authors did, that is not the right question to ask if the goal is to assess whether Medicare loses or saves money on HMO enrollees over some relevant period, such as the contract year. To assess the effects of HMO enrollment on Medicare's costs, it is necessary to include the effects of enrollment and disenrollment from HMOs over the contract year.

to estimate costs for both HMO and FFS enrollees was incomplete, thereby underreporting the incidence of each kind of chronic condition for both groups to varying degrees. To correctly identify all respondents who have ever been told they have certain chronic conditions, the version of the 1992 (round 4) data used in the PW study must be linked with data from 1991 (round 1), and that link was not made.

Because of these problems, the PW estimates of costs for both HMO enrollees and the matched FFS group are of doubtful validity. No data base currently available would make it possible to correct for all of these problems.¹² However, corrections for three sources of obvious bias in the PW results are described below--to account for decedents missing from the sample and for enrollees who moved to or from an HMO during the year. Estimated adjustments to the PW results were derived from CBO's analysis of the MCBS and Medicare program data.¹³ (See the appendix for a detailed explanation of the adjustments made and the methods used.)

Exclusion of Most Decedents. As currently available, the MCBS data exclude most decedents among the original sample population--because the only respondents kept in the data are those who were Medicare enrollees in January and who survived at least until the interview date in the fourth quarter of the year (September through December). Thus, the mortality rate is less than 1 percent in the MCBS sample, while it is about 5 percent for all Medicare enrollees in a given year.

The authors of the PW study recognized that exclusion of decedents would seriously bias their results if mortality rates among HMO enrollees differed significantly from mortality rates for FFS enrollees, but they presented no evidence about this question. However, Medicare program data show that mortality rates are quite different between HMO and FFS enrollees, even when the two groups are defined as in the PW study. In 1994, unadjusted mortality rates for HMO enrollees were about 80 percent of rates for FFS enrollees (3.8 percent versus 4.8 percent). After adjustment for the AAPCC risk factors, mortality rates for HMO enrollees were still significantly lower,

¹² Medicare's current claims data are also inadequate for analysis of selection bias. They contain no use or spending information to directly assess costs for HMO enrollees; and they provide nothing beyond the AAPCC risk factors to use to estimate costs for HMO enrollees from reported costs for FFS enrollees. But if the AAPCC risk factors are the only explanatory variables in the cost estimating equation, estimated costs for HMO enrollees in a given risk category will equal average costs for FFS enrollees in that category, and the resulting estimate of selection bias will be zero by construction.

¹³ The appropriate adjustments cannot be derived entirely from the MCBS data because most decedents are missing from the data base. Further, the HMO sample size is too small to generate reliable estimates of risk-adjusted FFS costs for respondents who moved to or from an HMO during the year. In the MCBS there were only 59 respondents who joined an HMO after January during the year, and only 29 who were HMO enrollees in January but returned to the FFS sector later in the year.

at about 88 percent the rate for FFS enrollees.

Medicare's costs for enrollees in the last year of life are typically about 7 times the average cost of survivors.¹⁴ Because mortality rates are appreciably higher for FFS enrollees than for HMO enrollees, exclusion of most decedents from the HMO/FFS comparisons in the PW study made costs for the matched FFS group look lower relative to those for the HMO group than they were, thus causing an underestimate of favorable selection for HMOs. If the PW results are adjusted only to account for decedents not in the data (assuming that these decedents would survive half the year, on average), the estimate of costs for HMO respondents relative to costs for the matched FFS group would drop from 98 percent to 96 percent.

Accounting for Enrollment Shifts from FFS to HMOs. In the MCBS, the number of enrollees who began the year in the FFS sector but moved into an HMO sometime during the year was equal to about 15 percent of HMO enrollment in January. Medicare program data show that, prior to their HMO enrollment, such new enrollees cost Medicare only about half as much each month as the average FFS enrollee, after adjusting for the AAPCC risk factors and geographic differences in health care costs.

If the HMO and FFS groups used in the PW study had been redefined only to recognize this shift of low-cost people from the FFS sector to HMOs sometime after January (increasing average HMO enrollment by about 7.5 percent for the year), PW's estimate of costs for the HMO sample would have dropped from 98 percent to 95 percent of costs for the matched FFS group.

Accounting for Enrollment Shifts from HMOs to FFS. In the MCBS, about 6.4 percent of those who were in an HMO at the beginning of the year disenrolled and returned to the FFS sector during the year. Medicare program data show that such HMO disenrollees are about 30 percent more costly each month than those who had been in the FFS sector all along, after adjustment for AAPCC risk factors and geographic differences in health care costs. If the HMO and FFS groups defined in the PW study were redefined to account for this movement from HMOs to the FFS sector (reducing average HMO enrollment by 3.2 percent for the year), this adjustment alone would have reduced the estimated costs for the HMO sample from 98 percent to 96 percent of costs for the matched FFS group.

¹⁴ J. Lubitz and G. Riley, "Trends in Medicare Payments in the Last Year of Life," *New England Journal of Medicine*, vol. 328, no. 15 (April 15, 1993). Table 1 shows that in 1988 5 percent of Medicare enrollees died, accounting for 27 percent of Medicare's costs that year. Thus, Medicare's average cost for decedents is $A(d) = .27C / .05E = 5.4A$, where C = total Medicare costs, E = total Medicare enrollment, and $A = C/E$ = Medicare cost per enrollee. Similarly, Medicare's average cost for survivors is $A(s) = .73C / .95E = 0.7684A$. Consequently, $A(d) = 5.4 * A(s) / 0.7684 = 7.027 A(s)$.

Combined Effect of Adjustments. If a combined adjustment is made for the three flaws discussed--including all decedents and accounting for new HMO enrollment and HMO disenrollment--the PW estimate of costs for HMO respondents would fall from 98 percent of FFS costs to only 91 percent. Thus, if all other aspects of the methods used in the PW study were valid, correction of these three flaws in the way the HMO and FFS groups were defined would more than quadruple its estimate of favorable selection bias for HMOs. The adjusted PW results would imply that HMOs enroll people who cost about 9 percent less than average for their risk category, rather than 2 percent less than average. However, this adjusted result may not be valid either because the initial PW estimates to which the adjustments were applied are suspect.

CONCLUSION

The estimate of selection bias developed in the Price Waterhouse study is not credible, and probably understates the extent of favorable selection experienced by Medicare's HMOs. Adjustment for obvious biases in the PW results would more than quadruple its estimate of favorable selection--from 2 percent to 9 percent. However, CBO's adjustments to the PW estimate are primarily illustrative and are not intended to generate a definitive estimate of the extent of selection bias for Medicare's HMOs. Derivation of a credible estimate for selection bias would involve far more detailed analysis, perhaps requiring survey data not now collected.

APPENDIX. CALCULATION OF ADJUSTMENTS

CBO's analysis used a one-percent sample from the Continuous Medicare History Sample (CMHS) for calendar year 1994, in addition to the MCBS for 1992.¹⁵ Only those who had coverage under both Parts A and B of Medicare in January and who did not have end-stage renal disease were kept in the sample. The HMO and FFS groups used were defined as they were in the PW study--based on enrollment as of January 1. For HMO enrollees, only those in risk-based plans were included; those in cost-based HMOs in January were excluded from the analysis.

Reported FFS costs for each enrollee with some FFS enrollment were annualized. They were also standardized for geographic differences in spending by multiplying all reimbursement amounts by the ratio of the USPPC over the county-specific AAPCC. Risk-adjustment (explained in more detail below) was based on 40 risk categories defined by age, sex, and Medicaid status.¹⁶ Because the CMHS has no information about whether a beneficiary was institutionalized, the 20 additional risk categories for institutionalized people could not be defined. Instead, the 40 risk categories used include both institutionalized and noninstitutionalized beneficiaries.¹⁷

Risk-adjusted mortality rates were calculated as follows. In each of the 40 risk categories defined, mortality rates were calculated as the ratio of decedents to January enrollees, separately for the HMO and FFS groups as defined in the PW study. Then an average mortality rate was calculated, separately for the HMO and FFS groups, using the number of HMO beneficiaries in each risk category as weights in the weighted average. Thus, HMO- or FFS-specific mortality rates were used in each risk category, but the overall average mortality rate calculated for each group used the same (HMO) distribution of people across the 40 risk categories. The result was a risk-adjusted mortality rate of 4.4 percent for the FFS group, and 3.8 percent for the HMO group. (Unadjusted mortality rates were 4.8 percent for the FFS group, and

¹⁵ The necessary CMHS data for 1992 were not immediately available.

¹⁶ The PW study adjusted for risk and geographic differences in costs by using a subset of FFS enrollees who were matched to the HMO group for all of the AAPCC risk factors and for location. CBO's analysis used all of the FFS group and adjusted for risk and geographic differences in costs as explained in the text. To most closely approximate the PW risk-adjustment process, the weights used for risk-adjusted averages were derived from the distribution of HMO enrollees among the risk categories.

¹⁷ The risk-adjusted relative mortality rate was virtually identical whether the sample distribution used for the weights was for the HMO group, the FFS group, or either group excluding Medicaid enrollees. Because the relative mortality rate was so robust, it is unlikely that inclusion of risk categories for institutionalization would change it much.

3.8 percent for the HMO group.) Risk-adjusted costs (per month in the FFS sector) for FFS enrollees and for HMO enrollees who either joined or left an HMO after January were calculated in an analogous way.

For CBO's analysis, initial enrollment and monthly costs for the HMO and FFS groups were set at the values reported in the PW study from the 1992 Current Beneficiary Survey (see Appendix Table 1). HMO enrollment (weighted) was 1,118 and FFS enrollment was 31,527. Per capita monthly costs reported in the PW study were \$237 for the HMO group and \$242 for the FFS group, after adjustment to match the risk distribution of the HMO group.¹⁸

Mortality rates in the PW sample were 1.1 percent for the HMO group and 0.8 percent for the matched FFS group. Medicare program data indicate that, in a representative sample, risk-adjusted mortality rates would be 3.8 percent for HMO enrollees and 4.4 percent for FFS enrollees as defined in the PW study. Thus, if the PW sample had been representative, it would have included about 32 more enrollees in the HMO group and 1,160 in the FFS group (both weighted counts), all of whom would have died during 1992.

Explanation: Both HMO and FFS groups in the PW study are too small because they exclude some decedents. In a representative sample, initial HMO enrollment would have been equal to $1118/(1-.02742) = 1,150$. Initial FFS enrollment would have been $31527/(1-.0355) = 32,687$.

The estimates assume these additional decedents would have survived only half the year, so that average HMO enrollment would have been higher by 16 and average FFS enrollment by 580 over the year. Decedents in their last year cost about seven times the average cost for survivors (see footnote 14). Consequently, the additional HMO decedents would have cost an average of \$1,562 for each month they lived; the additional FFS decedents would have cost \$1,622 a month.

Explanation: The average monthly cost for decedents equals 7.027 the average monthly cost for survivors. The average cost reported in the PW study is not the average cost for survivors, because it includes some but not all decedents that should have been in the sample. The average monthly cost of HMO decedents in the PW sample can be calculated by noting that, for the HMO group:

$$A(p) = .011 A(d) + (1-.011) A(s)$$

where $A(p) = 237 =$ the average cost PW reported;

¹⁸ PW's adjusted predicted cost for the HMO group is \$237, which is their initial predicted cost of \$252 adjusted down by 6 percent based on the percentage difference between predicted and actual costs for the FFS group.

A(d) = average cost for decedents;

A(s) = average cost for survivors = A(d)/7.027.

Thus, $237 = .011 A(d) + (1-.011) A(d)/7.027 = .1517 A(d)$

so that $A(d) = 237/.1517 = 1562$.

Similarly, for the FFS sample $A(d) = 242/(\.14917) = 1622$.

By taking the weighted average of costs reported by PW for those included in their sample and costs for the decedents missing from the PW sample, the adjusted average monthly cost becomes \$255 for the HMO group and \$267 for the FFS group.

Explanation: The new HMO average equals $(237*1118 + 1562*32/2)/1134$.

The new FFS average equals $(242*31527 + 1622*1160/2)/32107$.

Adjusting for the missing decedents in the PW sample would reduce its estimate of costs for the HMO group relative to the FFS group from 98 percent (237/242) to 96 percent (255/267).

Weighted counts in the MCBS indicate that the initial HMO group defined in the PW study would have grown by about 15 percent during 1992 as Medicare beneficiaries who began the year in the FFS sector moved to HMOs. Thus, there would have been 171 new HMO enrollees over the year, and the estimates assume they would have spent only 6 months in the HMO on average. Medicare program data indicate that, prior to their move to an HMO, such new enrollees cost Medicare less than half what the average FFS enrollee in the same risk category costs each month. The FFS group is defined as it was in the PW study, adjusted for the decedents that were missing from the PW sample. Estimated monthly costs for these new HMO enrollees are \$127.

Explanation: New HMO enrollees cost 0.474 times average monthly costs for FFS enrollees in the same risk category, where that average cost is 267.

Thus, the average cost for the new HMO enrollees is $.474*267 = 127$.

By taking the weighted average of costs reported by PW for those included in their sample and costs for new HMO enrollees during the year, the adjusted average monthly cost becomes \$229 for the HMO group and \$242 for the FFS group.

Explanation: The new HMO average equals $(237*1118 + 127*171/2)/1203$.

The new FFS average equals $(242*31527 - 127*171/2)/31442$.

Adjusting only for new HMO enrollment during the year would reduce the PW estimate of costs for the HMO group relative to the FFS group from 98 percent to 95 percent (229/242). Combining this adjustment with the earlier one for missing decedents would reduce the PW estimate from 98 percent to 92 percent (246/267).

Explanation: For the combined effect, the new HMO average equals $(255*1134 + 127*171/2)/1219$. The new FFS average equals $(267*32107 - 127*171/2)/32022$.

Weighted counts in the MCBS indicate that about 6.4 percent of the initial HMO sample defined in the PW study would have disenrolled to return to the FFS sector during the year. Thus, there would have been 71 HMO disenrollees over the year, and the estimates assume they would have spent only 6 months in the HMO on average. Medicare program data indicate that, after their return to the FFS sector, such disenrollees cost Medicare about 30 percent more than the average FFS enrollee costs each month. Estimated monthly costs for these HMO disenrollees are \$342.

Explanation: HMO disenrollees cost 1.283 times average monthly costs for FFS enrollees, where that average cost is 267. Thus, the average cost for the new HMO enrollees is $1.283*267 = 342$.

By taking the weighted average of costs reported by PW for those included in their sample and costs for HMO disenrollees, the adjusted average monthly cost becomes \$234 for the HMO group and \$242 for the FFS group.

Explanation: The new HMO average equals $(237*1118 - 342*71/2)/1082$. The new FFS average equals $(242*31527 + 342*71/2)/31563$.

Adjusting only for HMO disenrollment during the year would reduce the PW estimate of costs for the HMO group relative to the FFS group from 98 percent to 96 percent ($234/242$). Combining this adjustment with the earlier ones for missing decedents and new HMO enrollment would reduce the PW estimate from 98 percent to 91 percent ($244/267$).

Explanation: For the combined effect, the new HMO average equals $(246*1219 - 342*71/2)/1184$. The new FFS average equals $(267*32022 + 342*71/2)/32057$.

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APPENDIX TABLE 1. ILLUSTRATIVE ADJUSTMENTS TO PRICE WATERHOUSE ESTIMATE OF SELECTION BIAS

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Results from Price Waterhouse Study /a/	Effects in Isolation.....			Cumulative Effects.....		
	HMO	FFS	HMO/FFS	HMO	FFS	HMO/FFS
January enrollment	1118	31527		1118	31527	
Predicted average monthly costs	237	242	0.98	237	242	0.98
Adjustment for Decedents not in Sample /b/						
Death rates in population	0.038	0.044		0.038	0.044	
Death rates in PW sample	0.011	0.008		0.011	0.008	
Difference in death rates	0.027	0.036		0.027	0.036	
Decedents not in sample (half-year)	32	1160		32	1160	
Adjusted average enrollment	1134	32107		1134	32107	
Monthly costs for decedents	1562	1622		1562	1622	
Adjusted average costs	255	267	0.96	255	267	0.96
Adjustment for Enrollment Shifts from FFS to HMOs /c/						
Share of enrollment shifting to HMOs	0.153	-0.005		--	--	
Change in enrollment during year (half-year)	171	-171		171	-171	
Adjusted average enrollment	1203	31442		1219	32022	
Monthly costs for enrollees shifting	127	127		127	127	
Adjusted average costs	229	242	0.95	246	267	0.92
Adjustment for Enrollment Shifts from HMOs to FFS /d/						
Share of enrollment shifting to FFS	-0.064	0.002		--	--	
Change in enrollment during year (half-year)	-71	71		-71	71	
Adjusted average enrollment	1082	31563		1184	32057	
Monthly costs for enrollees shifting	342	342		342	342	
Adjusted average costs	234	242	0.96	244	267	0.91

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SOURCE: Congressional Budget Office from Medicare program data and the Medicare Current Beneficiary Survey for 1992.

NOTE: Prior to adjustments, the HMO and FFS groups are defined as they were in the Price Waterhouse study; that is, based on enrollment as of January 1 of the year. Enrollment, new HMO enrollment, and HMO disenrollment numbers are from the Medicare Current Beneficiary Survey for 1992. Mortality rates and costs for FFS enrollees, new HMO enrollees, and HMO disenrollees are risk-adjusted estimates from Medicare program data for 1994.

- a. From a study by Jack Rodgers and Karen Smith, "Is There Biased Selection in Medicare HMOs?" Price Waterhouse LLP (March 14, 1996). The actual predicted cost for HMO enrollees was \$252, but the authors adjusted this prediction down by 6 percent based on the percentage difference between actual and predicted costs for FFS enrollees. The enrollment numbers shown are weighted counts, not record counts.
- b. Assumes decedents in their last year cost 7.027 times the average survivor, from a study by J. Lubitz and G. Riley, "Trends in Medicare Payments in the Last Year of Life," New England Journal of Medicine, vol. 328, no. 15 (April 15, 1993). Also assumes that decedents survive only half the year, on average.
- c. Assumes new HMO enrollees cost 47.4% of the average FFS enrollee on a monthly basis, from Medicare program data. Also assumes that new enrollees are in the HMO only half the year, on average.
- d. Assumes HMO disenrollees cost 128% of the average FFS enrollee on a monthly basis, from Medicare program data. Also assumes that disenrollees are in the HMO only half the year, on average