CBO MEMORANDUM

PREDICTING HOW CHANGES
IN MEDICARE'S PAYMENT RATES
WOULD AFFECT RISK-SECTOR
ENROLLMENT AND COSTS

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CONGRESSIONAL BUDGET OFFICE
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This Congressional Budget Office (CBO) memorandum describes Medicare's risk-based sector, in which health maintenance organizations and other competitive health plans provide services at a set price per enrollee. Specifically, the memorandum estimates how enrollment in Medicare's risk-based plans might change in response to changes in Medicare's payment policies. The analysis uses predicted changes in enrollment to estimate how different payment rates would affect Medicare's costs, both in the risk-based sector and overall. The estimates presented here are valid only under the assumption that all Medicare policies other than payment rates remain the same in both the risk and fee-for-service sectors. If other policies changed as well, the effects of changing Medicare's payment rates would differ from those estimated here. In accordance with CBO's mandate to provide objective and impartial analysis, this memorandum makes no recommendations.

Sandra Christensen of CBO's Health and Human Resources Division wrote the memorandum under the direction of Joseph Antos and Linda Bilheimer. Judy Shinogle did much of the regression analysis presented in Appendixes A and B, and Portia DeFilippes did all of the substantial programming required.

Christian Spoor edited the manuscript, Marlies Dunson proofread it, and Sharon Corbin-Jallow prepared the memorandum for publication.

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SUMMARY

The market for health care is changing rapidly. Private insurers have largely eliminated the traditional unmanaged indemnity plan in favor of managed care plans—such as health maintenance organizations (HMOs) and preferred provider organizations. With managed care plans, insurers can control costs better by negotiating price discounts with providers in the plan's network. They can also limit patients' use of unnecessary services—and thus save money—by employing case management or having primary care physicians act as "gatekeepers." Competition among private insurers helps to ensure that plans with successful cost control methods pass the savings on to their enrollees through lower premiums, while plans without effective cost control lose market share. The fact that premiums for private health insurance are rising less quickly now than they used to probably results, at least in part, from the rapid transformation of the private insurance market from unmanaged indemnity plans to managed care.

Medicare lags behind the private sector in moving to managed care. Nearly 90 percent of Medicare beneficiaries are in the program's fee-for-service sector, where the use of health care services is largely unmanaged (although Medicare extracts substantial price discounts from providers). Enrollment in Medicare's HMO sector has been growing rapidly in recent years, but the program's HMO participation rate is still only about half that for the rest of the population. In mid-1995, 9 percent of Medicare beneficiaries were in HMOs compared with 22 percent of the non-Medicare population. Assuming that current policies continue, analysts do not expect Medicare's HMO participation rate to reach 22 percent until 2001.

The program's costs are growing at unsustainable rates, and many policymakers believe the best way to slow that growth without reducing the number of people or services covered is to accelerate the movement of Medicare beneficiaries into HMOs. Based on estimates from the Health Care Financing Administration, in 1996 HMOs provided their Medicare enrollees with basic Medicare benefits for only about 87 percent of the cost, on average, that Medicare would have paid for those beneficiaries in the fee-for-service sector.

Under current policies, however, Medicare does not reap those savings. Because its payments to HMOs do not adequately account for the fact that HMOs experience favorable selection—in other words, that they tend to enroll people with lower-than-average health care costs—Medicare pays HMOs more than it would pay for the same enrollees in the fee-for-service sector. Thus, its costs generally increase under current conditions, rather than decrease, when beneficiaries join an HMO. Although beneficiaries may be better off by moving to an HMO because they get additional benefits for little or no extra premium, Medicare's financial situation worsens.

In recent years, some Members of Congress have proposed changing the mechanism by which Medicare sets payment rates for HMOs so the program can garner more of the potential savings from HMOs' greater efficiency. Currently, the per capita amount that Medicare pays an HMO for each enrollee is based on Medicare's average cost in the fee-for-service sector for beneficiaries with the same demographic characteristics living in the same county (known as the adjusted average per capita cost, or AAPCC). Most proposals call for developing additional risk adjusters to augment the demographic characteristics that Medicare uses, in order to reduce the overpayment that most HMOs now experience because of favorable selection. In addition, many proposals would break the current link between Medicare's HMO payment rates and fee-for-service costs in the beneficiary's county.

Any change in Medicare's rate-setting policies would affect enrollment in its managed care (or risk-based) sector, with an equal but opposite change for enrollment in the fee-for-service sector. This memorandum develops an equation to predict how Medicare's risk-sector enrollment would differ if payment rates changed, under the assumption that all other aspects of Medicare policy stayed the same. That equation is used to estimate how Medicare's risk-sector costs and total costs would respond to various rate changes (see Summary Table 1).

Note, however, that the predictions made here of the effects of altering payment rates are valid only if all other aspects of Medicare policy do not change. If other aspects of policy were changed as well, the enrollment and cost responses that this analysis predicts would have to be modified, perhaps substantially. For example, eliminating Medicare's requirement that participating HMOs draw at least 50 percent of their enrolled population from privately insured patients would increase enrollment in the risk sector by making it easier for HMOs to enter the Medicare market. Introducing a coordinated open-enrollment period—during which Medicare beneficiaries would receive comparative information about all the HMO options available in their area—would probably also boost risk-sector enrollment. Such enrollment effects would have to be added to whatever enrollment changes new payment rates would cause.

The memorandum examines the effects of three options that would change Medicare's HMO payments. The first two alternatives would leave total payments to HMOs the same initially (that is, before any resulting changes in enrollment). The third option would reduce total payments.

In the absence of other policy changes, this analysis indicates that any reallocation of HMO payments that was initially budget neutral would have little effect on risk- sector enrollment or costs overall. One common proposal is to set Medicare's HMO rates by metropolitan statistical area (or by the rest of the state for rural areas) instead of at the county level, in order to reduce the year-to-year volatility

SUMMARY TABLE 1. PERCENTAGE CHANGES IN MEDICARE'S RISK-SECTOR ENROLLMENT AND COSTS UNDER VARIOUS CHANGES IN THE AAPCC, FISCAL YEAR 1996

	Total in Fiscal Year 1996	Percentage Change Under Option 1	Option 2	Option 3
Initial Risk-Sector Payments[a]				
Nationwide	$16.6 billion	0	0	-5.0
Urban	$16.3 billion	0.1	-0.3	-5.0
Rural	$0.3 billion	-3.7	16.0	-5.0
Risk-Sector Enrollment				
Nationwide	3.4 million	0.1	0.7	-4.9
Urban	3.3 million	0.2	0.4	-4.9
Rural	0.1 million	-1.5	16.1	-5.1
Risk-Sector Costs[b]				
Nationwide	$16.6 billion	0.2	0.8	-9.8
Urban	$16.3 billion	0.3	0.2	-9.7
Rural	$0.3 billion	-5.1	35.4	-10.0
Total Medicare Costs				
Nationwide	$194.3 billion	c	0.2	-0.4
Urban	$151.5 billion	c	0.2	-0.6
Rural	$42.7 billion	c	0.2	c

SOURCE: Congressional Budget Office estimates based on the regression equation discussed in Appendix B.

NOTE: The AAPCC is the adjusted average per capita cost for Medicare in each county. Medicare's current payment rates are equal to 95 percent of AAPCCs. Option 1 would set payment rates throughout a metropolitan area equal to 95 percent of the weighted average of county-level AAPCCs. Option 2 would set county-level payment rates equal to 95 percent of price-adjusted USPCCs. (The USPCC is the national average per capita cost for Medicare.) Option 3 would reduce all payment rates by 5 percent in each county. All other aspects of Medicare policy would be unchanged.

a. Before enrollment changes.
b. After enrollment changes.
c. Less than 0.05 percent in absolute value.

in rates that occurs now in counties with few Medicare beneficiaries. If rates were set that way (Option 1 in this analysis), risk-sector payments and enrollment would increase in most urban areas but would fall in most rural areas. Overall, risk-sector enrollment would increase by 0.1 percent and costs by 0.2 percent. The effect on Medicare's total costs would be negligible.

Option 2 would also reduce year-to-year volatility in rates and would eliminate any geographic variation that was not based on differences in providers' input prices. Specifically, it would set county-level payment rates for HMOs that equaled Medicare's average per capita fee-for-service cost nationwide (known as the USPCC) adjusted for the county's price level. Under Option 2, risk-sector payments would increase appreciably in rural areas and decrease slightly in urban areas, on average. However, the overall effect for urban areas masks differences by size—payments would generally fall only for large urban areas, whereas they would increase for mid-size and small urban areas. Consequently, risk-sector enrollment would fall only in large urban areas but would increase in all other areas, for an overall rise of nearly 1 percent. Risk-sector costs would increase a little overall, because of significantly higher costs in rural and smaller urban areas partly offset by lower costs in large urban areas. Medicare's total costs would increase slightly in all areas. In large urban areas, costs in the fee-for-service sector would rise (because of HMO enrollees moving to that sector) by more than risk-sector costs would fall, whereas in all other areas risk-sector costs would increase by more than costs in the fee-for-service sector would fall.

Any reduction in HMO payments, as in Option 3, would induce a similar percentage reduction in risk enrollment and a much smaller reduction in total Medicare costs. For example, if Medicare reduced HMO payment rates by 5 percent in all counties (with no comparable reduction in fee-for-service rates), risk-sector enrollment would drop by 4.9 percent and risk-sector costs would fall by 9.8 percent. Total costs under Medicare would drop by just 0.4 percent, however, because risk-sector costs are a small part of total costs, and because fee-for-service costs would increase as some HMO enrollees switched to that sector. If Medicare also reduced fee-for-service rates by 5 percent in all counties, risk-sector enrollment would not change, although Medicare's costs would fall.

Another proposal that has been made is to exclude the cost of certain payments to hospitals when calculating Medicare's rates for HMOs—specifically, payments to reimburse hospitals for the direct and indirect costs of graduate medical education (GME) and for the costs of serving a disproportionate share of low-income patients (so-called DSH payments). The reason is that many HMOs do not use hospitals with significant GME or DSH costs. If those costs were excluded, HMO payment rates for Part A of Medicare (Hospital Insurance) would be 8.4 percent lower on average. That would reduce Medicare's total payments to HMOs by about

5.5 percent in 1996. This memorandum does not analyze options of that kind, however, because the effects on risk-sector enrollment cannot be predicted without knowing how GME and DSH payments might be allocated under alternative funding mechanisms and to what extent HMOs could recapture those dollars.

INTRODUCTION: HMO PARTICIPATION IN MEDICARE

Although most Medicare beneficiaries still receive health care in the fee-for-service sector (which pays providers for each service that Medicare patients use), enrollment in the program's risk sector has grown rapidly in recent years. Health plans in that sector—primarily health maintenance organizations (HMOs)—agree to provide the basic Medicare benefit package for a prepaid amount per capita, regardless of the cost of services that patients actually use. The risk sector gets its name because plans are at risk for whatever the costs of care for their enrollees may be. This memorandum describes Medicare's risk-based sector, discusses its effects on federal costs and enrollees' benefits, and develops a method to predict how enrollment in Medicare's risk-based plans might change in response to changes in payment policies. It also estimates how changes in enrollment would affect the program's costs, both in the risk-based sector and overall.

HMOs serve Medicare enrollees in one of three ways—on a risk basis, on a cost basis, or on a cost basis only for Part B (Supplementary Medical Insurance) benefits. Whereas risk-based plans agree to provide all covered services to Medicare enrollees for a prepaid amount per person, cost-based plans are reimbursed by Medicare for the actual costs of all services that Medicare beneficiaries use. Cost-based plans that cover only Part B services are called health care prepayment plans (HCPPs). Cost-based HMOs are unique to the Medicare program; all HMOs serve their commercial enrollees on a risk basis.

Medicare beneficiaries who enroll in a risk-based health maintenance organization receive all medical care through the HMO, although if the plan has a point-of-service option they may see providers outside the network at the plan's expense.[1] Enrollees in comprehensive cost-based plans are free to use either the HMO or Medicare's fee-for-service sector. Enrollees in HCPPs get all Part A (Hospital Insurance) services in the fee-for-service sector, but they may receive Part B services either through the HMO or the fee-for-service sector.

Comprehensive risk- and cost-based HMOs face a number of administrative requirements intended to protect enrollees that generally do not apply to HCPPs. Besides covering all of the same services as Medicare's fee-for-service sector, comprehensive HMOs must maintain a number of information, enrollment, and grievance procedures for their Medicare enrollees that may not be required for their other patients. Comprehensive HMOs must enroll all Medicare beneficiaries who apply, up to the capacity limits of the plan. Further, they may not allow Medicare and Medicaid enrollees to make up more than 50 percent of their total enrollment.

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1. New guidelines issued in October 1995 made it clear that Medicare's HMOs could offer "open-panel" or point-of-service plans, in which enrollees may see non-network providers if they pay higher cost-sharing amounts than required when seeing providers in the network.

Initially, Medicare's exclusive reliance on the fee-for-service payment method prevented HMOs from serving their Medicare enrollees on a risk basis. Not until 1982 did the Congress pass legislation to allow Medicare enrollment in HMOs on a prepaid risk basis, and regulations to carry out the legislation were not final until 1985. Since then, enrollment in cost-based HMOs has grown little as a share of total Medicare enrollment, but enrollment in the risk sector has grown rapidly—by more than 35 percent a year in both 1995 and 1996.

Medicare's HMO enrollment may be growing rapidly, but it lags well behind HMO enrollment for the rest of the population. In mid-1995, about 9 percent of Medicare beneficiaries were in HMOs (7 percent on a risk basis and 2 percent on a cost basis) compared with some 22 percent of the non-Medicare population.[2] Unless current policies change, the Congressional Budget Office (CBO) does not expect Medicare's HMO enrollment to reach 22 percent of total enrollment until 2001 (see Figure 1).

A number of factors help to explain the lower rate of HMO enrollment among the Medicare population. In areas where HMOs do not choose to participate in the Medicare market, beneficiaries simply do not have the option of joining one. In 1995, only 62 percent of Medicare beneficiaries lived in counties served by at least one Medicare HMO (risk- or cost-based), and just 55 percent were in counties served by a risk-based HMO (see Table 1). Of all HMOs in the United States, less than a third served the Medicare market in some way in 1995, and only 21 percent offered a Medicare risk-based plan.[3]

The volatility of Medicare's payment rates may deter some HMOs from participating in the program on a risk basis. Those rates are set each year separately by county based on Medicare's costs in the fee-for-service sector in that county. Another factor impeding participation is that the medical needs of the Medicare population differ significantly from the needs of the younger groups that have been the primary market for HMOs up to now. And HMOs' marketing and administrative costs tend to be higher for Medicare enrollees because beneficiaries must usually be enrolled on an individual rather than a group basis.[4]

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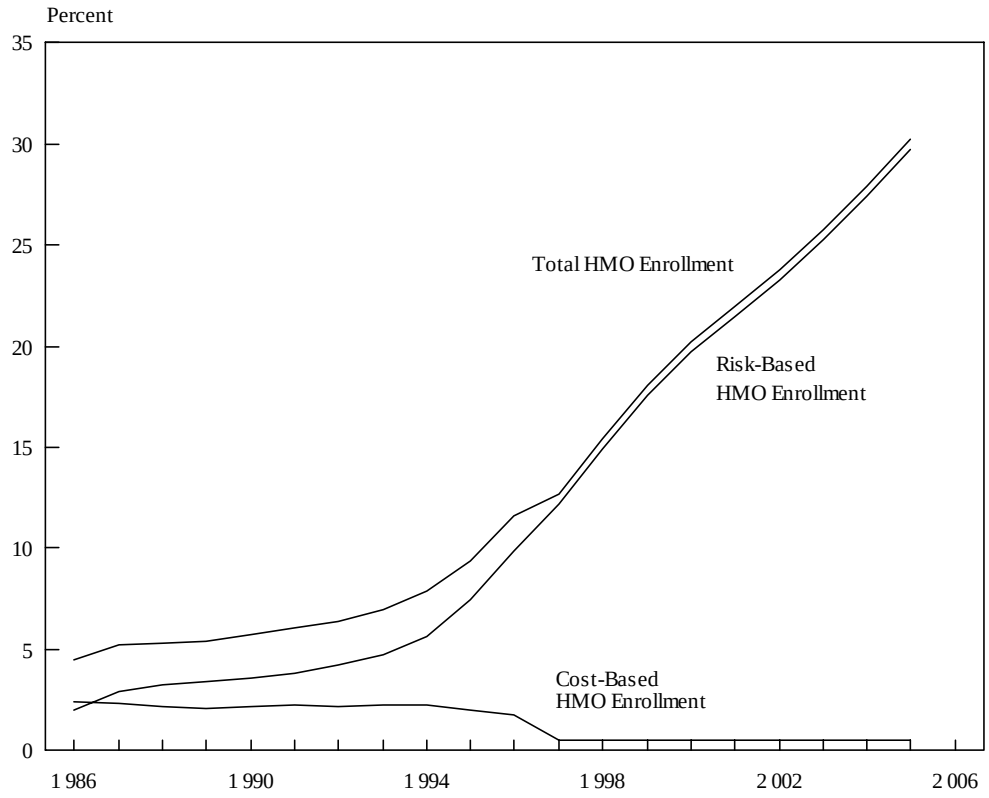
2. CBO calculation using data from the InterStudy National HMO Census 6.1 (InterStudy Publications, Minneapolis, 1996).

3. *The InterStudy Competitive Edge 6.1, Part II: Industry Report* (Minneapolis: InterStudy Publications, April 1996); and the Prospective Payment Assessment Commission, *Medicare and the American Health Care System: Report to the Congress* (June 1996).

4. In 1993, HMOs' mean administrative expenses for Medicare enrollees were twice the HMO average—$27.01 per Medicare enrollee compared with $13.39 per average enrollee. See American Association of Health Plans, *HMO and PPO Industry Profile, 1995-1996 Edition* (Washington, D.C.: American Association of Health Plans, May 1996), Tables 5-27 and 6-16.

FIGURE 1. ENROLLMENT IN RISK- AND COST-BASED HMOs AS A PERCENTAGE OF MEDICARE'S TOTAL ENROLLMENT, 1986-2005



SOURCES: Health Care Financing Administration, Office of Managed Care (for data through 1 996) and Congressional Budget Office (projections for 1 997 through 2005).

NOTE: Data are for July 1 each year.

TABLE 1. PERCENTAGE OF MEDICARE BENEFICIARIES LIVING IN COUNTIES SERVED BY HMOs, 1995 AND 1996

	1995	1996
Served by at Least One Risk- or Cost-Based Medicare HMO		
Nationwide	62	70
Urban	76	83
Rural	17	30
Served by at Least One Risk-Based Medicare HMO		
Nationwide	55	60
Urban	69	76
Rural	9	12

SOURCE: Congressional Budget Office based on data from the Health Care Financing Administration's Office of Managed Care.

NOTE: Figures are for March of each year.

Even when Medicare beneficiaries have access to HMOs, various factors may discourage their enrollment. Lack of information about HMO options, together with continued availability of the fee-for-service option, have made Medicare beneficiaries less likely to choose HMOs than the working-age population. More and more employers are offering only managed care plans so, unlike Medicare beneficiaries, many working-age people no longer have access to a traditional fee-for-service plan. Further, Medicare beneficiaries have until recently had no centralized source of information about the HMO options available to them—unlike people with employment-based plans—and they still have no central source of comparative information about those plans.[5]

Another reason that relatively few Medicare beneficiaries select HMOs is that people who were not already in an HMO before they retired may have established ties to fee-for-service providers whom they are reluctant to leave. That is especially true for people with chronic conditions, who may fear that an HMO will restrict their access to needed services.[6] Also, Medicare's requirement that its HMOs be open to everyone in an area sometimes prevents Medicare enrollees from continuing with their employment-based HMO after retirement, because some employment-based plans are limited to current and former employees. Furthermore, some beneficiaries relocate after retirement to areas not served by their employment-based HMO.

Despite those impediments, Medicare's HMO enrollment has been gaining on private-sector HMO enrollment since 1990 (see Table 2). While non-Medicare HMO enrollment increased by an average of 9.5 percent a year between 1990 and 1995, Medicare's HMO enrollment grew by 13.7 percent a year.

Though they are generally lower, Medicare's enrollment rates for risk-based HMOs by geographic area closely follow non-Medicare rates (see Table 3). In 1995, only two states (Arizona and Nevada) had higher risk-enrollment rates for the Medicare population than for the non-Medicare population. Medicare's risk enrollment is also more highly concentrated than non-Medicare enrollment. In 1995, nearly 57 percent of enrollees in Medicare's risk sector were in only two states—California and Florida, home to just 17 percent of Medicare beneficiaries. Fifteen states accounted for 95 percent of Medicare's risk enrollment but only 56 percent of its beneficiaries. By contrast, California and Florida supplied only 28

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5. See General Accounting Office, *Medicare: HCFA Should Release Data to Aid Consumers, Prompt Better HMO Performance*, GAO/HEHS-97-23 (October 1996).

6. One recent study indicates that such fears may be justified. See J.E. Ware and others, "Differences in 4-Year Health Outcomes for Elderly and Poor, Chronically Ill Patients Treated in HMO and Fee-for-Service Systems," *Journal of the American Medical Association*, vol. 276, no. 13 (October 2, 1996).

TABLE 2. ANNUAL GROWTH IN HMO ENROLLMENT, 1988-1995 (In percent)

	Total	Non-Medicare	Medicare
1988	11.6	12.3	0.9
1989	6.1	6.2	5.2
1990	5.2	4.9	10.0
1991	5.8	5.6	7.8
1992	7.3	7.2	8.9
1993	9.2	9.0	11.5
1994	13.1	12.9	15.7
1995	13.9	13.2	25.4

SOURCE: Congressional Budget Office based on data from Group Health Association of America, Patterns in HMO Enrollment, 4th ed. (Washington, D.C.: GHAA, June 1995) and from the Health Care Financing Administration's Office of Managed Care.

NOTE: Data are for December of each year. Medicare data include both risk- and cost-based HMO enrollment.

TABLE 3. HMO ENROLLMENT RATES FOR MEDICARE AND THE GENERAL POPULATION, BY STATE, 1995 (In percent)

	Total Population	Non-Medicare Population	Medicare Population (Risk Only)	Number of Medicare Risk-Based Plans
United States	20.1	21.9	6.8	162
Alabama	6.9	7.9	0.5	3
Alaska	0	0	0.2	0
Arizona	24.3	24.1	27.5	7
Arkansas	4.4	5.5	0.1	0
California	38.5	39.3	27.8	29
Colorado	24.1	24.7	12.8	5
Connecticut	23.3	21.1	0.2	1
Delaware	22.7	26.3	0.4	2
District of Columbia	27.3	30.1	0.5	4
Florida	20.8	23.0	15.3	19
Georgia	8.2	9.7	0.1	0
Hawaii	22.5	21.3	8.9	1
Idaho	1.7	1.1	0.2	0
Illinois	18.4	20.1	4.3	4
Indiana	8.4	10.9	0.5	4
Iowa	4.5	9.8	0.1	1
Kansas	5.1	7.5	1.3	3
Kentucky	15.0	17.4	0.4	1
Louisiana	8.8	9.7	2.9	3
Maine	7.3	8.7	0.1	0
Maryland	29.5	30.8	0.5	6
Massachusetts	39.3	35.2	5.8	6
Michigan	21.0	24.4	0.6	2
Minnesota	27.7	29.2	9.0	3
Mississippi	4.8	5.1	0	0
Missouri	19.3	20.6	1.6	6
Montana	2.6	2.8	0.1	0
Nebraska	9.2	10.5	1.2	1
Nevada	15.6	16.3	19.8	2
New Hampshire	19.6	29.0	0.2	2
New Jersey	16.8	21.0	1.0	2
New Mexico	16.8	17.1	14.1	4
New York	27.7	29.8	4.2	7
North Carolina	8.7	10.1	0	0
North Dakota	1.2	1.2	0.1	0

(Continued)

TABLE 3. CONTINUED

	Total Population	Non-Medicare Population	Medicare Population (Risk Only)	Number of Medicare Risk-Based Plans
Ohio	16.9	19.5	1.4	7
Oklahoma	8.0	8.8	3.0	0
Oregon	42.0	44.5	19.2	7
Pennsylvania	24.7	25.8	3.8	7
Rhode Island	22.4	28.0	5.0	1
South Carolina	5.6	6.4	0.1	0
South Dakota	2.9	3.4	0.1	0
Tennessee	13.3	15.6	0	0
Texas	11.4	12.1	5.1	9
Utah	27.8	29.8	0.1	0
Vermont	12.8	13.1	0.1	0
Virginia	7.7	16.4	0.5	4
Washington	19.4	21.2	12.5	8
West Virginia	5.7	5.6	0	0
Wisconsin	24.9	29.1	0.1	1
Wyoming	0	0	0.2	0

SOURCE: Congressional Budget Office based on data from the Health Care Financing Administration's Office of Managed Care and the InterStudy National HMO Census 6.1.

NOTES: Total population and enrollment data for the non-Medicare population are for July 1995. Data for the Medicare population are for March 1995.

The reported enrollment rates for Medicare HMOs include only risk-based plans. Because enrollees' residence is recorded at an earlier date than HMO enrollment, Medicare's reported rates sometimes show HMO enrollment even in areas with no HMOs serving them.

percent of non-Medicare HMO enrollment, and the 15 states that accounted for 95 percent of Medicare's risk enrollment made up only 69 percent of non-Medicare HMO enrollment.

FACTORS THAT DETERMINE THE COST OF MEDICARE'S RISK-BASED SECTOR

The amount Medicare pays risk-based HMOs per enrollee equals 95 percent of the beneficiary's adjusted average per capita cost (AAPCC). The AAPCC is an estimate of Medicare's expected cost for a fee-for-service beneficiary in the same county, adjusted to reflect the enrollee's age, sex, institutional status, Medicaid eligibility, reason for eligibility, and whether Medicare is the primary payer.

That payment mechanism was designed to allow Medicare to claim some of the savings expected from HMOs' more efficient practices, while permitting any additional savings to be shared between the HMO and its Medicare enrollees. In practice, however, Medicare probably pays more for people who enroll in risk-based HMOs than it would if they stayed in the fee-for-service sector. The reason is that Medicare's payments to HMOs do not adequately reflect the favorable selection that most HMOs experience with the Medicare population.

Selection Bias

Under the current payment system, if Medicare enrollees in risk-based HMOs are on average very like those who remain in the fee-for-service sector, Medicare's costs for HMO enrollees will be only 95 percent of what they would have been if those people had stayed in the fee-for-service plan. However, if the health characteristics of HMO enrollees differ from those of people still in the fee-for-service sector (within the risk categories used to adjust the AAPCC), then HMOs experience biased selection. In that case, 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 fee-for-service beneficiary in the same risk category—Medicare will save less than 5 percent for each HMO enrollee and may actually spend more than if the enrollee were in the fee-for-service sector. If the reverse—adverse selection—is true, Medicare will save more than 5 percent for each HMO enrollee.

Whether HMOs in the Medicare program 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, various factors would tend to generate favorable selection. New enrollees in any health plan that has a restricted panel of

providers are likely to be relatively healthy, because people with ongoing health problems are more reluctant to leave their current physicians. HMOs can encourage favorable selection by targeting their marketing toward preferred groups of Medicare beneficiaries (such as those who live in high-income areas, who are still working, or who attend a fitness fair). Medicare provisions that permit beneficiaries to enroll in or leave an HMO on a monthly basis, and permit HMOs to switch between cost-based and risk-based reimbursement each year, further contribute to favorable selection. Because of those provisions, HMO enrollees with costly conditions who are not satisfied with their treatment options can leave and seek care in the fee-for-service sector. And HMOs that find they cannot profitably treat their Medicare enrollees at Medicare's risk-based payment rates are free to change to a cost basis for the next contract year.

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

Almost all studies of Medicare's HMO enrollees have found evidence of favorable selection. The studies focused on three indicators: people's use or cost of services before enrolling in an HMO; mortality rates and imputed fee-for-service costs during HMO enrollment; and use or cost of services after people leave an HMO. Compared with fee-for-service beneficiaries in the same risk category, Medicare's HMO enrollees use fewer services before they join an HMO. They also have lower mortality rates and imputed fee-for-service costs while in health maintenance organizations. Both of those findings show favorable selection resulting from enrollment patterns. In addition, HMO enrollees who later return to the fee-for-service sector ("disenrollees") have higher use of services and mortality rates than either people who stay in HMOs or fee-for-service beneficiaries, indicating that favorable selection for Medicare's HMOs also results from disenrollment patterns.[7]

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7. For a summary of studies covering years through 1990, see Physician Payment Review Commission, *Annual Report to Congress* (1996), Table 15-1.

The most comprehensive study of selection bias in Medicare's HMOs to date was done by Mathematica Policy Research (MPR) using a sample of fee-for-service beneficiaries and risk enrollees who were selected in 1990, with findings based on their use of services during the preceding year.[8] The study concluded that Medicare's payments to HMOs were 5.7 percent higher than those HMO enrollees would have cost Medicare if they had remained in the fee-for-service sector. That result would mean the AAPCC—which is supposed to represent the expected cost in the fee-for-service sector of HMO enrollees in a given risk category—was about 11 percent higher than the expected cost.[9]

Although few analysts question that favorable selection exists, some expressed doubts that MPR had accurately estimated Medicare's overpayment.[10] One reason for doubt was that MPR's sampling technique excluded people who died during the study period from both the fee-for-service and HMO samples. Health care costs tend to be very large in the last year of life for Medicare beneficiaries, so excluding those people would seriously distort estimates of selection bias if mortality rates differed significantly between fee-for-service beneficiaries and HMO enrollees. Because mortality rates are in fact lower for HMO enrollees, MPR's exclusion of the deceased probably produced an underestimate of the favorable selection that HMOs experienced in 1989. In addition, the MPR study and earlier analyses were conducted 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 that enrollment has increased.

Two reasons exist to believe that the favorable selection experienced by Medicare's HMOs might diminish 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, an increasing proportion of people are already in an HMO when they become eligible for Medicare. If their employment-based HMO is

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

9. Since the study found that 0.95 times the AAPCC (Medicare's payment to HMOs) equals 1.057 times the fee-for-service cost for risk enrollees, the AAPCC would equal 1.057/0.95 (or 1.11) times the fee-for-service cost of risk-based enrollees.

10. See T. MacCurdy, "Evaluating the Evidence on the Cost-Effectiveness of HMOs in Medicare" (paper presented at the American Enterprise Institute conference "Medicare Reform—What Can the Private Sector Teach Us?" Washington, D.C., July 24, 1995). Also see J. Rodgers and K. Smith, *Is There Biased Selection in Medicare HMOs?* (Washington, D.C.: Price Waterhouse, Health Policy Economics Group, March 14, 1996). Results from the Price Waterhouse study, using data for 1992, indicate very little favorable selection. However, correcting for errors in the data and obvious biases in the methods used for the study would bring its estimate close to that reported by MPR. For a discussion of those biases, see the Congressional Budget Office memorandum by Sandra Christensen, "Biased Selection in Medicare's HMOs," July 17, 1996.

certified by Medicare, they need not change providers. Thus, new Medicare beneficiaries who "age into" a Medicare HMO may include a more representative mix of healthy and sick people than those who must leave their current fee-for-service provider to join an HMO.

Second, even though many new HMO enrollees may be healthier than average to start with, some regression toward the mean takes place—meaning that initially low rates of use 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 toward (but do not reach) the mean for their risk category over the next six years.[11] 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 changing rapidly. Because enrollment in Medicare's risk-based HMOs is growing very rapidly, prior-use rates are more indicative of selection bias now than they will be once enrollment has stabilized.

One recent study, using data for 1994, indicates that the extent of favorable selection in Medicare's risk-based HMOs may be somewhat higher than MPR found for 1989.[12] After adjusting for additional health-status factors not used in the AAPCC, that study concluded that expected costs for HMO enrollees in a given risk category were only about 88 percent of the costs predicted by the AAPCC mechanism. That finding implies that the AAPCC was about 14 percent higher than expected fee-for-service costs for HMO enrollees in a given risk category.[13] Consequently, Medicare's payments for risk enrollees (which are 95 percent of the AAPCC) were 8.3 percent higher in 1994 than they would have been in the fee-for-service sector.

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

12. Gerald Riley and others, "Health Status of Medicare Enrollees in HMOs and the Fee-for-Service Sector in 1994," *Health Care Financing Review*, vol. 17, no 4 (Summer 1996).

13. The study used the finding that expected costs for HMO enrollees were 87.6 percent of costs predicted by the AAPCC to conclude incorrectly that the AAPCC was 12.4 percent too high, and therefore that Medicare's payment (equal to 0.95 times 1.124, or 1.068) was 7 percent too high. Actually, the inverse of 0.876 is 1.14, so the study's results imply that the AAPCC is 14 percent too high. Consequently, they imply that Medicare's payment is 8.3 percent too high (because 0.95 times 1.14 equals 1.083).

Relative Efficiency of HMOs

Health care analysts generally agree that risk-based HMOs can provide health care services more efficiently than the typical fee-for-service plan.[14] On average, HMOs appear to reduce Medicare enrollees' use of services by 10 percent to 20 percent compared with use of services by people in Medicare's fee-for-service sector. (Those estimates are averages for all covered services and all types of HMOs.) Further, the relative reduction in use of services appears to have increased in recent years. The MPR study showed Medicare's HMO enrollees using 10 percent fewer services than its fee-for-service enrollees in 1989. Analyses by the Congressional Budget Office using more recent data show a difference of 13 percent for 1992 and 20 percent for 1994.[15] That growing difference may reflect the effects of a learning curve for HMOs, which tend to improve their ability to control unnecessary use of services with experience. Alternatively, it may reflect an increase in the extent of favorable selection experienced by HMOs that the health-status measures in the estimating equations do not adequately account for.

Those estimates for use of services, however, ignore two additional factors that are important—differences between HMOs and the fee-for-service sector in administrative expenses and in rates paid to providers for given services. The methods that HMOs employ to reduce use of services generally result in higher administrative expenses, which at least partially offset the savings on use of services. In addition, many HMOs negotiate discounts with providers that differ from the discounts Medicare imposes on its fee-for-service providers.

A more comprehensive—but probably conservative—assessment of the savings potential of HMOs is available from the premium proposals that Medicare's risk-based HMOs submit each year. As explained in the next section, those proposals indicate that HMOs covered the basic benefit package for Medicare enrollees in 1996 for less than 87 percent of what Medicare would probably have paid for the same beneficiaries in the fee-for-service sector. (That estimate includes the effects of all cost factors relevant to HMOs, including characteristics of enrollees, controls on use of services, costs per unit of service, administrative expenses, and market competition.)

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14. For a discussion of evidence mostly for non-Medicare groups, see Congressional Budget Office, *The Effects of Managed Care and Managed Competition*, CBO Memorandum (February 1995), and *Effects of Managed Care: An Update*, CBO Memorandum (March 1994).

15. See Appendix A for CBO's estimates of the effect of HMOs on use of services by Medicare enrollees, using data from the 1992 and 1994 National Health Interview Surveys. The 1989 estimates were presented in R.S. Brown and others, *The Medicare Risk Program for HMOs.*

Supplemental Benefits and Premiums

Under current law, if the profit that a risk-based HMO makes on Medicare enrollees exceeds its profit on commercial enrollees, it must return the excess either to the Medicare program or to enrollees. All HMOs in that situation choose to return the excess to enrollees by waiving premiums for benefits beyond the basic Medicare package. Typically, such extra benefits include lower cost-sharing requirements and coverage for prescription drugs. The amount of HMOs' excess profits, and thus the value of the additional benefits they must provide for no additional premium, is set by the difference between Medicare's average per capita payment to the HMO and the HMO's adjusted community rate, which is its estimate of how much it would charge its Medicare enrollees for the basic Medicare benefits in the absence of Medicare's payment. HMOs submit an estimate of their adjusted community rate (a rate proposal) to the Health Care Financing Administration each year.

For Medicare enrollees in risk-based HMOs, supplementary benefits are substantial. These extra benefits generally exceed those available in Medicare's fee-for-service sector through medigap plans. And when HMOs do charge supplemental premiums, they are often less (for more benefits) than medigap premiums in the same area (see Table 4).[16] For example, although 94 percent of Medicare HMOs charge small copayments for outpatient visits, the amounts are nominal ($5 or $10 per visit) compared with the 20 percent coinsurance that Medicare beneficiaries pay for most outpatient services in the fee-for-service sector. Further, virtually all risk-based HMOs cover preventive services not covered by Medicare, and 78 percent cover prescription drugs as well. Two-thirds of plans charge no supplemental premium for those extra benefits.[17]

Rate proposals for 1996 show that HMOs expected to return about 20 percent of Medicare's per capita payments to enrollees through additional benefits.[18] This implies that HMOs were able to provide Medicare's basic benefit package for about 76 percent of the AAPCC, on average (see Table 5).[19] If the AAPCC is actually 14 percent higher than HMO enrollees' expected costs in the fee-for-service sector because of favorable selection, then HMOs covered Medicare's basic benefit package

16. Health Care Financing Administration, *Medicare: A Profile* (February 1995).

17. From the January 1997 monthly report of the Health Care Financing Administration's Office of Managed Care.

18. From C. Zarabozo and others, "Data View: Medicare Managed Care—Numbers and Trends," *Health Care Financing Review*, vol. 17, no. 3 (Spring 1996).

19. Medicare's payments equal 0.95 times the AAPCC, and HMOs returned 20 percent of those payments to enrollees in extra benefits. Hence, HMOs provided the basic Medicare benefit package for 0.80 times 0.95 times the AAPCC, or for 0.76 times the AAPCC, on average.

TABLE 4. ANNUAL PREMIUMS FOR RISK-BASED HMOs AND MEDIGAP PLANS, 1994 (In dollars)

City	HMO Premiums[a]		Medigap Premiums[b]
	Lowest	Highest	
Los Angeles	0	264	963
Miami	0	60	999
New York City	0	684	936
Cleveland	830	857	783
Minneapolis	635	780	311

SOURCE: Health Care Financing Administration, *Medicare: A Profile* (February 1995).

NOTE: HMOs are clearly less expensive than medigap plans in the first three cities shown. Even for the other two cities, HMOs may be less expensive then medigap plans providing comparable benefits because the medigap premiums shown are for plans that do not cover balance-billing costs or prescription drugs.

a. Community rated. Includes coverage of prescription drugs.

b. Community rated. Does not include prescription drugs or balance-billing costs.

TABLE 5. PERCENTAGE OF MEDICARE'S PAYMENT THAT RISK-BASED HMOs RETURNED TO ENROLLEES AS SUPPLEMENTAL BENEFITS, 1992-1996 (start here)

	1992	1993	1994	1995	1996
Average Percentage Returned	12.5	11.6	13.8	15.7	20.0
Value of USPCC for Aged Enrollees (In dollars)	3,793	4,304	4,538	4,806	5,291
HMOs' Implicit Charge for Basic Medicare Benefits					
As a percentage of the AAPCC	83.1	84.0	81.9	80.1	76.0
As a percentage of Medicare's payment	87.5	88.4	86.2	84.3	80.0
As a percentage of the fee-for-service cost for the beneficiary[a]	94.8	95.7	93.4	91.3	86.6

SOURCE: Congressional Budget Office based on the rate proposals submitted by risk-based plans to the Health Care Financing Administration.

NOTE: USPCC = the national average per capita cost for Medicare; AAPCC = the adjusted average per capita cost for Medicare in each county.

a. Assumes that the AAPCC is 14 percent higher than Medicare's expected costs in the fee-for-service sector for a given enrollee, based on results presented in G. Riley and others, "Health Status of Medicare Enrollees in HMOs and Fee-for-Service in 1994," *Health Care Financing Review*, vol. 17, no. 4 (Summer 1996).

for about 87 percent of what those enrollees would have cost in the fee-for-service sector (because 0.76 times 1.14 equals 0.87).

If Medicare had claimed all of the excess identified through the rate proposals in 1996, it would have saved 20 percent for every enrollee already in a risk-based HMO. Furthermore, its costs would have dropped by 13 percent for every beneficiary who moved from the fee-for-service sector to a risk-based HMO. However, if Medicare did claim those excess payments instead of allowing HMOs to provide extra benefits to enrollees, beneficiaries would have less incentive to choose HMOs over the fee-for-service sector. (See Box 1 for discussion of another way that Medicare might achieve savings from HMO enrollment.)

Conclusions About the Potential for Medicare Savings from HMOs

The evidence discussed above indicates that HMOs typically provide their Medicare enrollees with the basic Medicare benefit package for less than the program would pay if those beneficiaries stayed in the fee-for-service sector. Despite that, Medicare's overall costs generally increase as beneficiaries move to HMOs, rather than decrease, because of the way it sets its payments to risk-based HMOs. Although beneficiaries may be better off by moving to an HMO because they get additional benefits for little or no additional premium, Medicare's financial situation worsens. That being the case, further expansion of Medicare's risk-based sector would be costly in the short run unless the payment system was changed. (In the long run, the favorable selection that Medicare's HMOs now experience might be reduced or eliminated.)

A number of recent proposals would change Medicare's rate-setting mechanism for HMOs. Most call for improving the risk adjusters that Medicare uses, although there is not yet a clear consensus on what changes to make. Many of the proposals would break the current link between Medicare's HMO payment rates and fee-for-service costs in the beneficiary's county—for example, by linking current payment rates to some index other than fee-for-service costs, by using competitive bidding among risk-based plans, or by limiting Medicare's costs to a defined per-enrollee contribution in a restructured market in which all Medicare plans (including the traditional fee-for-service sector) would compete for beneficiaries' premiums.

The only change that would be immediately feasible is introducing an index that does not depend on cost increases in the fee-for-service sector. But that would lock in place the geographic differences present in current payment rates, unless the rates were realigned first. One option for realignment would be to redefine the AAPCCs so they differed by geographic area only to reflect variation in an appropriate index of providers' input prices. Currently, rates vary to reflect area-

BOX 1.
SPILLOVER SAVINGS

The savings discussed in the text that Medicare could claim from risk-based HMO enrollment result from current differences in costs between HMOs and the fee-for-service sector. Over the long term, however, Medicare may reap additional "spillover" savings in locations where competing HMOs have enough market share to pressure fee-for-service providers to lower their costs. Spillover savings may result as providers treating Medicare beneficiaries in the fee-for-service sector adopt the more cost-effective treatment patterns advocated by the HMOs whose enrollees they also serve. To the extent that this effect occurs, however, it reduces the potential savings possible from shifting enrollment to HMOs at the same time that it reduces fee-for-service costs (because it lessens the difference in costs between the risk-based and fee-for-service sectors).

Reliable estimates of spillover effects are difficult to obtain, but those reported so far are quite small. For example, a recent study using Medicare's HMO enrollment rates and spending for 1986 through 1990 found that an increase of 10 percentage points in the HMO enrollment rate (doubling the current rate or tripling the 1990 rate) would generate spillover savings in Medicare's fee-for-service sector of less than 1 percent.[1] A subsequent study for 1988 through 1992 estimated savings in the fee-for-service sector ranging from 3 percent to 8 percent for each 10 percentage-point increase in Medicare's HMO enrollment share.[2] However, reanalysis of that study's data after a number of technical corrections reduced the estimate of possible savings to no more than 1.5 percent.[3] Another study, which looked at 1985 through 1988, found spillover savings averaging 5 percent.[4] Even the largest of those estimates would imply that the spillover savings from an increase in HMO enrollment rates are very small, with an elasticity of 0.05 or less.[5]

More fundamentally, because spillover savings to the fee-for-service sector may result more from the overall HMO enrollment rate in an area than from Medicare's HMO enrollment rate, studies that use only the Medicare rate may attribute more influence to changes in that rate than is warranted. To a considerable degree, Medicare's costs will be lower in areas where competitive HMOs have enough leverage to move providers toward more efficient practices, whether or not there is any Medicare HMO enrollment there.

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1. L. C. Baker, *Can Managed Care Control Health Care Costs: Evidence from the Medicare Experience* (Washington, D.C.: National Institute of Health Care Management, May 1995).

2. J. Rodgers and K. Smith, *Do Medicare HMOs Reduce Fee-For-Service Costs?* (paper prepared by Price Waterhouse for the Group Health Association of America, September 11, 1995).

3. J. Bae, "Comments on the Price Waterhouse Spillover Study" (Health Care Financing Administration, Office of Research and Demonstrations, April 1996).

4. D.G. Clement and others, *The Effects of Risk Contract HMO Market Penetration on Medicare Fee-for-Service Costs: Final Report*, (Princeton, N.J.: Mathematica Policy Research, Inc., December 18, 1992).

5. An elasticity is a measure of responsiveness, with elasticities greater than 1 indicating substantial responsiveness and elasticities less than 1 indicating less responsiveness. The elasticities implied by spillover estimates to date are near zero. An elasticity is calculated as the percentage change in the affected variable (spillover savings) divided by the percentage change in the affecting variable (the HMO enrollment rate). Because Medicare's HMO enrollment rate is about 10 percent, a 10 percentage-point increase would be a change of more than 100 percent. For the years covered by the spillover studies, the actual HMO enrollment rate was less than 5 percent, so a change of 10 percentage points was a change of more than 200 percent.

specific differences in beneficiaries' use of services as well.[20] In addition, the current county-level payment areas could be redefined to incorporate larger areas, where appropriate, to reduce volatility in the AAPCCs from one year to the next.

Medicare could set the new rates so as to keep its total payments to risk-based plans nationwide unchanged (before enrollment responses) or to reduce them. Even if rates were budget neutral nationwide, however, realigning rates among counties would alter incentives for plans and beneficiaries to participate in Medicare's risk-based sector. Rates that reduced Medicare's risk-sector payments would reduce risk enrollment (in the absence of other policy changes). The remainder of this memorandum develops methods for predicting what effects new rate-setting policies would have on risk enrollment in the absence of any other changes affecting Medicare's risk-based and fee-for-service sectors.

ENROLLMENT IN MEDICARE'S RISK-BASED SECTOR

Medicare has many policies that, if changed, would significantly alter the program's risk-sector enrollment. For example, the October 1995 guidelines released by the Health Care Financing Administration, indicating that Medicare HMOs may offer "open-ended" or point-of-service options to enrollees, are expected to slightly accelerate the already rapid rate of growth in enrollment. Introducing a coordinated open-enrollment period once a year, when beneficiaries would receive comparative information about all the HMO and medigap options available to them, would probably also boost risk-sector enrollment because beneficiaries in most areas would see that the supplemental benefits provided by HMOs are generally less expensive than those available through medigap supplements in the fee-for-service sector.

Another change that could lead more Medicare beneficiaries to choose risk-based HMOs would be to eliminate the current medigap option and permit supplemental insurance only if it was sponsored by plans that also cover the basic benefit package. In that situation, beneficiaries would no longer have any way other than HMOs to insure against the large cost-sharing expenses they might face in Medicare's fee-for-service sector. Eliminating the option for cost-based HMOs might reduce Medicare's total HMO enrollment but increase risk-sector enrollment, as some cost-based plans dropped out of the HMO market and others converted to a risk basis. Also, getting rid of the rule that Medicare HMOs not draw more than half of their enrollment from the Medicare or Medicaid populations would increase risk-sector enrollment by making it easier for HMOs to enter the Medicare market.

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20. That includes variation in payments to hospitals for graduate medical education and disproportionate share costs.

However, predicting how much Medicare's risk-sector enrollment would change in response to such policy actions is difficult (although the direction of change is generally clear) because there is no historical experience on which to base such predictions. Analysts can more reliably predict how enrollment would change in response to different payment rates because there is experience with varying those rates. This section examines the factors that generally influence enrollment in Medicare's risk sector. It also develops an equation for predicting how that enrollment would change in response to specified changes in Medicare's payment rates (assuming no other changes that might alter risk enrollment).

Factors That Affect the Level of Risk-Based Enrollment

Enrollment rates for Medicare's risk-based HMOs are highest in large urban areas where HMOs are already well established for the general population.[21] In March 1995, when 6.8 percent of Medicare beneficiaries nationwide were enrolled in risk-based plans, rates were 12.0 percent in large urban areas (those with at least 1 million residents), 4.0 percent in other urban areas, and 0.5 percent in rural areas. Between 1995 and 1996, enrollment rates grew most rapidly in urban areas with below-average rates. Specifically, in that period enrollment rates increased by about 15 percent in urban areas where at least 12 percent of Medicare beneficiaries were already in risk-based HMOs, but they more than doubled in urban areas with lower (but positive) risk-enrollment rates. (In 1995, Medicare's overall risk-sector enrollment rate was 12.2 percent in areas that had any risk-based plans serving them.)

The geographic distribution of Medicare's risk enrollment reflects both the requirements of the Medicare program and the logistics of expanding enrollment. Since Medicare requires that its HMOs get at least half their patient population from non-Medicare and non-Medicaid markets, HMOs typically must first establish a solid base of commercial patients before they can enter the Medicare market. (Some HMOs win temporary waivers of that 50/50 requirement, however.) Another factor that affects the geographic distribution of enrollment is the size of the Medicare population to be served in an area. In general, only larger urban areas have a big enough Medicare population to provide HMOs with enough enrollment to make their costs predictable.

Of the factors usually associated with relatively high rates of risk-sector enrollment, the only one that is a policy set by Medicare is the level of Medicare's payment rate in each county (95 percent of the AAPCC). The price-adjusted AAPCC

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21. Prospective Payment Assessment Commission, *Medicare and the American Health Care System.* Also see General Accounting Office, *Medicare HMOs: Rapid Enrollment Growth Concentrated in Selected States*, GAO/HEHS-96-63 (January 1996).

(the AAPCC divided by an index of providers' input prices) is directly correlated with Medicare's risk-enrollment rate. In 1995, HMOs were 55 percent more likely to participate in Medicare's risk-based program in urban counties with price-adjusted AAPCCs above the 90th percentile than in urban counties with rates in the lowest 10th percentile.

Still, almost one-third of urban counties with the highest price-adjusted AAPCCs had no Medicare risk plans. Even when all the important factors identified are present, HMO participation in Medicare's risk program is not guaranteed. Some urban areas with many commercial HMOs, relatively high price-adjusted AAPCCs, and large Medicare populations (such as New Orleans, Philadelphia, and New York City) nevertheless had few Medicare risk plans and low enrollment rates. Other urban areas that had relatively low price-adjusted AAPCCs (Portland, San Francisco, and San Jose) had many risk plans and high enrollment.[22] Specific characteristics of the market and of individual HMOs undoubtedly play a role, and those less measurable influences alter the effects of the other factors discussed above in varying ways.

Predicting Payment-Induced Changes in Enrollment

The proportion of Medicare beneficiaries enrolled in risk-based plans in a given area is the end result of separate decisions made by HMOs (about whether to enter Medicare's risk-based market in that area) and by beneficiaries (about whether to enroll when plans are offered).

HMOs are more likely to serve a given area commercially when it has a large enough population base to justify the costs of establishing a provider network. Likewise, HMOs are more likely to enter Medicare's risk-based market in areas where they already serve the commercial market, where Medicare's payment rate is high relative to costs in the area, and where the number of beneficiaries is sufficient to justify the costs of meeting Medicare's requirements and to support a large enough enrollment to make costs predictable. Increases in either payment rates or eligible beneficiaries would induce expansion by HMOs already serving the Medicare market, whereas decreases might prompt some HMOs to switch to a cost basis or stop serving Medicare beneficiaries.[23]

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22. Prospective Payment Assessment Commission, *Medicare and the American Health Care System.*

23. The number of other HMOs serving the Medicare market would also be a consideration for any given HMO, but that number results from the interaction between supply and demand. Hence, it is not included among the exogenous variables used to predict enrollment in the reduced-form equation estimated here.

In areas served by at least one risk-based HMO, beneficiaries are more likely to join when they are already familiar with that type of health plan, either because they were previously enrolled in one or because HMOs are an important part of the health care market in their area. Enrollment is also more likely when HMOs supplement the basic Medicare benefit package at little or no additional premium—something that occurs more often when Medicare's payment rate in the area is high relative to providers' costs.[24]

Thus, independent (or exogenous) factors likely to determine Medicare's rate of risk-sector enrollment in a given county include:

- The AAPCC, standardized for providers' input costs using Medicare's hospital wage index and the physician geographic adjustment factor;[25]
- The number of eligible beneficiaries in the county;
- The rate of non-Medicare HMO enrollment in the area;
- Medicare's risk-sector enrollment rates for the previous year in the county and statewide; and
- How urbanized an area the county is in.

Measures for each of those factors were used as explanatory variables in a regression equation intended to predict risk-based Medicare enrollment rates for each county with Medicare residents.[26] The objective for the equation was limited: to predict how Medicare's risk-sector enrollment would change in response to changes in the price-adjusted AAPCC, given the previous year's enrollment rate. No attempt was made to explain how the previous year's rate came about. Instead, that rate was

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24. The supplemental premium that HMOs charge Medicare enrollees is the price to which beneficiaries would respond, but that too results from the interaction between supply and demand. The AAPCC is the primary exogenous determinant of the supplemental premium that HMOs charge for any given benefit package.

25. Specifically, the county-level AAPCCs for Part A were standardized by dividing each by a blended index equal to the weighted average of the hospital wage index for the county (70 percent) and an adjustment factor of 1 (30 percent). The AAPCCs for Part B were standardized by dividing each by a blended index equal to the weighted average of the physician geographic adjustment factor (66 percent) and the index used for Part A (34 percent). Those are the price indexes specified in the Balanced Budget Act of 1995, which was passed by the Congress but vetoed by the President.

26. A similar equation was estimated, using only large urban areas, by P. Welch, "Growth in HMO Share of the Medicare Market, 1989-1994," *Health Affairs*, vol. 15, no. 3 (Fall 1996).

included as an explanatory variable to serve as a proxy for the many unknown factors that encouraged or discouraged risk enrollment in the county in the past.

All variables included in the regression were statistically significant, explaining about 80 percent of the variation in actual enrollment rates for 1996. Further, the equation tracked actual enrollment rates well over the entire range of rates observed. (See Appendix B for a detailed description of the regression variables and for the resulting coefficient estimates.)

The regression results indicate that risk-sector enrollment responds moderately and positively to changes in the price-adjusted AAPCC. One measure of responsiveness is elasticity, which is defined as the percentage change in the dependent variable resulting from a 1 percent change in the value of a given explanatory variable. Elasticities of 1 or more indicate strong responsiveness, whereas elasticities less than 1 indicate relatively weak response.

Elasticities in response to a 5 percent decrease in the price-adjusted AAPCC were estimated separately for counties grouped by type of area—large urban (1 million or more residents), mid-size urban (250,000 to 999,999), small urban (less than 250,000), and rural (nonmetropolitan areas). The estimated elasticities varied somewhat by size of area but had a value of nearly 1 in all cases (see Table 6). Rural areas would experience the largest percentage drop in risk-sector enrollment if the AAPCC decreased, but from a very small base. The largest decrease in the number of risk-sector enrollees would occur in large urban areas where initial levels of enrollment were high.

ESTIMATED EFFECTS OF CHANGES IN PAYMENT RATES

The regression equation discussed above was used to predict how Medicare's risk-sector enrollment would have differed in 1996 if the program had made various changes in its payment policies.[27] The resulting effects on Medicare's risk-sector and total costs were also estimated. The results assume that Medicare makes no other policy changes that might affect risk-sector enrollment. If other changes were made at the same time, the results outlined below would not apply.

27. The simulation results presented here use county-level enrollment for March 1996. Estimates of the distribution of risk-sector enrollment by type of beneficiary (aged, disabled, or with chronic renal disease) and by demographic category (age, sex, institutional status, Medicaid eligibility, work status) use person-level data for all risk enrollees as of December 1994. Results may change when the data are updated.

TABLE 6. ESTIMATED CHANGES IN RISK-SECTOR ENROLLMENT FROM A 5 PERCENT DECREASE IN THE AAPCC

	Estimated Elasticity	Total Medicare Enrollment	Current Risk Enrollment	Change in Risk Enrollment	Enrollment Rate (In percent) Current	New
Overall	0.987	37,886,747	3,473,913	-171,435	9.2	8.7
By Size of Area						
MSAs of 1 million or more	0.995	17,043,039	2,695,399	-134,077	15.8	15.0
MSAs of 250,000 to 999,999	0.950	8,469,988	613,411	-29,126	7.2	6.9
MSAs of less than 250,000	0.967	3,327,589	85,091	-4,116	2.6	2.4
Rural areas	1.029	9,046,131	80,012	-4,116	0.9	0.8

SOURCE: Congressional Budget Office estimates from the regression equation discussed in Appendix B.

NOTE: AAPCC = the adjusted average per capita cost for Medicare in each county; MSA = metropolitan statistical area.

The first two policy options would reallocate payments among counties while keeping Medicare's total risk-sector payments nationwide unchanged (budget neutral) so long as risk enrollment in each county was unchanged. Option 1 would use the same payment rate throughout a metropolitan statistical area (MSA), equal to 95 percent of the weighted average of county-level AAPCCs for all counties in the MSA. Option 2 would set county-level AAPCCs equal to Medicare's nationwide per capita cost (the USPCC) adjusted for price differences among counties. Thus, AAPCCs would vary between counties only by differences in input prices and not by differences in use of services. Option 3 would uniformly reduce risk-sector payment rates by 5 percent in all counties.

Four kinds of effects for each option for fiscal year 1996 were estimated, both nationwide and separately for urban and rural areas (see Table 7). The four effects are:

- The percentage change in Medicare's risk-sector payments that would occur initially under the option, before allowing for any enrollment responses;

- The percentage change in risk-sector enrollment expected to occur in response to the initial change in payments, based on the regression equation discussed earlier;

- The percentage change in Medicare's risk-sector costs based on the initial payment change and the resulting change in enrollment; and

- The resulting percentage change in Medicare's total costs, considering not only the change in risk-sector costs but also associated changes in Medicare's fee-for-service costs.

The estimate of associated changes in Medicare's fee-for-service costs is derived as the product of three factors: the change in fee-for-service enrollment in each county, which is the opposite of the change in risk-sector enrollment; the average payment for risk-sector enrollees in the county (which assumes that enrollment changes do not appreciably alter the demographic mix of risk-sector enrollees); and a cost-adjustment factor equal to 0.92 (1 divided by 1.083). That factor is used to account for the evidence discussed earlier that Medicare pays 8.3 percent more, on average, for risk-sector enrollees than it would pay for those enrollees in the fee-for-service sector. However, the cost-adjustment factor does not have a significant effect on total costs: results are essentially the same whether the factor used is 0.92 (indicating an average overpayment of 8.3 percent) or 1.0 (indicating no overpayment).

TABLE 7. PERCENTAGE CHANGES IN MEDICARE'S RISK-SECTOR ENROLLMENT AND COSTS UNDER VARIOUS CHANGES IN THE AAPCC, FISCAL YEAR 1996

	Total in Fiscal Year 1996	Percentage Change Under Option 1	Option 2	Option 3
		Initial Risk-Sector Payments[a]		
Nationwide	$16.6 billion	0	0	-5.0
Urban	$16.3 billion	0.1	-0.3	-5.0
Rural	$0.3 billion	-3.7	16.0	-5.0
		Risk-Sector Enrollment		
Nationwide	3.4 million	0.1	0.7	-4.9
Urban	3.3 million	0.2	0.4	-4.9
Rural	0.1 million	-1.5	16.1	-5.1
		Risk-Sector Costs[b]		
Nationwide	$16.6 billion	0.2	0.8	-9.8
Urban	$16.3 billion	0.3	0.2	-9.7
Rural	$0.3 billion	-5.1	35.4	-10.0
		Total Medicare Costs		
Nationwide	$194.3 billion	c	0.2	-0.4
Urban	$151.5 billion	c	0.2	-0.6
Rural	$42.7 billion	c	0.2	c

SOURCE: Congressional Budget Office estimates based on the regression equation discussed in Appendix B.

NOTE: The AAPCC is the adjusted average per capita cost for Medicare in each county. Medicare's current payment rates are equal to 95 percent of AAPCCs. Option 1 would set payment rates throughout a metropolitan area equal to 95 percent of the weighted average of county-level AAPCCs. Option 2 would set county-level payment rates equal to 95 percent of price adjusted USPCCs. (The USPCC is the national average per capita cost for Medicare.) Option 3 would reduce all payment rates by 5 percent in each county. All other aspects of Medicare policy would be unchanged.

a. Before enrollment changes.
b. After enrollment changes.
c. Less than 0.05 percent in absolute value.

Option 1: Set MSA-wide Payment Rates

The first alternative would use as the new payment rate 95 percent of the beneficiary-weighted average of current AAPCCs for all counties in a given MSA (or the rest of the state for nonmetropolitan areas). The resulting rates would be adjusted uniformly nationwide to keep Medicare's total risk-sector payments unchanged at existing enrollment levels. Using larger geographic areas would reduce year-to-year changes in the AAPCCs because the number of beneficiaries on which Medicare bases its estimates of fee-for-service costs in each area would also be larger and therefore more stable. In addition, AAPCCs would no longer vary among counties in the same marketplace, as now happens.

Because Medicare's payment rates would be more stable and predictable, HMOs might be more willing to participate on a risk basis. And because the rates would be uniform for all counties in a metropolitan area, plans would be less likely to serve only selected portions of the markets they enter. However, Medicare's risk-sector payments would be appreciably lower in rural areas (3.7 percent lower on average), which would further discourage risk-sector enrollment in those areas.

Under Option 1, Medicare's risk-sector enrollment and costs would increase slightly, and its total costs would be virtually unchanged. Those results may understate the overall increase in risk enrollment, however, because the estimating equation does not account for the effects of lesser volatility for AAPCCs in counties with few Medicare beneficiaries.

Option 2: Set County-Level AAPCCs Equal to Price-Adjusted USPCCs

Under this option, Medicare's estimated per capita costs nationwide would be adjusted by county-specific price indexes to set county-level AAPCCs. The USPCC for Part A would be adjusted using Medicare's hospital wage index, and the USPCC for Part B would be adjusted by a blend of the hospital wage index and Medicare's physician geographic adjustment factor.[28] The resulting rates would then be uniformly adjusted to keep Medicare's total risk-sector payments unchanged at the initial risk-enrollment levels. Medicare's payments to risk-based plans would no longer vary because of geographic differences in the use of services by enrollees in a given risk category, but they would continue to vary because of differences in input prices among areas. As a result, payments to HMOs in areas with above-average usage would fall, and payments to HMOs in areas with below-average usage would rise. That change would help to make risk-based plans in low-use areas more

28. See footnote 25 for the specific formulation used for the indexes.

competitive than they are now, but plans in high-use areas might have to diverge from community norms to remain competitive in the Medicare market.

Initially, Medicare's risk-sector payments would increase by 16 percent in rural areas and fall by 0.3 percent in urban areas, on average. However, the overall effect for urban areas masks differences by size—payments would generally fall only for large urban areas, but they would increase for mid-size and small urban areas. Consequently, risk-sector enrollment would fall only in large urban areas but would increase in all other areas, for an overall increase of 0.7 percent. Costs for the risk sector would rise by 0.8 percent overall, because of significantly higher costs in rural and smaller urban areas partly offset by lower costs in large urban areas. Medicare's total costs would increase slightly (by 0.2 percent) in all areas. In large urban areas, costs in the fee-for-service sector would increase (because of higher enrollment) by more than risk-sector costs would fall, whereas in all other areas risk-sector costs would increase by more than costs in the fee-for-service sector would fall.

Option 3: Reduce AAPCCs by 5 Percent in All Counties

The third alternative would reduce Medicare's payment rates to risk-based HMOs in all counties by a uniform 5 percent. As a result, risk-sector enrollment would fall by 4.9 percent overall, with a somewhat larger percentage drop in rural areas. Consequently, Medicare's overall risk-sector costs would be 9.8 percent lower nationwide, and the program's total costs would drop by 0.4 percent. Those results assume that there would be no change in Medicare's fee-for-service rates.

If fee-for-service rates were also reduced by 5 percent in all counties, enrollment would probably not change in either Medicare sector. However, Medicare's costs in both sectors would initially drop by 5 percent, before any offsetting volume responses that might occur in the fee-for-service sector. As explained in Appendix B, changes in the price-adjusted AAPCC can be viewed as changes in a relative payment rate—Medicare's risk-sector payment rate relative to its fee-for-service rate. If both rates were changed in all counties by the same percentage, no change would be likely in risk-sector enrollment because there would be no change in the price-adjusted AAPCC.

In addition to the three alternatives discussed above, another recent proposal would exclude the cost of certain payments to hospitals when calculating Medicare's rates for HMOs—specifically, payments to reimburse hospitals for the direct and indirect costs of graduate medical education (GME) and the costs of serving a disproportionate share of low-income patients (known as DSH payments). The reason is that many HMOs do not use hospitals with significant GME or DSH costs. If those costs were excluded, HMO payment rates for Part A of Medicare would be

8.4 percent lower on average. That would have reduced Medicare's total payments to HMOs by 5.5 percent in 1996. This memorandum did not analyze options of that kind, however, because the effects on risk-sector enrollment cannot be predicted without knowing how GME and DSH payments might be allocated under alternative funding mechanisms and to what extent HMOs could recapture those dollars.

CONCLUSIONS

The effects of payment-rate changes on HMO enrollment that this memorandum predicts are valid only if all other aspects of Medicare policy remain the same. If other aspects of policy changed as well, the enrollment responses predicted here would have to be modified, perhaps substantially. For example, eliminating Medicare's current 50/50 requirement for HMOs would increase risk-sector enrollment by making it easier for HMOs to enter the Medicare market. Introducing a coordinated open-enrollment period, when Medicare beneficiaries would get comparative information about all of the HMO options available in their area, would probably also boost risk-sector enrollment. Such enrollment effects would have to be added to whatever enrollment changes new payment rates caused.

Changes in payment rates that were budget neutral at initial levels of risk-sector enrollment would have little effect on the overall level of that enrollment, on Medicare's risk-sector costs, or on total costs. Such changes could have disparate effects on rural areas, though, as seen in Options 1 and 2. Moving to MSA-wide AAPCCs would decrease risk-sector payments and enrollment in rural areas on average, whereas changing to national rates with county-level price adjustments would increase them.

In the absence of other, countervailing policy changes, any reduction in Medicare's risk-sector payments would reduce risk-sector enrollment below what it would otherwise have been. On average, the percentage change in risk-sector enrollment would be nearly as large as the percentage change in payment rates that induced it. Because risk-sector enrollment is expected to keep growing rapidly under current law, a payment-induced drop from the level currently projected would not generally mean that risk-sector enrollment would be lower than it was last year. Instead, it means that enrollment would probably be larger than it was last year but not as large as if there had been no change in payment policy. For example, under the Congressional Budget Office's current projections for risk-sector enrollment, a 5 percent drop in 1997 would mean that enrollment would rise by 21 percent from its 1996 level rather than by 27 percent.

APPENDIX A: ESTIMATED DIFFERENCES IN THE USE OF HEALTH CARE SERVICES BETWEEN MEDICARE BENEFICIARIES IN HMOs AND IN THE FEE-FOR-SERVICE SECTOR

This appendix estimates the extent to which Medicare beneficiaries' use of health care differs depending on whether they are in a health maintenance organization (HMO) or in the fee-for-service sector. About 10 percent of beneficiaries are now in HMOs, which typically supplement the benefits provided under Medicare. Most beneficiaries in the fee-for-service sector also have supplemental coverage—through a medigap plan, a retirement health plan, or Medicaid. Only about 15 percent of beneficiaries have no supplement to Medicare.

Studies generally take one of two approaches to estimating the effects of type of insurance plan on use of services. The more reliable approach is a controlled experiment in which patients are randomly assigned to different plans so that any differences in their use of services are likely to reflect only differences in type of insurance coverage. The second and more common approach is a nonexperimental, or observational, study that measures differences in use of services by patients who choose their own type of plan.

Inaccurate estimates can occur in the observational approach if there are unobserved differences among respondents that affect both their choice of insurance plan and their use of services. In that case, ordinary least squares estimates of the effects of insurance on use of services may be biased because the estimates will also reflect whatever selection bias occurs when people self-select among types of insurance.

One solution to the problem of selection bias is to model choice of insurance plan and use of services simultaneously, then estimate reduced-form equations for each decision, and use those estimated equations to predict how a given population's use of services would differ for different types of insurance. Such an approach is rarely feasible, though, because few data sources include enough information about the insurance plans that are available to respondents to estimate the choice equation. However, evidence from previous studies that were able to model the choice and utilization equations simultaneously indicates that researchers can neutralize the effects of selection bias by including measures of chronic illness or health status along with other demographic characteristics as explanatory variables in the utilization equation.[1]

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1. R. Feldman and others, *Employer-Based Health Insurance*, PHS 89-3434 (Department of Health and Human Services, Public Health Service, June 1989); B. Dowd and others, "Health Plan Choice and the Utilization of Health Care Services," *Review of Economics and Statistics*, vol. 73, no. 1 (February 1991).

Data and Methods

The data used for this analysis came from the National Health Interview Surveys (NHIS) for 1992 and 1994. Those surveys are conducted by the National Center for Health Statistics, part of the Centers for Disease Control and Prevention. They include a health insurance supplement that describes the types of insurance each respondent has.[2] The NHIS is an annual survey that is representative (when weighted appropriately) of the civilian noninstitutional population of the United States.

The analysis in this appendix uses only those respondents who reported having Medicare coverage. Respondents who did not know whether they had additional insurance or who had public insurance other than Medicare were excluded.[3] Also excluded were respondents living in areas with little HMO penetration among Medicare enrollees, since no comparison between HMOs and indemnity plans would be possible in such areas. After those exclusions, the 1992 sample for the Medicare population had 2,476 respondents in nine primary sampling units (PSUs); the 1994 sample had 2,370 respondents in eight PSUs.

The reduced samples are not nationally representative, but they should give more accurate estimates of the average effects of HMOs on use of services than a sample using all PSUs would if, as is likely, use of services varies systematically between areas with and without HMOs. (Whether the effects found here would apply to HMOs entering new markets is unclear, however.) HMOs are more likely to enter markets in areas with high cost or use because they are more likely to be profitable there. If the sample was not limited to PSUs with significant Medicare HMO enrollment, the estimated effects would inappropriately include the effects of that bias in where HMOs choose to enter the Medicare market, probably resulting in an underestimate of HMOs' impact on use of services.

Two other possible sources of understatement of HMOs' effects are unavoidable. First, the NHIS data do not distinguish between HMOs that serve Medicare enrollees on a risk basis and those that operate on a cost basis. (Medicare gives them the option to do either.) Because Medicare enrollees in cost-based HMOs are free to use fee-for-service providers whenever they want to, cost-based HMOs cannot control enrollees' use of services as effectively as risk-based ones can. Thus,

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2. Respondents were asked to classify their plan or plans by type as well as to identify them by name. Plan names were used later to verify and, if necessary, correct the plan type given by the respondent.

3. Those with Medicaid or other public insurance (besides Medicare) were excluded because of uncertainty about what that coverage provided. Even for Medicaid, coverage could mean coverage for all medical expenses, only for Medicare's cost sharing and premiums, or only for Medicare's premiums.

the estimates presented here may understate the effects that risk-based HMOs could produce. Further, that underestimate would tend to be larger in 1992 (when cost-based enrollment was 34 percent of Medicare's HMO enrollment) than in 1994 (when it was 29 percent).

Second, some evidence exists that costs in the fee-for-service sector tend to be lower in areas with a mature and competitive HMO market, indicating that the efficiencies that HMOs spur spill over into the indemnity market to some degree. If the lower costs from spillover effects result at least partly from lower use of services by people with indemnity plans and not just from lower prices, the estimates here will understate the long-term effects of HMOs on use of services.

Two sets of multivariate regression equations were estimated—one to explain respondents' use of outpatient medical contacts during the 12 months before the survey, and the other to explain their use of hospital inpatient days. In each case, two equations were used to explain respondents' use of services: a logistic regression to estimate the probability that the respondent had any use (one or more outpatient contacts, or one or more inpatient stays) during the year, and an ordinary least squares regression to predict the amount of use (number of outpatient contacts for those with any contacts during the year, or number of inpatient days for those with at least one hospital admission). The predicted probability of any use multiplied by the predicted amount of use (for users) gives an estimate of the total amount of use for a respondent with a given set of characteristics.[4]

The explanatory variables were the same for each of the regression equations estimated. All variables were coded as sets of categorical or "dummy" variables. The variable of greatest interest is the one indicating whether the respondent was in an HMO at the time of the survey.[5] Respondents unable to identify whether their private insurer was an HMO were included in the non-HMO category, as they appear to be low users with indemnity coverage.

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4. Monte Carlo studies indicate that the two-part model used here performs as well as or better than selection models (Tobit procedures) in analyses of this type: where a substantial proportion of cases make no use of services, and where the same variables explain both whether to use services and how much to use. See W.G. Manning, N. Duan, and W.H. Rogers, "Monte Carlo Evidence on the Choice Between Sample Selection and Two-Part Models," *Journal of Econometrics*, vol. 35 (1987).

5. HMOs are of two main types, but the PSU-specific samples in this study were too small to distinguish between them. One type is the group or staff model, in which physicians treat only HMO patients. The other is the independent practice association (IPA), in which physicians treat a variety of patients from both IPA and indemnity plans. The general consensus is that group/staff HMOs are able to exert considerable influence on their providers' practice patterns because the HMO gives physicians their entire patient load. IPAs are thought to be less effective, partly because they have less exclusive arrangements with providers, thus reducing the influence of any one insurer on practice patterns.

In an effort to neutralize the effects of selection bias, a number of additional categorical variables were used to control for demographic factors other than insurance that might affect respondents' use of medical services. They included variables for race, age, sex, education, income, health status, and presence of chronic and limiting conditions that would typically require continuing and costly medical care. An additional set of dummy variables was included in each equation, representing each primary sampling unit that had at least 30 respondents in HMOs. That fixed-effects formulation was used to control for unobserved differences between areas (such as in practice norms or availability of providers) that might affect patients' use of services independent of their insurance type.

Estimated coefficients were obtained using unweighted data, but the implications of the regressions were calculated using weighted means to reflect the characteristics of the insured population. Because the NHIS uses a complex sampling scheme rather than simple random sampling, it is necessary to use weighted data to produce representative estimates of population proportions, although un-weighted data produce reliable coefficient estimates.

The analysis produced separate estimates for outpatient and inpatient services. It then used the dollar-weighted average of those separate effects as an estimate of the overall effect of HMOs on use of services. The weights were derived from the 1987 National Medical Expenditure Survey using a population comparable to the one examined in this analysis.

Findings

Table A-1 lists the dependent and independent variables that were used in the analysis, along with their definitions, means, and standard deviations. As discussed above, in observational studies like this one controlling for any differences in patient characteristics that might affect use of services is necessary to accurately assess the effects of plan type. Otherwise, the estimated effect of a given type of insurance on use of services would be biased to the extent that plans experienced either favorable or unfavorable selection not captured by the control variables. In addition to more readily available demographic characteristics (such as age, sex, and race), controls were included for chronic illness and self-reported health status. Previous studies indicate that including such health-status measures helps neutralize the effects of selection bias. However, only experimental studies, with randomized assignment to different types of insurance, can be confident that their results are not distorted by selection bias.

The metropolitan areas with sufficient HMO representation to be included in the 1992 sample were New York, Chicago, Minneapolis, Miami, Los Angeles, San

TABLE A-1. VARIABLE DEFINITIONS, MEANS, AND STANDARD DEVIATIONS FOR SAMPLE DATA

Name	Definition	Data for 1992 Mean	Data for 1992 Standard Deviation	Data for 1994 Mean	Data for 1994 Standard Deviation
outpuse	l if respondent had any outpatient contacts during year	0.873	0.333	0.893	0.309
ln (outpvsts)	natural log of number of outpatient contacts for users	1.221	1.033	1.265	1.051
inpuse	l if respondent had any inpatient stays during year	0.139	0.346	0.164	0.370
ln (inpdays)	natural log of number of inpatient days for users	0.250	0.737	0.294	0.783
chronic	1 if has certain chronic and limiting conditions[a]	0.142	0.349	0.139	0.345
black	1 if black	0.082	0.275	0.089	0.285
ch0-18	1 if age is less than 18	0.011	0.102	0.003	0.056
fe19-64	1 if female age 19 through 64	0.025	0.157	0.031	0.175
fe65-69	1 if female age 65 through 69	0.150	0.357	0.148	0.355
fe70-79	1 if female age 70 through 79	0.260	0.439	0.262	0.440
fe80+	1 if female age 80 or more	0.126	0.331	0.130	0.336
ma19-64	1 if male age 19 through 64	0.030	0.171	0.026	0.160
ma65-69	1 if male age 65 through 69	0.127	0.333	0.130	0.337
ma70-79	1 if male age 70 through 79	0.199	0.399	0.190	0.392
ma80+	1 if male age 80 or more	0.072	0.259	0.080	0.271
hlth1	1 if reported health is excellent	0.178	0.382	0.163	0.369
hlth2	1 if reported health is very good	0.236	0.425	0.272	0.445
hlth3	1 if reported health is good	0.332	0.471	0.321	0.467
hlth4	1 if reported health is fair	0.176	0.380	0.166	0.372
hlth5	1 if reported health is poor	0.079	0.269	0.078	0.269
educ1	1 if years of family head's education are under 12	0.202	0.401	0.193	0.394
educ2	1 if years of family head's education are 12	0.347	0.476	0.364	0.481
educ3	1 if years of family head's education are 13 through 16	0.195	0.396	0.196	0.397
educ4	1 if years of family head's education are 17 or more	0.257	0.437	0.247	0.432
lowncome	1 if family income is under $35,000	0.508	0.500	0.505	0.500
midncome	1 if family income is between $35,000 and $50,000	0.094	0.292	0.089	0.285
hincome	1 if family income is $50,000 or more	0.135	0.341	0.142	0.349
unkncome	1 if family income is not reported	0.263	0.440	0.264	0.441

(Continued)

TABLE A-1. CONTINUED

Name	Definition	Data for 1992 Mean	Data for 1992 Standard Deviation	Data for 1994 Mean	Data for 1994 Standard Deviation
PSU01	1 for New York-New Jersey-Connecticut	0.330	0.470	0.338	0.473
PSU02	1 for Philadelphia-Wilmington-Trenton	n.a.	n.a.	0.109	0.311
PSU11	1 for Chicago-Gary	0.142	0.349	0.118	0.322
PSU13	1 for Cleveland-Akron-Lorain	n.a.	n.a.	0.065	0.247
PSU14	1 for Minneapolis-St. Paul	0.032	0.176	n.a.	n.a.
PSU25	1 for Miami-Fort Lauderdale	0.081	0.272	n.a.	n.a.
PSU42	1 for Los Angeles	0.211	0.408	0.177	0.382
PSU43	1 for San Francisco	0.112	0.315	0.096	0.294
PSU44	1 for Phoenix	n.a.	n.a.	0.043	0.202
PSU47	1 for San Diego	0.038	0.190	n.a.	n.a.
PSU49	1 for Seattle-Tacoma	n.a.	n.a.	0.055	0.228
PSU50	1 for Portland	0.033	0.179	n.a.	n.a.
PSU52	1 for Sacramento	0.022	0.146	n.a.	n.a.
hmo	1 if beneficiary is enrolled in an HMO	0.248	0.432	0.235	0.424
Memorandum:					
Sample Size		2,476		2,370	

SOURCE: Congressional Budget Office based on the 1992 and 1994 National Health Interview Surveys.

NOTE: n.a. = not applicable; HMO = health maintenance organization; PSU = primary sampling unit.

a. Cancer, cardio- or cerebrovascular disease, diabetes, asthma, or emphysema.

Francisco, San Diego, Portland, and Sacramento. The 1994 sample included New York, Philadelphia, Chicago, Cleveland, Los Angeles, San Francisco, Phoenix, and Seattle.

In both years' samples, about 25 percent of beneficiaries were in HMOs. Among those in the fee-for-service sector, 32 percent had no supplement to Medicare in 1992 and 27 percent had no supplement in 1994. Nationwide, the corresponding figure is about 22 percent. The proportion of Medicare beneficiaries with no private supplement is higher in these samples perhaps because the respondents are primarily from large urban areas, where the costs of private supplemental insurance would be relatively high.

Outpatient Contacts. In both 1992 and 1994, enrollees in HMOs were about 3 percent more likely to have some outpatient contact than those in the fee-for-service sector (see Table A-2). However, the number of contacts per user was lower for HMO enrollees than for fee-for-service beneficiaries in both years. Overall, use of outpatient services by HMO enrollees was slightly higher in 1992, and 3.6 percent lower in 1994, compared with fee-for-service beneficiaries.

Hospital Inpatient Days. In both 1992 and 1994, the probability of at least one inpatient hospital stay was higher for HMO enrollees than for fee-for-service beneficiaries. However, HMO enrollees who were admitted to the hospital stayed appreciably fewer days than their fee-for-service counterparts. Overall, HMO enrollees used about 20 percent fewer inpatient days in 1992 and 28 percent fewer in 1994 than beneficiaries in Medicare's fee-for-service sector.

Overall Use of Medical Services. Combining the above results on use of outpatient and inpatient services yields an estimate of the effect that HMOs have on the overall resource costs of medical services used. For this estimate, the analysis assumed that the resource costs of all outpatient care were proportional to the number of outpatient contacts, and that the resource costs of all inpatient care were proportional to the number of inpatient days used. For the Medicare population, about 33 percent of spending on insured services goes for outpatient care and 67 percent is for inpatient care.[6] Those values were used to weight the results discussed above to estimate the effects of HMO enrollment on the overall use of medical services.

In both 1992 and 1994, HMO enrollment increased the probability that some services would be used, but reduced the extent of use among those seeking care,

6. Based on tabulations from the 1987 National Medical Expenditure Survey. Outpatient care includes facility, physician, and other professional costs for services provided in a hospital outpatient department, an office, or the patient's home. Inpatient care includes facility, physician, and other professional costs for services provided to hospital inpatients.

TABLE A-2. DIFFERENCE IN USE OF SERVICES BETWEEN MEDICARE'S HMO ENROLLEES AND BENEFICIARIES IN THE FEE-FOR-SERVICE SECTOR, 1992 AND 1994 (In percent)

HMO Enrollees	Outpatient Contacts	Inpatient Days	Medical Services[a]
	1992		
Probability of Any Use	2.8	5.2	4.4
Extent of Use Among Users	-2.3	-23.6	-16.6
Total Use of Services[b]	0.5	-19.7	-13.0
	1994		
Probability of Any Use	3.1[c]	7.6	6.1
Extent of Use Among Users	-6.5	-33.2[c]	-24.4
Total Use of Services[b]	-3.6	-28.1	-20.0

SOURCE: Congressional Budget Office regressions from the 1992 and 1994 National Health Interview Surveys.

NOTE: Figures are for all primary sampling units with 30 or more HMO enrollees.

a. In calculating the effects on overall use of medical services, outpatient visits were weighted by 0.33 and inpatient days by 0.67 to reflect the Medicare population's mix of spending on outpatient and inpatient services.

b. By definition, expected use equals (probability of any use) times (expected use for users). Given this, it can be shown algebraically that the percentage change in expected use equals (1 + percentage change in probability of use) times (1 + percentage change in expected use for users) - 1. The percentage change in the probability of use is derived by evaluating the logistic equation both with and without the HMO variable. The percentage change in the extent of use among users is equal to the estimated coefficient on the HMO variable in the least squares equation.

c. Significant at the 0.05 level or better.

compared with similar fee-for-service beneficiaries. Overall, HMOs reduced use of services by an estimated 13 percent in 1992 and 20 percent in 1994.

Those results compare use of services by HMO enrollees with use of services by all fee-for-service beneficiaries regardless of whether the latter have a private insurance supplement. In an earlier analysis, where the comparison group was limited to only those fee-for-service beneficiaries with no supplemental insurance, HMOs increased the number of outpatient contacts and reduced the number of inpatient days, with both effects statistically significant. Overall, HMOs decreased the use of medical services very slightly. That finding indicates that HMOs were able to reduce or eliminate Medicare's cost-sharing requirements without increasing enrollees' overall use of services. By contrast, indemnity supplements to Medicare (such as medigap or retiree health plans) increased beneficiaries' use of services by 20 percent or more.[7]

The effects of HMO coverage found in this analysis for 1992 are consistent with those reported in a study using 1989 data for the Medicare population.[8] That study found that, on average over all types of HMOs, Medicare's risk-based HMOs increased the number of outpatient contacts by about 5 percent, reduced the number of inpatient hospital days by nearly 17 percent, and lowered overall use of services by about 10 percent compared with use by similar beneficiaries who were not in HMOs (whether or not they had supplementary coverage).[9] The results here indicate that HMOs increased use of outpatient services by 0.5 percent, reduced use of inpatient services by 20 percent, and decreased overall use of services by 13 percent. They also show, as did the 1989 study, that HMO enrollment increased the probability of a hospital admission but substantially reduced the average length of stay for those admitted when compared with non-HMO beneficiaries.

The differences between 1992 and 1994 could indicate that Medicare's HMOs have become more effective at reducing use of services over time—something that typically does occur as HMOs mature. Even if Medicare's risk-based HMOs were no more effective in 1994 than in 1992, the apparent effectiveness of HMOs in this analysis would increase for two reasons: first, because the proportion of Medicare HMO enrollees in risk-based rather than cost-based plans increased between 1992 and 1994 (from 67 percent to 72 percent); and second, because the proportion of fee-

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7. See the Congressional Budget Office memorandum by S. Christensen and J. Shinogle titled "The Effects of Supplemental Insurance on Use of Services by Medicare Enrollees," July 1996.

8. R. Brown and others, *The Medicare Risk Program for HMOs: Final Summary Report on Findings from the Evaluation* (Princeton, N.J.: Mathematica Policy Research, Inc., February 1993), p. 84.

9. Although the study also reported results by type of HMO, differences by type were not statistically significant.

for-service beneficiaries in the sample who had no Medicare supplement fell (from 32 percent to 27 percent).

However, other explanations might account for some of the estimated differences between 1992 and 1994. The extent of favorable selection experienced by Medicare's HMOs may have increased in recent years. If the health-status measures included in the regression equations do not adequately account for selection bias, the overestimate of HMOs' effects on use of services would be larger in 1994 than in 1992. Further, some or all of the differences could result from the different mix of geographic areas and HMOs included in the two samples.

The importance of the last factor—a change in the mix of geographic areas and HMOs included in each sample—was examined by rerunning the regressions using only those PSUs with enough HMO respondents to be included in both samples. (Those PSUs were New York, Chicago, Los Angeles, and San Francisco.) The results of the narrower analysis were qualitatively similar to the broader results: in both 1992 and 1994, HMOs increased the probability that some health care services would be used but reduced the extent of use among users by enough to reduce the use of services overall (see Table A-3). Quantitatively, the apparent increase in the effectiveness of HMOs between 1992 and 1994 was larger than the broader analysis found. Thus, the estimated increase in effectiveness for HMOs does not appear to be a spurious result arising from the characteristics of the different areas included in the 1992 and 1994 samples.

TABLE A-3. DIFFERENCE IN USE OF SERVICES BETWEEN MEDICARE'S HMO ENROLLEES AND BENEFICIARIES IN THE FEE-FOR-SERVICE SECTOR, USING ONLY PSUs WITH 30 OR MORE HMO ENROLLEES IN BOTH 1992 AND 1994 (In percent)

HMO Enrollees	Outpatient Contacts	Inpatient Days	Medical Services[a]
	1992		
Probability of Any Use	2.1	6.0	4.7
Extent of Use Among Users	-5.1	-16.0	-12.4
Total Use of Services[b]	-3.1	-10.9	-8.3
	1994		
Probability of Any Use	3.4[c]	7.9	6.4
Extent of Use Among Users	-2.4	-41.1[c]	-28.4
Total Use of Services[b]	0.9	-36.5	-24.2

SOURCE: Congressional Budget Office regressions from the 1992 and 1994 National Health Interview Surveys.

NOTE: PSU = primary sampling unit.

a. In calculating the effects on overall use of medical services, outpatient visits were weighted by 0.33 and inpatient days by 0.67 to reflect the Medicare population's mix of spending on outpatient and inpatient services.

b. By definition, expected use equals (probability of any use) times (expected use for users). Given this, it can be shown algebraically that the percentage change in expected use equals (1 + percentage change in probability of any use) times (1 + percentage change in expected use for users) - 1. The percentage change in the probability of use is derived by evaluating the logistic equation both with and without the HMO variable. The percentage change in the extent of use among users is equal to the estimated coefficient on the HMO variable in the least squares equation.

c. Significant at the 0.05 level or better.

APPENDIX B: ESTIMATED REGRESSION EQUATION FOR PREDICTING CHANGES IN MEDICARE'S RISK-SECTOR ENROLLMENT

This appendix describes the regression equation that was used in this memorandum to predict how Medicare's risk-sector enrollment in each county would change in response to changes in Medicare's payment rate, the adjusted average per capita cost or AAPCC. Various other policy changes could also affect risk-sector enrollment—such as introducing coordinated open-enrollment periods, increasing health maintenance organization (HMO) enrollees' minimum enrollment period from one month to one year, eliminating medigap insurance, doing away with the 50/50 enrollment requirement or the cost-based option for HMOs, or changing Medicare's fee-for-service sector. The changes in risk-sector enrollment that the equation predicts apply only if the general framework in which Medicare's risk-based program operates does not change. Otherwise, the predictions would have to be modified.

Theoretical Underpinnings

The theory behind the equation is straightforward. It presumes that a host of factors might induce Medicare beneficiaries to choose risk-based HMOs, and a somewhat different set of factors might induce HMOs to serve Medicare enrollees in a given area on a risk basis. The equation that was estimated is intended to be a reduced-form quantity equation derived from the structural equations that would explain beneficiary demand and HMO supply as a function of price and other variables. As such, the explanatory variables should include all of the exogenous factors that might affect either a beneficiary's decision to enroll or an HMO's decision to enter the market, but there should be no endogenous measures of either price or quantity.[1]

The quantity measure used as the dependent variable is the risk-sector penetration rate: risk-sector enrollment as a proportion of the number of Medicare beneficiaries living in a county. The key explanatory variable is the county's AAPCC for aged enrollees, adjusted for differences among counties in providers' input prices.[2] Under current law, (95 percent of) the AAPCC is an exogenous component subtracted from the total price an HMO charges its Medicare enrollees.

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1. The regression equation estimated here is similar to one estimated in a recently published study, except that the study used data only for large metropolitan statistical areas, whereas this analysis used data for all counties with any Medicare beneficiaries. See P. Welch, "Growth in HMO Share of the Medicare Market, 1989-1994," *Health Affairs*, vol. 15, no. 3 (Fall 1996).

2. To adjust for differences in input prices, the county-level AAPCCs for Part A were standardized by dividing each by a blended index equal to the weighted average of the hospital wage index for the county (70 percent) and 1 (30 percent). The AAPCCs for Part B were standardized by dividing each by a blended index equal to the weighted average of the physician geographic adjustment factor (66 percent) and the index used for Part A (34 percent). Those are the price indexes specified in the Balanced Budget Act of 1995, which was passed by the Congress but vetoed by the President.

Risk-sector penetration rates at the county level should vary directly with the price-adjusted AAPCC, since relatively high payment rates ensure that both HMOs' profits and enrollees' free supplemental benefits can be high. The price-adjusted AAPCC can also be interpreted as a relative price: Medicare's risk-sector payment rates relative to its fee-for-service payment rates. That interpretation can be made because the price indexes used to adjust the AAPCCs in the regression equation are the same indexes that Medicare uses to transform its national hospital rates per diagnosis and its national fees for physicians' services into local payment rates for its fee-for-service sector.[3] Hence, the denominator in the price-adjusted AAPCC may be viewed as the price for a standardized service in Medicare's fee-for-service sector. Under that interpretation, a uniform reduction of 5 percent in Medicare's risk-sector payment rates (with fee-for-service rates unchanged) would have the same effects on risk enrollment (but not on costs) as a uniform increase of 5.3 percent in Medicare's fee-for-service payment rates (with risk-sector rates unchanged). Either change would reduce the price-adjusted AAPCC by 5 percent.

Other explanatory variables used in the equation are:

- The number of eligible beneficiaries in the county (entered in logarithmic form), since HMOs would not incur the expense of establishing a Medicare-certified network if there were too few beneficiaries to make doing so worthwhile.

- The non-Medicare risk penetration rate in the area, where an area is defined as the metropolitan statistical area (MSA) for urban areas and as the non-MSA rest of the state for rural areas. That is an important factor for several reasons. One is that HMOs can more readily move into the Medicare market if they already have a provider network in the area. Second, they must already have a solid commercial enrollment because Medicare requires HMOs serving its beneficiaries to draw at least half their enrollment from commercial plans (non-Medicare and non-Medicaid). A third reason is that beneficiaries may be more receptive to HMOs if they are already familiar with them because of HMOs' importance in employment-based plans in the area.

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3. For each service provided by physicians, there is a single national rate which is adjusted by the geographic adjustment factor to derive local fees. For each hospital stay classified by diagnosis-related group, there are two national rates—one for hospitals in large metropolitan areas and one for hospitals in all other areas. Because separate equations are estimated for large metropolitan areas and for other areas, the interpretation given in the text is valid.

- Medicare's risk-sector penetration rates for the prior year, entered at the county and the state level. Naturally, prior-year county-level penetration is the strongest explanatory variable in the equation, but state-level penetration is also strong and significant. That may be because once an HMO has achieved Medicare certification in a given state, it can easily expand the areas it serves in the state.

- The size of the population. Responsiveness to the explanatory variables described above appears to vary among areas of different population size. For example, rural areas have very low HMO penetration rates regardless of Medicare's payment rates, presumably because the population base is too small to justify the costs of establishing provider networks or to support an enrollment base large enough to make an HMO's costs predictable. Among metropolitan areas, percentage increases in enrollment are generally related inversely to the size of the MSA, although increases in the number of HMO enrollees are directly related to the size of the MSA because the smaller percentage increases are applied to much larger initial levels of HMO enrollment.[4] Consequently, the estimated coefficients for all of the other explanatory variables are allowed to differ among four groups of counties—those in MSAs of one million people or more, those in MSAs of 250,000 to 999,999, those in MSAs of less than 250,000, and those in nonmetropolitan areas. That is equivalent to estimating separate equations for each of the four groups of counties.

The objective of the equation is a limited one: to explain how Medicare's risk enrollment in each county would change in response to changes in the AAPCC. It does not attempt to explain how the existing level of risk enrollment came about. Instead, the equation uses the existing penetration rate as a proxy for the many unknown factors that encouraged or discouraged risk enrollment in the area in the past.

Data

County-level data for 1995 and 1996 were used to estimate the equation. (See Table B-1 for definitions and means of the variables.) The Health Care Financing Administration provided the data on Medicare's enrollment, HMO penetration rates, AAPCCs, and price indexes. Data on non-Medicare penetration rates came from the

4. *The InterStudy Competitive Edge 5.2 Part III: Regional Market Analysis* (Minneapolis: InterStudy Publications, November 1995).

TABLE B-1. VARIABLE DEFINITIONS AND MEANS FOR COUNTY-LEVEL DATA

Variable	Symbol	MSAs by Size[a]				
		Overall	Large	Medium	Small	Rural
Unweighted Means of Variables						
Medicare Risk Penetration Rate in County, 1996	P96	0.017	0.081	0.038	0.017	0.006
Independent Variables						
Price-adjusted AAPCC, 1996	ADJAPC96	418.667	441.709	427.326	408.155	415.306
Log of number of beneficiaries in county, 1996	LN(ELIG96)	8.369	9.983	9.624	9.424	7.878
Non-Medicare risk penetration rate in MSA, 1995[b]	OTHPENMA	0.097	0.270	0.188	0.090	0.062
Medicare risk penetration rate in state, 1995	P95STATE	0.033	0.045	0.039	0.041	0.030
Medicare risk penetration rate in county, 1995	P95	0.011	0.055	0.025	0.009	0.003
Beneficiary-Weighted Means of Variables						
Medicare Risk Penetration Rate in County, 1996	P96	0.092	0.158	0.072	0.026	0.009
Independent Variables						
Price-adjusted AAPCC, 1996	ADJAPC96	446.900	477.384	432.340	408.914	417.074
Log of number of beneficiaries in county, 1996	LN(ELIG96)	10.587	11.724	10.676	9.851	8.632
Non-Medicare risk penetration rate in MSA, 1995[b]	OTHPENMA	0.207	0.297	0.200	0.102	0.083
Medicare risk penetration rate in state, 1995	P95STATE	0.068	0.088	0.067	0.055	0.035
Medicare risk penetration rate in county, 1995	P95	0.068	0.121	0.050	0.014	0.005
Memorandum:						
Sample Size (Number of counties)		3,126	311	317	212	2,286

SOURCE: Congressional Budget Office.

NOTE: MSAs = metropolitan statistical areas; AAPCC = adjusted average per capita cost.

a. Large refers to MSAs with populations of 1 million or more; medium to MSAs with populations between 250,000 and 999,999; small to MSAs with populations of less than 250,000; and rural to all nonmetropolitan counties.

b. Areas are defined as the MSA for urban areas and the rest of the state for nonurban areas.

July 1995 InterStudy census of all HMOs.[5] Although the InterStudy census does not show county-level penetration rates, it does provide state-level and MSA-level penetration rates. By combining that information, a "rest-of-state" penetration rate for all nonmetropolitan counties in each state was calculated.

The Regression Equation

The analysis used the logistic functional form because it generates the characteristic growth pattern for HMO penetration rates—slow initial growth, rapid growth after some threshold level of penetration, and then slow growth again as penetration approaches its maximum achievable level. Although logistic regression is most commonly used with a binary dependent variable, it is also appropriate when the dependent variable is a continuous variable between zero and one and the variable can be appropriately interpreted as the result of a number of trials in which either the event occurred or it did not. That interpretation is appropriate for the county-level data used here. In a county with 100 Medicare beneficiaries of which 20 were risk enrollees, for example, there were 100 trials, each of which could have resulted in an event (a risk enrollee).

The regression results confirm the importance of allowing the coefficients to vary for each of the four groups of counties, because the coefficients used to permit such variation are all statistically significant. Considering each of the four groups of counties separately, the estimated coefficients all have the expected sign and are all statistically significant with p-values of 0.0001 or less (see Table B-2).[6] A secondary ordinary least squares regression of the actual penetration rate for all counties on the predicted rate shows that the prediction explains nearly 80 percent of the variation in the actual rate. Further, it shows that the prediction tracks observed penetration rates well, because the estimated slope is not significantly different from one and the intercept is virtually zero.

The estimated coefficients in the logistic regression are also quite stable. Stability was determined by running the regression 100 times on randomly selected 80 percent subsamples from the database. The averages for the estimated coefficients from the 100 runs were generally quite close to the estimates from the full sample, and the standard deviation of the coefficient estimates was usually small relative to the average value of the estimated coefficient.

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5. Provided by InterStudy Publications, Minneapolis.

6. A p-value is the probability of getting the estimated coefficient if the true population parameter was zero. A p-value of 0.0001 indicates that there is only a one in 10,000 chance of getting the observed coefficient estimate if the actual parameter value is zero.

TABLE B-2. ESTIMATED LOGISTIC COEFFICIENTS FOR PREDICTING MEDICARE'S RISK-SECTOR ENROLLMENT

Independent Variable	MSAs by Size[a]				
	Overall	Large	Medium	Small	Rural
INTERCEPT	n.a.	-3.695	-7.295	-12.103	-9.821
ADJAPC96	n.a.	0.001	0.003	0.005	0.003
LN(ELIG96)	n.a.	0.015	0.177	0.490	0.286
OTHPENMA	n.a.	0.656	1.677	3.040	2.863
P95STATE	n.a.	0.632	4.528	7.513	7.829
P95	n.a.	6.168	6.298	9.861	17.520
Percentage of Variation Explained[b]	79.7	84.5	77.6	59.3	61.1

SOURCE: Congressional Budget Office.

NOTES: All coefficients are statistically significant, with p-values of 0.0001 or less.

MSAs = metropolitan statistical areas; n.a. = not applicable.

a. Large refers to MSAs with populations of 1 million or more; medium to MSAs with populations between 250,000 and 999,999; small to MSAs with populations of less than 250,000; and rural to all nonmetropolitan counties.

b. As determined by a least squares regression of the actual 1996 penetration rates on the rates predicted by the logistic regression.

The regression results indicate that risk-sector enrollment is moderately and positively responsive to changes in the AAPCC. One measure of responsiveness is an elasticity—defined as the percentage change in the dependent variable resulting from a 1 percent change in the value of a given explanatory variable. An elasticity of one or more indicates strong responsiveness, whereas an elasticity of less than one indicates relatively weak responsiveness. The elasticity implicit in the estimated results is nearly one overall, indicating that a 10 percent increase in the price-adjusted AAPCC in all counties would increase Medicare's risk-sector enrollment by nearly 10 percent. The value of this elasticity is sensitive to the form of the price indexes used to get the price-adjusted AAPCCs, however. For example, the average elasticity is only about 0.7 when the index used for hospital costs (in the price-adjusted AAPCCs for Part A and Part B) is identical to the hospital wage index.

In general, the AAPCC is a relatively weak determinant of risk-sector enrollment. Standardized coefficients measure the relative importance of the different explanatory variables.[7] Naturally, the most consistently important determinant in the estimated equation is Medicare's risk-sector enrollment for the prior year (see Table B-3). However, except in the case of counties in large MSAs, the other explanatory variables used in the equation are almost always more important than the AAPCC in predicting risk-sector enrollment.

7. The standardized coefficient for an explanatory variable is the product of its coefficient and its standard deviation, divided by the standard deviation of the dependent variable. A standardized coefficient of 0.25, for example, indicates that a change of one standard deviation in the explanatory variable results in a change of one-fourth of the standard deviation of the dependent variable.

TABLE B-3. STANDARDIZED COEFFICIENTS FROM THE LOGISTIC REGRESSION

Independent Variable	MSAs by Size[a]			
	Large	Medium	Small	Rural
ADJAPC96	0.047	0.098	0.166	0.113
LN(ELIG96)	0.009	0.086	0.150	0.124
OTHPENMA	0.044	0.129	0.214	0.155
P95STATE	0.035	0.217	0.313	0.262
P95	0.455	0.337	0.208	0.212

SOURCE: Congressional Budget Office.

NOTES: The standardized coefficient for an explanatory variable is the product of its coefficient and its standard deviation, divided by the standard deviation of the dependent variable. A standardized coefficient of 0.25, for example, indicates that a change of one standard deviation in the explanatory variable results in a change of one-fourth of the standard deviation of the dependent variable.

MSAs = metropolitan statistical areas.

a. Large refers to MSAs with populations of 1 million or more; medium to MSAs with populations between 250,000 and 999,999; small to MSAs with populations of less than 250,000; and rural to all nonmetropolitan counties.