Border-Crossing Adjustment and Personal Health Care Spending by State

Joy Basu, Ph.D.

This article presents the results of a pioneering effort by the Health Care Financing Administration (HCFA) to measure interstate border crossing for services used by Medicare and non-Medicare beneficiaries. A major focus is to provide estimates of per capita expenditures by State for individual services. Such estimates are not possible without adjustment for interstate border-crossing flows. This is HCFA's first attempt to furnish a unified per capita personal health care expenditures data base comprising all services and covering total population. The study also analyzes interstate differences in expenditure flows by computing rates of inflow and outflow of expenditures, and highlights Medicare/non-Medicare flow differences.

INTRODUCTION

The study incorporates the findings from a project initiated by HCFA's Office of the Actuary (OACT) to refine State estimates of health care expenditures. The project was undertaken in response to a request by 1993 President's Task Force on Health Care Reform for estimates of health care spending by States. As the first step, State estimates of personal health care spending were developed, using data based on provider locations. These estimates show expenditures on total personal health care services in each State, where "State" represents the location of the provider of service (Levit et al., 1995). Because State spending estimates based on location of providers differ from spending by persons residing in that State, estimates of per capita expenditures, however, could not be produced based on this data.

The data on per capita expenditure by State is an essential tool to identify differences among States in patterns and levels of spending. These estimates are useful for evaluating the effectiveness of individual State health reform initiatives, by providing information to address issues related to the impact of policy changes on spending patterns and growth in a State. The key toward accurately producing these data was to first create State expenditure estimates based on State of beneficiary residence. For this, the expenditure data based on provider location had to be converted to those based on location of beneficiary residence.

The difference between estimates based on provider location and those based on location of beneficiary residence is accounted for by flows of expenditures from one State to another as a result of the border crossing by State residents for services in another State. There are various reasons for such crossing of State borders, among which the need for specialized care probably tops the list (Mayer, 1983; Folland, 1983; Holahan and Zuckerman, 1993). Border crossing may also be circumstantial (Miller and Welch, 1992). If a beneficiary resides near a State border, simply going to the most convenient hospital may entail crossing a State border.

The author is with the HCFA Office of the Actuary. The views and opinions are those of the author and do not necessarily reflect those of HCFA.

Usually, significant amounts of border crossing occur when a hospital market area overlays State boundaries. Some States, such as Florida and Arizona, also experience large seasonal inflows of out-of-State patients. The creation of expenditure estimates based on beneficiary residence location, therefore, requires estimating these expenditure flows from beneficiary State to provider State.

To serve this process, the first step was to develop a data base defining interstate flows of expenditures for Medicare beneficiaries. The availability of Medicare data files containing expenditure data at the beneficiary level both by beneficiary residence-State and by provider location enabled the creation of complete interstate flow matrices for Medicare patients for a broad array of services. The results analyzing the border-crossing behavior by Medicare beneficiaries were reported in an earlier study (Basu, Lazenby, and Levit, 1995). Because similar data for the rest of the population were not available, adjustment factors developed for Medicare patients were used to serve as the building blocks for estimating border-crossing patterns and expenditures per capita of non-Medicare population.

This article presents the final results from this effort, where the conversion of total personal health care expenditures by provider State to those by beneficiary residence-State takes place. This is accomplished by separately estimating the expenditure flows incurred by Medicare and non-Medicare population and finally aggregating expenditures derived from these two individual flows. The analysis provides State-specific data on total personal health care expenditures for each of the nine individual types of services estimated in the National Health Accounts (NHA). For each service, expenditures are estimated both by State of a provider and by State of beneficiary residence. The difference between these estimates for each State reflects the adjustment for border crossing. The study also provides per capita expenditure estimates based on adjusted expenditures and examines the impact of border crossing on per capita expenditure estimates. The study analyzes interstate differences in expenditure flows by computing rates of inflow and outflow of expenditures, and highlights the differences in flows between Medicare and non-Medicare patients.

DATA AND METHOD

The method for estimating residence-based adjustment for service-specific total personal health care expenditure involves three steps: (1) Medicare adjustment, (2) Medicaid adjustment, and (3) non-Medicare, non-Medicaid adjustment. This three-part analysis is based on the fact that sources of funds in the NHA framework can be grouped into three broad categories based on insurance coverage: (1) the Medicare-insured population, (2) the population covered by Medicaid, and (3) the residual population composed primarily of privately-insured and uninsured persons.[1] Medicare, Medicaid, and private health insurance payments together account for two-thirds of payments made for personal health care.

The data on Medicare residence-based adjustment were reported in an earlier article (Basu, Lazenby, and Levit, 1995). The data for Medicare adjustment came from National Claims History (NCH) files and was processed to create provider-State and beneficiary-State specific Medicare expenditures for each NHA category. The expenditure flow ratios from each provider to beneficiary State and vice versa were calculated for each Medicare type of service

[1] Also included in the residual are people covered under different Federal Government programs, e.g., Veterans Administration, Department of Defense, Indian Health Service, etc.

which formed the basis of creating flow matrices for each service.

The data for Medicaid and other payers are not available to the same extent as Medicare data is, which limits the choice of methodology and estimation techniques for this population group. To determine the extent that Medicaid beneficiaries travel out of State to receive health care services, the 1991 Medicaid data, e.g., Medicaid Statistical Information System (MSIS), were examined. MSIS claims do not contain information on the beneficiary State of residence and provider State locations. The data also do not cover all the States. Even after linking the claims data with other files (e.g., eligibility files), and making assumptions about provider locations, the degree of border crossing by these beneficiaries could not be estimated using the available data sources (Fu Associates, 1993). Given the limited information on Medicaid recipients' travel patterns, it was assumed that the extent of border crossing by this group is minimal and no adjustments for border crossing by the Medicaid population were made.

The third group of expenditures, that incurred by non-Medicare non-Medicaid beneficiaries, accounts for the largest proportion of expenditures in each State. Services associated with these expenditures are usually for the population under 65 years of age not eligible for Medicare or Medicaid coverage.[2] Because there is not a single insurer, the out-of-State expenditure data for this group is not available from a single source or at the same level of detail as Medicare data is. Typically, insurers collect only the information that allows them to pay bills and set premiums. The available data on insurance lacks the level of service detail and uniformity of formats, and, therefore, is not comprehensively available to researchers or policymakers.

[2] Expenditures included under non-Medicare non-Medicaid category could include out-of-pocket costs or costs of secondary insurance (i.e., medigap) incurred by Medicare and Medicaid beneficiaries.

Using Medicare Flows as Proxies

Because of data limitations, the calculation of interstate flows of spending for the non-Medicare non-Medicaid group provides a challenge. Studies have explored the possibility of using Medicare data for analyzing non-Medicare admission patterns. It was found that Medicare data can provide fairly accurate estimates of "other" (non-Medicare) adult admissions for two-thirds of all hospitals (which are also "typical" hospitals) in California (Radany and Luft, 1993). Other studies found that elderly and non-elderly have similar travel patterns for ambulatory care (Kleinman and Makuc, 1983), and also for routine hospital care (Makuc et al., 1991). Based on these findings, and in the absence of other proxies, it may be reasonable to assume that Medicare flow matrices are fairly representative of those for non-Medicare population. To make Medicare flows better approximate the same for non-Medicare population, several adjustments are made to it. These are detailed later.

In order to use Medicare flows for each service, the Medicare flow matrices for 3 age groups are examined: under 65 (also referred to as the disabled cohort), 65-70, and over 70. The average out-of-State spending is found to be highest for the disabled (under 65), followed by 65-70, and over 70 groups. The highest rate for the disabled population is partly due to the high out-of-State spending rate for end stage renal disease (ESRD) beneficiary included in that group. The under-65 ESRD beneficiaries account for the highest proportion (60 percent) of total ESRD expenditures, and also have higher out-of-State spending ratios than other age groups

(10.1 percent as opposed to 8.4 and 7.9 percents respectively for the 65-70 and over-70 groups). When ESRD patients are excluded from each age group, the 65-70 cohort exhibits the highest (7.53 percent) average out-of-State spending, followed by disabled (6.99 percent), and the over 70 group (6.50 percent). Thus, the elderly Medicare population spends a smaller proportion than other groups outside their residence State despite the fact that, as indicated in several studies, elderly have higher utilization and per capita expenditures than non-elderly population. By NHA service category, however, the data (Table 1) indicate that for some services, such as home health, and hospice, the over 70 group spends a higher percentage than other age groups outside their residence State.

An examination of these age group-specific flows indicates that 65-70 would be the most representative group to proxy the non-Medicare population. This is because the expenditure patterns of the non-elderly are presumably more like those of the age 65-70 population than those of the entire Medicare population (Fu Associates, 1993) or any other Medicare age groups. The Medicare beneficiaries who belong in the under-65 group collect monthly Social Security income on the basis of disability and thus represent a unique population due to their health status. Such a group, therefore, may not be representative of a similar under-65 age cohort within the non-Medicare population. Medicare beneficiaries over 70 are elderly and more likely to have a different expenditure pattern than the under-65 non-Medicare population. Studies provide evidence to suggest that elderly do not travel extensively, particularly for hospitalization (Hogan, 1988; Adams et al., 1991). The 65-70 cohort, reflecting a minimum of 25 percent of Medicare enrollees and 25 percent of Medicare expenditures in each State, appears to be the most likely group to have an expenditure pattern similar to that of the non-elderly population.

In addition to selecting this age group, a further modification in the Medicare data is made to make it representative of the non-Medicare group. This is done by excluding Medicare beneficiaries with ESRD status. The ESRD patients are high-cost cases. Enrollees with ESRD comprised 0.6 percent of total Medicare enrollees and 4.4 percent of total expenditures in 1991. The majority of renal failure cases are insured by Medicare, and their

Table 1

Mean Percent of Out-of-State Expenditures for Medicare Beneficiaries Under 65, 65-70, and Over 70 Years of Age, by National Health Account (NHA) Categories: Calendar Year 1991

	Age Group			
NHA Category	Under 65	65-70	Over 70	All Ages
		Percent		
Total	6.99	7.53	6.50	6.79
Medical Durables	19.50	14.52	19.38	18.43
Outpatient Hospital	4.60	5.79	5.22	5.31
Inpatient Hospital	6.84	7.88	6.29	6.72
Freestanding ESRD	2.61	3.31	3.62	3.37
Hospice	2.65	3.01	3.65	3.45
Home Health Care	2.22	2.58	2.82	2.75
Skilled Nursing Facility	4.30	4.58	4.28	4.31
Physician Services	6.15	6.78	6.06	6.26
Independent Labs	22.04	23.49	22.01	22.40
Other Professional Services	4.02	5.04	4.83	4.80

NOTE: ESRD is end stage renal disease. Medicare patients with ESRD status have been excluded from this data.

SOURCE: Health Care Financing Administration: National Claims History file, 1991.

health care expenditures may not be representative of that for the non-Medicare group (Fu Associates, 1993).

Seasonal Migration

Another factor that was considered in determining the appropriateness of using Medicare flows for non-Medicare population was the seasonal migration, which contributes to a significant proportion of out-of-State expenditures incurred by Medicare patients in a few States, such as Florida and Arizona. Since seasonal migrants are predominantly elderly, including the expenditure patterns of elderly seasonal migrants in Medicare data may bias the observed expenditure pattern of the non-Medicare population. Studies exploring the issue of seasonal migration noted that seasonal migrants are difficult to identify, because their second residence cannot be identified from Medicare data (Buczko, 1994). The adjustment for expenditure patterns of seasonal migrants was not incorporated in this study because no consistent method could be found to separate these people (Fu Associates, 1993)[3]. A likely impact of not making such adjustment may be to underestimate the expenditures for residents of the Sunbelt areas and to overestimate those in States of residence of seasonal migrants. However, since the proportions of these people are relatively small, and seasonal migration is relatively a weak predictor of interstate flows of Medicare patients (for inpatient care) (Buczko, 1992), inclusion of expenditures by seasonal migrants is not likely to significantly bias the non-Medicare distribution in general.

[3] Different travel assumptions were used to account for spending patterns of seasonal migrants, including one in which all health expenditures made in non-adjacent States were eliminated under the assumption that people travel only as far as necessary to receive health services. The method, however, eliminated more information than desired and appeared too restrictive. Another method which used a similar assumption for only two States (e.g., Florida and Arizona) also was found somewhat restrictive.

Service-Specific Flows

In order to calculate non-Medicare flows, therefore, the trimmed (65-70 group, with ESRDs excluded) Medicare population and their interstate flow matrices are used. For each individual category of PHC expenditure for which a corresponding Medicare category exists, the Medicare matrix for the trimmed population is used. For Medicare non-covered services, either a proxy Medicare category is used or the adjustment is not made. For example, for dental services, which is not covered by Medicare, the trimmed matrix for other professional category is used. For drugs and other non-durables, there is no flow data available. Therefore, the market is assumed to be local and no adjustment is done. Also, for other PHC, which includes a number of government- and business-financed services, no adjustment is done for lack of a suitable method.

In some cases, two Medicare matrices have been combined to generate one matrix that is consistent with data available for non-Medicare. For example, Medicare flows for other professionals and ESRD services for the 65-70 age group are combined to generate a single flow matrix that is appropriate for using against non-Medicare provider-based data on other professionals which include freestanding ESRD services.[4] On the other hand, a single trimmed flow matrix for Medicare physician services is applied to the combined provider-based data on physician and laboratory expenditures. For durable medical supplies used by non-Medicare beneficiaries, Medicare matrix for other professionals is used in lieu of that for Medicare durables. This is because

[4] Although Medicare beneficiaries with ESRD status have generally been eliminated for calculating the Medicare trimmed matrices, other professional care is the only category where this is included in order to account for ESRD services provided for the non-Medicare population.

Medicare durables are special products (e.g., wheelchairs, crutches, etc.), different from those used by non-elderly (e.g., vision products, eyeglasses, and hearing aids, primarily available at other professionals' offices). The expenditure flows for durables used by non-elderly should accordingly follow those for other professionals' services.

In estimating adjustment factors for hospital care, the difference in out-of-State expenditure pattern for services provided in inpatient and outpatient treatment settings is taken into account. In order to be able to use different flow ratios for inpatient and outpatient care, provider-based expenditure data on hospital care, available as a total, is disaggregated into these categories using split ratios calculated from other sources (e.g., American Hospital Association's Panel surveys). For inpatient and outpatient care, Medicare trimmed matrices for the corresponding categories were used with the provider-based non-Medicare expenditure data to arrive at residence-based estimates. To further refine the estimates for inpatient care, an additional service-mix adjustment (detailed later) is used. Table 2 summarizes the respective Medicare categories used for non-Medicare, non-Medicaid services.

Service-Mix Adjustments

Although the expenditure patterns of the Medicare 65-70 population (excluding ESRD) may be representative of the expenditure patterns of the non-Medicare population, it may be more accurate to assume that patterns are similar for selected services or groups of services within each NHA service category and that differences in the overall expenditure patterns and flow matrices are due to variations in service mix between these two groups. The underlying hypothesis behind this assumption is that the elderly and non-elderly have the same propensity to consume out-of-State services. However, people travel more for certain (high-technology) procedures (Holahan and Zuckerman, 1993) and the extent to which these procedures occur disproportionately among the elderly (rather than the non-elderly) will create differences in the interstate flow ratios between these groups. Thus, in order to use Medicare flow ratios to calculate non-Medicare flows, Medicare flows should be adjusted to reflect non-Medicare case-mix. This assumption could be valid for each NHA category; however, the availability of inpatient hospital and physician data by diagnoses and procedures makes it possible to make this refinement of non-Medicare estimates only for these two categories of services.

To make this adjustment for inpatient hospitals, flow matrices were first calculated at the diagnosis-related groups (DRG) level for the Medicare beneficiaries representing 65-70 age cohorts (ESRD excluded) and then reweighted to reflect the service mix of the non-elderly. To calculate service-mix of the non-elderly, data obtained from Codman Research Group (CRG) on inpatient hospital expenditures for 1991 were used. The data contains revenue center charges by DRG for 20 States and is summarized by provider State, in-State and out-of-State charges, age group, and primary payor. Service-mix weights were computed first by grouping DRGs and then calculating proportions of total charges for each group of DRGs. Because CRG data was only available for 20 States, a single set of case-mix weights was developed from this data and used for all States. DRGs were grouped according to the similarity of travel patterns within the same group (indicated by percentages of out-of-State spending by State residents).

Table 2

Medicare Flow Matrices Used to Compute Non-Medicare, Non-Medicaid Flows of Personal Health Care Expenditures, by Type of Service

Non-Medicare Non-Medicaid Categories	Medicare Trimmed Flow Matrix*
Hospital Services	
Inpatient	Inpatient Hospital, Service-Mix Adjusted
Outpatient	Outpatient Hospital
Physician Services (Includes Laboratory)	Physician Services, Service-Mix Adjusted
Freestanding Home Health	Freestanding Home Health
Freestanding Nursing Homes	Freestanding Nursing Homes
Other Professional Services (Includes ESRD)	Combined Other Professionals and ESRD**
Dental Services	Other Professionals
Medical Durables	Other Professionals
Drugs and Other Non-Durables	No Adjustment
Other Personal	No Adjustment

* Medicare 65-70 age group, excluding patients with ESRD status.
** For this service only, Medicare patients with ESRD status are included.

NOTE: ESRD is end stage renal disease.

SOURCE: Health Care Financing Administration, Office of the Actuary, 1996.

The primary purpose of DRG grouping was to assign DRGs to groups when no Medicare expenditure data are available for a DRG. This problem arises particularly for non-Medicare DRGs representing maternity cases, for which Medicare does not have any expenditures. Thus, expenditure patterns for these DRGs cannot be developed based on Medicare flows. The DRG grouping method allows these DRGs to be assigned to groups with similar out-of- State spending patterns (Fu Associates, 1994). A total of 30 such groups were created. Medicare expenditure flow matrices for these groups were reweighted by mean non-elderly service weights for each group, and finally summed across all groups to create an interstate non-elderly expenditure flow matrix for inpatient hospital. The flow ratios in the matrix were used to convert provider State expenditures for non-Medicare inpatient hospitals to beneficiary State expenditures.

For physician services, a similar method was used. Service weights for the non-Medicare population were calculated using a summary database created from MEDSTAT data containing expenditures by procedure codes. The procedures were grouped using type of service classification developed by The Urban Institute from all procedures received by the Medicare population (Fu Associates, 1993). These service-mix weights were then used to adjust Medicare trimmed matrices for physician services.

FINDINGS

Tables 3-9 present summarized information on interstate flows of total PHC expenditures that resulted from HCFA's study. The total PHC expenditures presented in these tables are derived as the sum of expenditures incurred by beneficiaries enrolled under Medicare, Medicaid, and other types of insurance (or no insurance).

Converting from Provider State to Beneficiary State

Tables 3 and 4, respectively, summarize the provider-based and residence-based estimates of total PHC expenditures by State, Region, and the United States as a whole. Each column in Tables 3 and 4 represent total expenditures incurred by beneficiaries enrolled under Medicare, Medicaid, and other types of insurance (or no insurance) for the respective NHA cate-

Table 3

Personal Health Care Expenditures by Type of Service[1], Region, and State of Provider: Calendar Year 1991

Region and State of Provider	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[2]	Home Health Care[3]	Nursing Home Care[3]	Other Professional Services[4]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
	Millions of Dollars									
United States	$667,909	$279,820	$150,318	$16,543	$57,159	$40,425	$31,676	$11,271	$67,051	$13,647
New England	41,293	16,773	8,088	1,139	5,317	2,479	2,008	555	3,763	1,170
Connecticut	10,859	3,967	2,336	302	1,586	603	610	176	927	351
Maine	2,933	1,207	520	73	396	168	133	42	306	88
Massachusetts	20,565	8,826	3,892	609	2,603	1,197	909	246	1,806	477
New Hampshire	2,747	1,102	583	53	220	215	150	39	289	96
Rhode Island	2,898	1,177	527	68	373	197	135	31	290	101
Vermont	1,290	494	229	34	138	100	71	21	146	57
Mideast	134,549	57,838	26,350	4,776	14,817	7,731	5,979	2,254	12,058	2,746
Delaware	1,890	777	405	41	191	122	85	31	190	50
District of Columbia	3,793	2,291	662	41	187	212	97	32	169	105
Maryland	13,029	5,097	3,249	243	993	721	660	243	1,566	258
New Jersey	21,557	8,586	4,771	539	1,875	1,441	1,214	411	2,233	487
New York	58,540	24,784	10,238	3,298	7,959	2,928	2,448	982	4,677	1,226
Pennsylvania	35,740	16,303	7,026	614	3,612	2,308	1,475	556	3,224	621
Great Lakes	109,253	47,026	23,280	2,066	10,858	6,119	5,057	1,902	11,138	1,808
Illinois	29,944	13,560	6,191	575	2,668	1,630	1,345	544	2,957	474
Indiana	13,859	5,918	2,821	187	1,698	815	541	243	1,431	207
Michigan	23,824	10,309	5,017	535	1,720	1,425	1,320	417	2,669	412
Ohio	29,126	12,359	6,486	488	3,234	1,557	1,201	482	2,925	393
Wisconsin	12,499	4,880	2,765	282	1,537	692	650	216	1,156	322
Plains	45,799	19,664	9,594	791	5,111	2,657	1,962	821	4,288	910
Iowa	6,507	2,856	1,178	97	809	372	287	134	676	98
Kansas	5,984	2,487	1,280	102	636	378	276	96	627	104
Minnesota	12,540	4,473	3,202	291	1,613	789	595	247	1,027	304
Missouri	13,577	6,527	2,581	232	1,214	777	511	219	1,284	232
Nebraska	3,799	1,749	700	51	424	173	165	72	381	83
North Dakota	1,750	786	371	12	231	72	62	26	147	44
South Dakota	1,641	786	280	7	184	98	66	27	147	46
Southeast	151,657	65,208	34,098	4,632	10,352	8,980	6,222	2,430	16,742	2,994
Alabama	10,332	4,511	2,477	370	580	526	377	136	1,110	246
Arkansas	5,356	2,336	1,228	95	491	258	202	51	610	87
Florida	38,487	14,890	9,600	1,642	2,558	2,756	1,701	767	3,926	646
Georgia	16,912	7,398	3,957	450	879	976	741	289	1,834	389
Kentucky	8,821	3,900	1,762	249	713	526	296	124	1,068	184
Louisiana	11,008	5,164	2,282	189	928	578	362	143	1,151	211
Mississippi	5,194	2,398	990	221	362	242	173	53	648	107
North Carolina	15,285	6,658	3,213	368	1,240	822	668	235	1,786	294
South Carolina	7,563	3,588	1,423	124	527	370	330	103	872	226
Tennessee	13,679	6,146	2,822	574	892	906	501	201	1,442	196
Virginia	14,704	6,240	3,462	261	875	778	744	262	1,775	308
West Virginia	4,316	1,977	882	89	309	243	128	67	521	100
Southwest	60,730	25,905	13,919	1,326	3,965	3,898	2,556	1,137	6,572	1,451
Arizona	9,168	3,532	2,559	187	476	622	459	196	958	180
New Mexico	3,202	1,538	590	39	182	206	138	60	353	96
Oklahoma	6,851	2,938	1,431	115	675	372	296	107	785	133
Texas	41,509	17,897	9,340	985	2,633	2,699	1,664	773	4,477	1,042

See footnotes at end of table.

Table 3—Continued

Personal Health Care Expenditures by Type of Service[1], Region, and State of Provider: Calendar Year 1991

Region and State of Provider	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[2]	Home Health Care[3]	Nursing Home Care[3]	Other Professional Services[4]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
	Millions of Dollars									
Rocky Mountains	$16,554	$6,860	$3,704	$256	$1,184	$1,056	$984	$371	$1,660	$480
Colorado	8,538	3,480	2,032	125	562	598	500	193	780	267
Idaho	1,871	752	410	27	154	105	128	31	223	41
Montana	1,770	764	325	36	163	125	85	32	183	57
Utah	3,524	1,483	794	56	242	173	224	100	373	78
Wyoming	851	381	142	12	62	54	47	15	100	37
Far West	108,075	40,546	31,284	1,557	5,557	7,505	6,907	1,801	10,829	2,088
Alaska	1,368	631	265	2	49	102	101	23	142	53
California	81,340	30,554	24,654	1,130	3,547	5,691	5,015	1,363	8,037	1,350
Hawaii	3,023	1,250	706	17	168	177	192	56	372	85
Nevada	3,098	1,162	879	63	124	239	182	64	337	49
Oregon	6,607	2,403	1,626	80	629	405	481	83	667	233
Washington	12,639	4,546	3,155	264	1,039	893	936	212	1,275	319

[1] National Health Account categories.
[2] Includes independent laboratory services.
[3] Services provided by freestanding facilities.
[4] Includes expenditures for end stage renal disease in freestanding facilities.

SOURCE: Health Care Financing Administration, Office of the Actuary: Estimates prepared by the Office of National Health Statistics, 1996.

gory of service, which are groups of services based on the establishments providing services. These establishments are defined by the Standard Industrial Classification coding system (Executive Office of the President, 1987). These NHA categories represent the standard classification system used in National Health Expenditure (NHE) reports (Levit et al., 1996). The NHA categories are as follows: hospital care, physician services, home health care, nursing homes, other professionals, medical durables, drugs and other non-durables, dental services, and other PHC.

The difference between Tables 3 and 4 measures the extent to which residence-based adjustment alters the PHC expenditure totals by State and Region. Except for services such as drugs and other non-durables, and other PHC, for which no adjustment is done, Table 4 presents the results of converting the estimates based on provider location of Table 3 into estimates based on State of beneficiary residence. The method for such conversion has been detailed in the previous section.

Per Capita Expenditure Estimates

Table 5 presents per capita expenditure estimates based on residence-based expenditure data in Table 4. To calculate per capita expenditures, the total PHC expenditures in Table 4 are divided by mid-year census population estimates by State for the year 1991. The estimates of per capita expenditures, based on expenditure data for resident beneficiaries in each State, serve as the major analytical tool for interstate comparisons and are one of the major objectives of developing border- crossing measures for Medicare and non-Medicare populations. Had this adjustment not been done, estimates of State spending per person could be produced only by using expenditures by location of provider and population by location of beneficiary residence.

The data in Table 5 indicate that, overall, the New England region spends the most per enrollee ($3,101), followed by the Mideast ($3,069), Great Lakes ($2,625), and Far West ($2,594). High-spending

Table 4

Personal Health Care Expenditures by Type of Service[1], Region, and State of Residence: Calendar Year 1991

Region and State of Residence	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[2]	Home Health Care[3]	Nursing Home Care[3]	Other Professional Services[4]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
	Millions of Dollars									
United States[5]	$667,592	$279,640	$150,237	$16,536	$57,142	$40,413	$31,663	$11,262	$67,051	$13,647
New England	40,954	16,560	8,003	1,143	5,272	2,475	1,999	568	3,763	1,170
Connecticut	10,852	3,976	2,323	302	1,577	608	611	178	927	351
Maine	3,032	1,254	554	74	390	178	141	46	306	88
Massachusetts	20,000	8,486	3,751	610	2,550	1,187	891	242	1,606	477
New Hampshire	2,774	1,121	585	54	229	211	149	41	289	96
Rhode Island	2,950	1,200	536	68	386	194	137	37	290	101
Vermont	1,346	524	253	35	140	97	71	23	146	57
Mideast	134,675	57,874	26,410	4,781	14,826	7,785	6,008	2,187	12,058	2,746
Delaware	1,940	811	422	39	193	120	84	31	190	50
District of Columbia	2,789	1,481	482	37	209	194	82	31	169	105
Maryland	13,572	5,609	3,276	249	976	734	665	239	1,566	258
New Jersey	22,520	9,321	5,000	538	1,874	1,480	1,229	359	2,233	487
New York	58,716	24,743	10,292	3,298	8,005	2,974	2,471	1,030	4,677	1,226
Pennsylvania	35,137	15,909	6,938	620	3,568	2,284	1,476	497	3,224	621
Great Lakes	111,235	48,100	23,973	2,088	10,859	6,257	5,141	1,871	11,138	1,808
Illinois	31,097	14,255	6,559	580	2,706	1,686	1,381	498	2,957	474
Indiana	13,842	5,891	2,854	191	1,655	815	548	250	1,431	207
Michigan	24,423	10,616	5,221	541	1,747	1,457	1,341	419	2,669	412
Ohio	29,164	12,382	6,492	491	3,214	1,583	1,206	477	2,925	393
Wisconsin	12,709	4,956	2,847	284	1,536	716	666	227	1,156	322
Plains	44,634	19,055	9,178	793	5,059	2,607	1,936	807	4,288	910
Iowa	6,940	3,057	1,363	97	795	397	313	144	676	98
Kansas	6,333	2,703	1,397	92	634	392	287	98	627	104
Minnesota	11,428	4,102	2,644	291	1,597	714	542	208	1,027	304
Missouri	12,949	6,064	2,434	241	1,212	751	500	230	1,284	232
Nebraska	3,711	1,663	706	52	410	175	166	75	381	83
North Dakota	1,594	677	334	12	222	73	61	26	147	44
South Dakota	1,680	789	302	8	189	105	67	27	147	46
Southeast	151,997	65,417	34,186	4,604	10,415	8,922	6,231	2,486	16,742	2,994
Alabama	10,439	4,542	2,504	370	604	530	383	150	1,110	246
Arkansas	5,565	2,426	1,305	96	491	272	214	64	610	87
Florida	38,508	15,007	9,650	1,607	2,563	2,676	1,688	745	3,926	646
Georgia	16,613	7,219	3,858	448	879	973	725	287	1,834	389
Kentucky	8,988	3,970	1,787	248	746	536	311	139	1,068	184
Louisiana	10,979	5,134	2,263	190	928	577	364	162	1,151	211
Mississippi	5,605	2,637	1,118	226	368	254	181	65	648	107
North Carolina	15,159	6,567	3,157	364	1,254	824	666	248	1,786	294
South Carolina	7,956	3,807	1,550	132	532	389	341	106	872	226
Tennessee	12,766	5,592	2,602	560	861	861	477	175	1,442	196
Virginia	14,854	6,387	3,459	267	868	781	738	270	1,775	308
West Virginia	4,567	2,131	933	95	320	248	143	77	521	100
Southwest	60,282	25,603	13,786	1,318	3,966	3,868	2,539	1,179	6,572	1,451
Arizona	8,925	3,474	2,450	179	458	595	442	191	958	180
New Mexico	3,381	1,628	659	42	187	210	143	65	353	96
Oklahoma	7,269	3,164	1,560	119	682	388	310	128	785	133
Texas	40,706	17,338	9,117	979	2,639	2,675	1,644	795	4,477	1,042
Rocky Mountains	16,589	6,840	3,763	258	1,178	1,058	982	370	1,660	480
Colorado	8,249	3,303	1,965	124	556	584	484	186	780	267
Idaho	2,116	882	491	29	157	115	141	36	223	41
Montana	1,838	795	351	37	164	128	89	34	183	57
Utah	3,365	1,383	761	56	235	168	215	96	373	78
Wyoming	1,021	477	195	12	65	63	53	18	100	37

See footnotes at end of table.

Table 4—Continued

Personal Health Care Expenditures by Type of Service[1], Region, and State of Residence: Calendar Year 1991

Region and State of Residence	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[2]	Home Health Care[3]	Nursing Home Care[3]	Other Professional Services[4]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
	Millions of Dollars									
Far West	$107,226	$40,190	$30,938	$1,552	$5,567	$7,442	$6,827	$1,793	$10,829	$2,088
Alaska	1,385	638	281	3	50	99	97	23	142	53
California	80,689	30,293	24,328	1,126	3,553	5,665	4,974	1,363	8,037	1,350
Hawaii	2,938	1,208	685	18	168	171	177	53	372	85
Nevada	3,011	1,134	875	63	131	207	160	55	337	49
Oregon	6,619	2,393	1,634	84	626	411	485	85	667	233
Washington	12,585	4,524	3,135	259	1,039	888	933	214	1,275	319

[1] National Health Account categories.
[2] Includes independent laboratory services.
[3] Services provided by freestanding facilities.
[4] Includes expenditures for end stage renal disease in free-standing facilities.
[5] The difference between U.S. totals in Tables 3 and 4 reflects services used by residents from outlying areas (i.e., Peurto Rico, Virgin Islands, and other U.S. territories). Because of incomplete information on dollars spent by U.S. residents outside the United States, the data in this table may be underestimated.

SOURCE: Health Care Financing Administration, Office of the Actuary: Estimates prepared by the Office of National Health Statistics, 1996.

States include Washington, DC ($4,693), Massachusetts ($3,333), Connecticut ($3,298), and New York ($3,255). The States with the lowest per capita expenditures are in the Rocky Mountains and South regions: Utah ($1,904), Idaho ($2,037), Mississippi ($2,162), and New Mexico ($2,185). Ranked by the U.S. average expenditures per capita, the highest to lowest NHA categories respectively are: hospital care ($1,109), physician services ($596), drugs and other non-durables ($266), nursing home care ($227), other professional services ($160), dental services ($126), home health care ($66), other personal care ($54), and durable medical supplies ($45). The spending on hospital and physician services contributes 41.8 and 22.5 percent, respectively, of total PHC expenditures. Since the major part of personal medical expenditures is accounted for by hospital care, these high (low)-spending States are also those with high (low) hospital expenditures per capita. The lowest per capita spending for hospital care is incurred in States such as Utah, Oregon, Idaho and Nevada, and the highest in States such as Washington, DC., Pennsylvania, New York, Massachusetts, and Illinois. States in the Far West region spend proportionately more for physician care (29 percent) and less for hospital care (37 percent), relative to the respective U.S. averages.

Although the data in Table 5 indicate State-to State variations in per capita spending, the spending was within 10 percent of the U.S. average in 28 out of 51 States (Table 6). This was consistent with a previous finding, based on provider-State data for the year 1982, which shows that more than one-half of the States fell within 10 percent of U.S. average (U.S. General Accounting Office, 1992) for per capita total PHC expenditures.[5] Thirteen States were above the U.S. average, and the remaining 38 States were below. Forty-two States spent within one standard deviation of the U.S. average per capita.

The inequality across States existed more or less for all services; however,

[5] 1991 per capita expenditure estimates, based on provider State data, also show that more than one-half (29 out of 51) States fell within the 10-percent range.

Table 5

Per Capita[1] Personal Health Care Expenditures by Type of Service[2], Region, and State of Residence: Calendar Year 1991

Region and State of Residence	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[3]	Home Health Care[4]	Nursing Home Care[4]	Other Professional Services[5]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
United States	$2,648	$1,109	$596	$66	$227	$160	$126	$45	$266	$54
New England	3,101	1,254	606	87	399	187	151	43	285	89
Connecticut	3,298	1,208	706	92	479	185	186	54	282	107
Maine	2,453	1,015	449	60	316	144	114	37	248	71
Massachusetts	3,333	1,414	625	102	425	198	148	40	301	80
New Hampshire	2,505	1,012	528	48	206	190	134	37	261	87
Rhode Island	2,937	1,195	534	68	385	193	137	37	288	101
Vermont	2,367	921	444	61	247	171	125	41	256	101
Mideast	3,069	1,319	602	109	338	177	137	50	275	63
Delaware	2,852	1,192	620	57	284	176	124	46	279	73
District of Columbia	4,693	2,492	810	62	351	327	138	53	284	176
Maryland	2,793	1,154	674	51	201	151	137	49	322	53
New Jersey	2,900	1,200	644	69	241	191	158	46	287	63
New York	3,255	1,372	571	183	444	165	137	57	259	68
Pennsylvania	2,941	1,332	581	52	299	191	124	42	270	52
Great Lakes	2,625	1,135	566	49	256	148	121	44	263	43
Illinois	2,698	1,237	569	50	235	146	120	43	257	41
Indiana	2,470	1,051	509	34	295	146	98	45	255	37
Michigan	2,607	1,133	557	58	186	155	143	45	285	44
Ohio	2,668	1,133	594	45	294	145	110	44	268	36
Wisconsin	2,568	1,001	575	57	310	145	135	46	234	65
Plains	2,508	1,071	516	45	284	147	109	45	241	51
Iowa	2,486	1,095	488	35	285	142	112	52	242	35
Kansas	2,542	1,085	561	37	254	157	115	39	251	42
Minnesota	2,580	926	597	66	361	161	122	47	232	69
Missouri	2,511	1,176	472	47	235	146	97	45	249	45
Nebraska	2,332	1,045	444	33	257	110	104	47	240	52
North Dakota	2,514	1,068	526	18	350	114	96	41	231	69
South Dakota	2,393	1,123	430	11	269	149	96	39	209	66
Southeast	2,522	1,086	567	76	173	148	103	41	278	50
Alabama	2,554	1,111	613	91	148	130	94	37	272	60
Arkansas	2,347	1,023	550	41	207	115	90	27	257	37
Florida	2,897	1,129	726	121	193	201	127	56	295	49
Georgia	2,508	1,090	583	68	133	147	110	43	277	59
Kentucky	2,419	1,069	481	67	201	144	84	37	287	49
Louisiana	2,589	1,210	534	45	219	136	86	38	271	50
Mississippi	2,162	1,017	431	87	142	98	70	25	250	41
North Carolina	2,245	973	468	54	186	122	99	37	264	44
South Carolina	2,238	1,071	436	37	150	109	96	30	245	64
Tennessee	2,579	1,130	526	113	174	174	96	35	291	40
Virginia	2,363	1,016	550	42	138	124	117	43	282	49
West Virginia	2,539	1,185	519	53	178	138	79	43	290	56
Southwest	2,334	991	534	51	154	150	98	46	255	56
Arizona	2,382	927	654	48	122	159	118	51	256	48
New Mexico	2,185	1,052	426	27	121	136	92	42	228	62
Oklahoma	2,295	999	492	38	215	123	98	41	248	42
Texas	2,345	999	525	56	152	154	95	46	258	60
Rocky Mountains	2,229	919	506	35	158	142	132	50	223	65
Colorado	2,447	980	583	37	165	173	143	55	231	79
Idaho	2,037	849	473	28	152	111	136	35	215	39
Montana	2,274	984	434	45	203	158	111	42	227	71
Utah	1,904	783	431	32	133	95	121	54	211	44
Wyoming	2,229	1,042	425	26	143	137	115	40	219	82

See footnotes at end of table.

Table 5—Continued

Per Capita[1] Personal Health Care Expenditures by Type of Service[2], Region, and State of Residence: Calendar Year 1991

Region and State of Residence	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[3]	Home Health Care[4]	Nursing Home Care[4]	Other Professional Services[5]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
Far West	$2,594	$972	$748	$38	$135	$180	$165	$43	$262	$51
Alaska	2,431	1,121	493	5	88	174	170	40	249	93
California	2,653	996	800	37	117	186	164	45	264	44
Hawaii	2,592	1,066	605	16	148	151	156	47	328	75
Nevada	2,342	882	681	49	102	161	125	43	262	38
Oregon	2,267	820	560	29	215	141	166	29	229	80
Washington	2,508	902	625	52	207	177	186	43	254	63

[1] Mid-year census estimates of U.S. population, 1991.
[2] National Health Account categories.
[3] Includes independent laboratory services.
[4] Services provided by freestanding facilities.
[5] Includes expenditures for end stage renal disease in freestanding facilities.

SOURCE: Health Care Financing Administration, Office of the Actuary: Estimates prepared by the Office of National Health Statistics, 1996.

home health and nursing home care are services for which these fluctuations were the most apparent. In spending for home health care, the difference between the highest (New York) and the lowest ranking States (Alaska) was manyfold. For nursing homes, the Mideast and New England regions spent around 50-75 percent above the U.S. average, while South and Rocky Mountains regions spent 24-30 percent less than the U.S. average. Measured by the coefficient of variation, per capita home health and nursing home expenditures demonstrate the highest variation (55.62 and 39.99 percent, respectively) across States; drugs and non-durables show the least (10.17 percent). Hospital and physician services show moderate fluctuations (21.38 and 16.88 percent) across States. A major part of fluctuations for total as well as hospital expenditures was accounted for by expenditures by District of Columbia residents. When the District of Columbia is excluded, the values of coefficient of variation drops from 21.38 to 12.03 percent for per capita hospital expenditures, and from 16.20 to 11.52 percent for per capita total expenditures.

Effect of Border Crossing

In order to study the effect of border-crossing adjustment, the changes in the distribution of per capita expenditures across States are examined. This is accomplished by analyzing the difference between per capita expenditures with and without border-crossing adjustment. Although it is found that fluctuations in per capita expenditures across States still persisted, the border crossing adjustment actually reduced such variation to some extent. The coefficient of variation estimated for total per capita expenditures showed a decline from 24.43 percent to 16.20 percent as a result of using expenditure measures adjusted for State of beneficiary residence.[6] By service, the highest reduction in coefficient of variation was observed for hospital care (from 37.15 per-

[6] A major factor contributing to the reduction in variability was the redistribution of expenditures from the District of Columbia to Maryland and Virginia, where a large volume of the District of Columbia patients reside. Had the District not been included, the variability of per capita expenditure would change only insignificantly between these measures (from 13 percent to 11 percent). This was particularly true for hospital care and physician services, where large scale border crossing by Maryland and Virginia residents to the District of Columbia occurs. For most other services, the effect of including or excluding this area was insignificant.

Table 6

Per Capita Personal Health Care Expenditures as a Percent of U.S. Average Per Capita by Type of Service[1], Region, and State of Residence: Calendar Year 1991

Region and State of Residence	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[2]	Home Health Care[3]	Nursing Home Care[3]	Other Professional Services[4]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
United States	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
New England	117.11	113.05	101.69	131.94	176.15	116.91	120.54	96.26	107.15	163.70
Connecticut	124.56	108.94	118.47	140.10	211.43	115.28	147.76	120.86	105.97	196.87
Maine	92.65	91.50	75.30	91.49	139.39	89.80	90.62	83.84	93.12	131.02
Massachusetts	125.88	127.51	104.92	155.00	187.50	123.41	118.24	90.23	113.19	146.99
New Hampshire	94.60	91.22	88.69	73.85	91.09	118.82	106.95	83.48	98.00	160.81
Rhode Island	110.94	107.73	89.62	103.43	169.78	120.51	108.77	83.46	108.44	185.70
Vermont	89.40	83.07	74.53	92.86	108.92	106.63	99.58	92.08	96.29	185.95
Mideast	115.90	118.91	101.00	166.13	149.07	110.68	109.01	111.59	103.32	115.61
Delaware	107.71	107.45	104.08	87.09	125.51	109.73	98.89	103.65	105.00	134.93
District of Columbia	177.26	224.65	136.00	94.80	155.06	204.16	109.78	118.56	106.81	325.05
Maryland	105.49	104.08	113.15	78.28	88.61	94.19	108.95	109.95	121.19	98.13
New Jersey	109.53	108.22	108.06	105.72	106.49	118.89	126.01	103.37	108.11	115.84
New York	122.93	123.67	95.75	278.74	195.82	102.86	109.08	127.83	97.49	125.59
Pennsylvania	111.08	120.07	97.46	79.14	131.78	119.26	98.42	93.18	101.47	96.00
Great Lakes	99.14	102.34	94.94	75.13	113.06	92.12	96.61	98.86	98.84	78.81
Illinois	101.91	111.52	95.52	76.73	103.61	91.26	95.40	96.75	96.49	76.01
Indiana	93.30	94.79	85.47	52.02	130.36	90.80	77.83	99.85	96.00	68.12
Michigan	98.46	102.17	93.52	88.07	82.29	97.00	113.99	100.25	107.14	81.33
Ohio	100.77	102.14	99.68	68.56	129.74	90.33	87.86	97.67	100.64	66.38
Wisconsin	97.00	90.30	96.55	87.61	136.93	90.30	107.12	102.67	87.83	120.10
Plains	94.72	96.54	86.56	67.91	125.42	91.41	86.63	101.56	90.61	94.50
Iowa	93.90	98.75	81.92	52.80	125.71	88.74	89.32	115.50	91.02	65.20
Kansas	96.00	97.83	94.07	56.47	112.20	98.26	91.78	87.82	94.57	76.75
Minnesota	97.45	83.51	100.20	100.14	159.11	100.57	97.37	105.10	87.18	126.64
Missouri	94.83	106.02	79.20	71.24	103.73	90.91	77.18	99.82	93.65	83.08
Nebraska	88.07	94.24	74.45	49.99	113.61	68.78	82.93	104.82	90.09	96.20
North Dakota	94.95	96.25	88.33	27.97	154.43	71.37	76.82	91.04	87.05	126.99
South Dakota	90.38	101.28	72.16	17.39	118.69	93.01	76.53	87.39	78.59	122.10
Southeast	95.26	97.87	95.20	116.49	76.26	92.36	82.34	92.36	104.47	91.79
Alabama	96.47	100.20	102.84	138.19	65.22	80.95	74.67	82.00	102.11	111.00
Arkansas	88.64	92.25	92.37	61.78	91.36	71.54	71.97	60.13	96.79	67.48
Florida	109.40	101.78	121.82	184.37	85.06	125.61	101.13	125.40	111.06	89.81
Georgia	94.73	98.27	97.76	103.04	58.59	91.69	87.20	97.18	104.13	108.41
Kentucky	91.37	96.36	80.74	101.95	88.64	89.93	66.59	83.53	108.06	91.29
Louisiana	97.77	109.14	89.56	68.26	96.53	84.94	68.29	85.28	102.04	91.90
Mississippi	81.67	91.72	72.38	133.20	62.71	61.17	55.66	55.85	94.04	76.54
North Carolina	84.80	87.71	78.47	82.15	81.93	76.10	78.56	82.31	99.46	80.56
South Carolina	84.51	96.54	73.16	56.77	66.07	68.18	76.44	66.96	92.19	117.64
Tennessee	97.41	101.87	88.22	172.50	76.73	108.58	76.67	79.16	109.55	73.30
Virginia	89.24	91.61	92.35	64.70	60.96	77.53	93.53	96.13	106.15	90.52
West Virginia	95.89	106.81	87.02	80.55	78.51	86.07	63.10	95.22	108.93	102.65
Southwest	88.17	89.40	89.60	77.80	67.77	93.45	78.29	102.20	95.71	103.79
Arizona	89.98	83.60	109.74	72.66	53.99	99.05	93.87	114.06	96.11	88.76
New Mexico	82.54	94.84	71.43	41.00	53.36	84.61	73.43	93.52	85.84	114.94
Oklahoma	86.67	90.06	82.65	57.22	94.98	76.46	77.97	90.82	93.17	77.34
Texas	88.55	90.04	88.13	85.95	67.07	96.13	75.42	102.50	96.96	110.86
Rocky Mountains	84.18	82.86	84.86	52.78	69.85	88.66	105.04	111.43	83.86	119.23
Colorado	92.43	88.36	97.85	56.11	72.82	108.02	114.23	123.48	87.01	146.50
Idaho	76.93	76.52	79.38	42.72	66.90	69.04	108.35	78.18	80.85	72.20
Montana	85.88	88.69	72.80	69.02	89.52	98.68	88.17	93.82	85.25	131.05
Utah	71.92	70.56	72.32	48.35	58.69	59.44	96.69	121.54	79.41	81.18
Wyoming	84.19	93.93	71.36	39.50	62.97	85.74	91.87	90.19	82.27	151.20

See footnotes at end of table.

Table 6—Continued

Per Capita Personal Health Care Expenditures as a Percent of U.S. Average Per Capita by Type of Service[1], Region, and State of Residence: Calendar Year 1991

Region and State of Residence	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[2]	Home Health Care[3]	Nursing Home Care[3]	Other Professional Services[4]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
Far West	97.96	87.65	125.59	57.24	59.42	112.30	131.50	97.09	96.50	93.31
Alaska	91.83	101.07	82.68	7.89	38.91	108.26	135.41	88.81	93.48	170.95
California	100.19	89.80	134.23	56.43	51.54	116.21	130.23	100.34	99.36	82.00
Hawaii	97.88	96.09	101.49	24.16	65.51	94.33	124.46	104.14	123.39	137.85
Nevada	88.47	79.55	114.30	74.73	44.84	100.43	99.35	95.93	98.49	70.15
Oregon	85.64	73.92	93.93	43.69	94.66	87.87	132.43	65.44	85.94	147.60
Washington	94.72	81.29	104.84	78.62	91.38	110.40	148.04	95.41	95.57	117.30

[1] National Health Account categories.
[2] Includes independent laboratory services.
[3] Services provided by freestanding facilities.
[4] Includes expenditures for end stage renal disease in freestanding facilities.

SOURCE: Health Care Financing Administration, Office of the Actuary: Estimates prepared by the Office of National Health Statistics, 1996.

cent to 21.38 percent), followed by physician services (from 23.96 percent to 16.88 percent), and durable medical supplies (from 21.17 percent to 16.43 percent) and the lowest for services such as home health and nursing home care (Table 7). In spite of varying substantially across States, the distribution of home health and nursing home expenditures was not particularly affected by the border-crossing adjustment. This can be explained by the fact that border crossing for these services occurred less frequently than for services such as hospital and physician care.

By State, the effect of border crossing was found to be very large for certain States (9-26 percent), such as the District of Columbia, Wyoming, Idaho, North Dakota, and Minnesota.[7] The per capita spending declined in the District of Columbia, Minnesota, and North Dakota, and increased in Wyoming and Idaho. Border-crossing adjustment, on the other hand, had minimal overall effects in Florida, Connecticut, Indiana, Ohio, Oregon and Louisiana (less than 0.5 percent). For 11 States, changes in average per capita expenditures were less than 1 percent. In 18 out of 51 States, percent changes in per capita spending were above the statewide mean. By service, the highest average change was observed for durable medical supplies, which seems to be a result of large-scale border crossing reported for this service, especially for Medicare beneficiaries. However, a large part of this could be attributed to centralized billing offices located outside the States where services are actually rendered, contributing to ambiguity in correctly identifying the location of the provider from the Medicare data (Basu, Lazenby, and Levit, 1995).

In comparison with Medicare spending (Basu, Lazenby, and Levit et al., 1995), average per capita total spending changed by a lesser magnitude due to border crossing adjustment. While the border crossing caused an average change in per capita expenditures of 5.8 percent for Medicare patients, the corresponding change was 4.7 percent for total population.[8] Such differences can be accounted for by the fact that the impact of border crossing was somewhat dampened in the total as total personal health expenditures included services such as drugs and other personal

[7] Because of the use of the same denominator for calculating both provider-based and residence-based per capita expenditures, these percentages reflect the percent differences between Tables 3 and 4.

[8] Calculated as mean (unweighted) of absolute values of percent changes.

Table 7

Comparison of Coefficient of Variation: Per Capita Personal Health Care Expenditures Based on Provider State and Residence State: Calendar Year 1991

NHA Category	Provider State	Residence State	Percent Difference
Total	24.43	16.20	-33.68
Hospital Services	37.15	21.38	-42.44
Physician Services	23.96	16.88	-29.54
Home Health Care	56.56	55.62	-1.66
Nursing Home Care	40.39	39.99	-0.99
Other Professional Services	26.49	23.23	-12.30
Dental Services	24.08	22.13	-8.09
Medical Durables	21.17	16.43	-22.39
Drugs and Other Non-Durables[1]	10.17	10.17	0.00
Other Personal[1]	39.41	39.41	0.00

[1] No border-crossing adjustment is made.

NOTE: NHA is national health account.

SOURCE: Health Care Financing Administration, Office of the Actuary, 1996.

care, as well as segments of the population, such as those under Medicaid, for which border crossing was assumed to be insignificant in this study. Border crossing, however, reduced the coefficient of variation nearly by the same proportion for total (from 24 percent to 16 percent) as for Medicare (22 percent to 15 percent) expenditures per capita.

Inflows and Outflows

The magnitude and the direction of the impact of border-crossing adjustment can be better understood by examining the rates of inflow and outflow of expenditures from one State to another. Tables 8 and 9 show these rates, which are computed as follows: the inflow rate is the percentage of total expenditures that are incurred by out-of-State residents in the provider State; the outflow rate is the percentage of out-of-State spending incurred by residents of a State. An outflow of expenditures indicates import of services and an inflow of expenditures implies export of services.

The border-crossing rates (measured by rates of inflow and outflow of expenditures) and the changes in per capita expenditures between provider-based and residence-based data are directly related to each other. The data show that States with higher inflow than outflow rates were those whose total as well as per capita expenditures declined as a result of reallocation of funds to the beneficiary residence location. These States included the District of Columbia, North Dakota, Minnesota, and Tennessee. The reverse was the case for those whose outflow rates were higher than inflow rates. These States included Wyoming, Idaho, Mississippi, and Iowa. A higher proportion of States (59 percent) had an upward adjustment in per capita as well as total spending because their outflow rates were above the inflow rates.

Since the inflow and outflow rates in Tables 8 and 9 measure flows of PHC expenditures among total population, they represent weighted averages of the corresponding rates for Medicare and non-Medicare population. Within non-Medicare, those under Medicaid are assumed not to cross State borders and accordingly would have zero inflow and outflow. This fact is reflected in the rates shown in Tables 8 and 9, which are found to be less than the corresponding rates for both Medicare and the non-Medicare non-Medicaid population. While the U.S. average inflow and outflow rates were respectively 4.78 and 4.73 per-

Table 8

Percent of Total Personal Health Care Expenditures Incurred by Out-of-State Residents (Inflow Rate)[1] in Region and State of Provider, by Type of Service[2]: Calendar Year 1991

Region and State of Provider	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[3]	Home Health Care[4]	Nursing Home Care[4]	Other Professional Services[5]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
United States	4.78	5.93	6.07	2.22	2.41	4.58	4.84	9.36	NA	NA
New England	5.31	6.93	7.07	1.58	2.41	6.02	5.77	8.46	NA	NA
Connecticut	3.61	4.75	4.99	1.46	1.91	3.93	3.12	5.31	NA	NA
Maine	3.17	4.07	4.27	1.99	1.84	3.67	3.98	3.72	NA	NA
Massachusetts	5.12	6.59	6.79	1.10	2.73	4.58	5.52	9.69	NA	NA
New Hampshire	12.32	16.16	15.62	5.57	4.07	13.32	14.74	16.94	NA	NA
Rhode Island	5.67	6.80	8.01	2.29	1.25	11.59	7.60	8.95	NA	NA
Vermont	11.82	17.32	15.41	2.65	4.26	13.01	12.69	13.35	NA	NA
Mideast	4.74	5.95	6.68	1.44	1.75	4.13	4.47	12.01	NA	NA
Delaware	8.15	9.71	10.31	7.04	4.04	9.61	11.32	16.44	NA	NA
District of Columbia	33.22	38.10	44.17	20.97	1.04	18.28	35.66	35.77	NA	NA
Maryland	5.97	6.30	8.85	3.36	4.29	6.31	6.82	11.24	NA	NA
New Jersey	3.75	3.31	5.44	2.28	2.99	3.80	4.03	22.89	NA	NA
New York	2.81	3.68	4.53	0.82	0.74	2.59	2.94	3.54	NA	NA
Pennsylvania	4.87	5.98	5.90	1.60	2.55	4.02	3.88	17.68	NA	NA
Great Lakes	3.27	3.93	4.10	1.67	2.11	2.85	3.04	9.63	NA	NA
Illinois	2.62	2.82	3.16	1.31	1.69	2.05	2.41	16.19	NA	NA
Indiana	5.75	7.47	7.22	2.52	3.77	4.98	4.92	6.23	NA	NA
Michigan	1.70	1.99	1.97	1.30	1.03	1.73	1.94	6.09	NA	NA
Ohio	3.61	4.34	4.53	2.25	2.31	3.24	3.59	8.67	NA	NA
Wisconsin	4.30	5.72	5.88	1.53	1.77	3.66	4.03	5.90	NA	NA
Plains	9.69	11.46	14.62	4.90	3.91	9.36	9.40	13.51	NA	NA
Iowa	5.64	6.95	6.47	3.60	5.76	5.80	4.43	5.86	NA	NA
Kansas	5.36	5.68	6.61	16.92	4.15	5.72	5.79	14.47	NA	NA
Minnesota	13.28	14.80	22.36	1.99	2.34	13.69	13.85	21.41	NA	NA
Missouri	9.18	11.48	12.69	4.00	3.26	7.63	8.10	9.48	NA	NA
Nebraska	9.64	12.93	11.11	2.89	7.10	7.23	7.36	8.51	NA	NA
North Dakota	16.78	21.59	21.34	9.90	7.05	16.86	16.67	18.49	NA	NA
South Dakota	10.85	13.44	14.64	5.22	1.77	14.12	14.20	17.25	NA	NA
Southeast	5.60	6.83	7.07	2.94	3.16	5.80	6.12	10.64	NA	NA
Alabama	3.85	4.77	4.73	1.07	1.71	4.88	4.35	7.13	NA	NA
Arkansas	5.90	7.71	5.99	2.83	6.37	5.00	4.43	12.69	NA	NA
Florida	6.67	8.07	7.67	4.15	4.08	7.88	8.57	12.20	NA	NA
Georgia	5.18	6.53	6.42	1.61	2.52	4.49	5.38	9.00	NA	NA
Kentucky	5.12	6.43	7.47	2.85	1.82	4.75	4.97	7.60	NA	NA
Louisiana	3.14	4.02	4.18	0.94	0.92	2.38	2.73	5.90	NA	NA
Mississippi	3.21	3.72	4.45	1.19	2.05	4.26	4.80	9.27	NA	NA
North Carolina	4.40	5.41	6.46	2.65	1.85	3.31	4.09	7.49	NA	NA
South Carolina	2.88	3.37	3.44	1.29	1.64	2.93	3.89	13.29	NA	NA
Tennessee	9.39	11.85	11.46	3.60	6.80	7.15	8.46	21.87	NA	NA
Virginia	5.36	6.27	7.59	2.80	3.06	5.42	5.57	6.54	NA	NA
West Virginia	9.35	11.39	13.12	3.89	3.79	11.03	10.15	11.62	NA	NA
Southwest	4.35	5.43	5.43	2.25	2.47	3.98	4.99	5.91	NA	NA
Arizona	9.03	9.51	11.29	7.18	8.92	10.57	12.58	12.17	NA	NA
New Mexico	4.59	6.05	4.46	2.62	2.23	5.97	5.32	5.13	NA	NA
Oklahoma	2.32	2.74	3.07	1.18	1.65	2.80	2.53	4.03	NA	NA
Texas	3.63	5.02	4.25	1.42	1.54	2.47	3.30	4.65	NA	NA
Rocky Mountains	6.16	8.16	7.02	2.51	3.47	5.86	6.35	7.65	NA	NA
Colorado	6.09	8.20	6.66	2.56	3.18	5.42	5.94	8.52	NA	NA
Idaho	6.11	7.29	7.60	2.73	3.51	8.91	8.00	8.30	NA	NA
Montana	4.69	6.36	6.59	0.82	1.16	4.45	4.54	4.43	NA	NA
Utah	7.34	9.94	8.02	3.02	4.93	6.45	6.92	7.06	NA	NA
Wyoming	5.17	6.28	5.82	4.23	6.28	6.14	6.73	5.97	NA	NA

See footnotes at end of table.

Table 8—Continued

Percent of Total Personal Health Care Expenditures Incurred by Out-of-State Residents (Inflow Rate)[1] In Region and State of Provider, by Type of Service[2]: Calendar Year 1991

Region and State of Provider	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[3]	Home Health Care[4]	Nursing Home Care[4]	Other Professional Services[5]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
Far West	2.94	3.64	3.25	2.21	1.74	2.97	3.47	4.93	NA	NA
Alaska	5.40	6.76	5.09	3.84	0.10	7.04	8.34	8.59	NA	NA
California	2.02	2.40	2.36	1.64	1.45	1.81	2.20	3.39	NA	NA
Hawaii	4.46	5.21	5.03	1.49	1.19	5.22	9.21	9.00	NA	NA
Nevada	13.10	15.77	12.88	4.43	4.73	19.44	21.22	24.42	NA	NA
Oregon	5.74	8.05	6.66	3.42	2.78	5.58	5.49	10.19	NA	NA
Washington	4.24	5.67	5.20	3.79	1.90	3.88	4.09	5.36	NA	NA

[1] Provider State expenditures for residents of non-provider States divided by total expenditures for provider State.
[2] National Health Account categories.
[3] Includes independent laboratory services.
[4] Services provided by freestanding facilities.
[5] Includes expenditures for end stage renal disease in freestanding facilities.

NOTE: NA is not applicable; no inflows or outflows occur for services marked NA.

SOURCE: Health Care Financing Administration, Office of the Actuary: Estimates prepared by the Office of National Health Statistics, 1996.

cent for total population,[9] the corresponding rates for the Medicare and the non-Medicare non-Medicaid population were, respectively, 6.79 and 6.74 percent, and 6.11 and 6.05 percent.

In terms of rates of inflow and outflow, the highest to lowest ranking services were the following: medical durables, physician services, hospital services, dental services, other professional services, nursing homes, and home health care. This hierarchy is consistent with that observed for Medicare beneficiaries for Medicare-covered services. The out-of-State purchase of durable medical supplies tops the list for Medicare as well as for total population. However, this is caused more by the spending patterns of Medicare than non-Medicare population, which could again be partially caused by centralized billing and inability to identify the provider location in the Medicare data. While the Medicare inflow and outflow rates were respectively 21.11 and 20.96 percent (Basu, Lazenby, and Levit, 1995), the corresponding non-Medicare rates[10] were 5.14 and 5.10 percent. The significantly lower border-crossing rate for non-Medicare population is also a result of using Medicare trimmed flow matrix for other professionals instead of that for medical durables to adjust non-Medicare provider-based data for medical durables.

There was very little border crossing observed for home health service. Medicare and non-Medicare non-Medicaid rates were comparable for this service, although Medicare had slightly higher rates (2.74 and 2.72 percent) than non-Medicare non-Medicaid (2.54 and 2.48 percent). The higher Medicare border-crossing rate for home health was a result of the fact that out-of-State spending by total Medicare population for this service was higher (Table 1) than that incurred by Medicare patients in the 65-70 age group (which forms the basis for non-Medicare non-Medicaid flows). Except for physician service, home health, and durable medical supplies, non-Medicare non-Medicaid rates were generally higher than Medicare rates for rest of the services. This is

[9] The discrepancy between U.S. average inflow and outflow rates can be accounted for by the inflow and outflow of funds to and from areas outside the United States.

[10] The spending on durable medical equipment by Medicaid population could not be separately identified from the data.

Table 9

Percent of Total Personal Health Care Expenditures for State Residents Incurred Outside the State of Residence (Outflow Rate)[1] In Region and State of Residence, by Type of Service[2]: Calendar Year 1991

Region and State of Residence	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[3]	Home Health Care[4]	Nursing Home Care[4]	Other Professional Services[5]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
United States	4.73	5.87	6.02	2.18	2.38	4.55	4.80	9.28	NA	NA
New England	4.53	5.74	6.08	1.93	1.59	5.85	5.36	10.59	NA	NA
Connecticut	3.55	4.96	4.43	1.64	1.31	4.73	3.20	6.41	NA	NA
Maine	6.31	7.64	10.16	3.32	0.46	9.28	9.14	11.82	NA	NA
Massachusetts	2.44	2.85	3.29	1.32	0.70	3.78	3.57	8.25	NA	NA
New Hampshire	13.18	17.58	15.88	6.91	7.73	11.60	14.16	21.50	NA	NA
Rhode Island	7.34	8.61	9.70	1.84	4.58	10.20	9.30	25.49	NA	NA
Vermont	15.45	21.99	23.21	4.68	5.66	10.83	12.80	21.08	NA	NA
Mideast	4.83	6.01	6.89	1.56	1.81	4.79	4.93	9.31	NA	NA
Delaware	10.50	13.47	13.99	2.63	5.44	7.73	10.45	18.78	NA	NA
District of Columbia	9.18	4.22	23.31	13.25	11.62	11.00	24.09	35.23	NA	NA
Maryland	9.73	14.86	9.61	5.89	2.61	7.97	7.56	9.64	NA	NA
New Jersey	7.87	10.93	9.77	2.13	2.93	6.35	5.19	11.71	NA	NA
New York	3.10	3.52	5.03	0.82	1.32	4.09	3.84	7.99	NA	NA
Pennsylvania	3.23	3.65	4.69	2.48	1.34	2.99	3.96	7.91	NA	NA
Great Lakes	5.00	6.07	6.87	2.70	2.12	4.99	4.64	8.16	NA	NA
Illinois	6.23	7.56	8.60	2.24	3.07	5.31	4.93	8.44	NA	NA
Indiana	5.63	7.05	8.30	4.63	1.33	5.04	6.01	8.84	NA	NA
Michigan	4.11	4.83	5.79	2.44	2.55	3.87	3.51	6.76	NA	NA
Ohio	3.73	4.52	4.62	2.91	1.70	4.79	4.00	7.69	NA	NA
Wisconsin	5.88	7.16	8.59	2.50	1.68	6.92	6.32	10.35	NA	NA
Plains	7.33	8.63	10.75	5.03	2.91	7.64	8.17	12.06	NA	NA
Iowa	11.52	13.07	19.12	3.68	4.11	11.79	12.38	12.21	NA	NA
Kansas	10.57	13.23	14.37	8.50	3.78	9.29	9.62	15.66	NA	NA
Minnesota	4.84	7.10	5.96	1.87	1.37	4.66	5.40	6.81	NA	NA
Missouri	4.78	4.72	7.39	7.63	3.13	4.54	6.01	13.84	NA	NA
Nebraska	7.51	8.45	11.84	4.98	3.84	8.42	7.58	11.79	NA	NA
North Dakota	8.63	8.93	12.62	8.29	3.20	17.91	14.97	18.40	NA	NA
South Dakota	12.90	13.74	20.79	13.36	4.23	19.99	15.92	17.99	NA	NA
Southeast	5.81	7.13	7.31	2.36	3.75	5.18	6.27	12.66	NA	NA
Alabama	4.83	5.41	5.75	1.08	5.69	5.71	5.91	15.60	NA	NA
Arkansas	9.43	11.11	11.57	4.28	6.43	9.95	10.12	30.65	NA	NA
Florida	6.72	8.78	8.14	2.07	4.24	5.14	7.88	9.61	NA	NA
Georgia	3.47	4.21	4.02	1.17	2.61	4.21	3.39	8.53	NA	NA
Kentucky	6.88	8.08	8.78	2.63	6.20	6.52	9.47	17.11	NA	NA
Louisiana	2.88	3.45	3.37	1.61	0.93	2.29	3.19	16.53	NA	NA
Mississippi	10.30	12.44	15.42	3.72	3.62	8.94	8.94	25.66	NA	NA
North Carolina	3.60	4.11	4.77	1.38	2.94	3.45	3.80	12.23	NA	NA
South Carolina	7.67	8.92	11.32	7.52	2.69	7.57	6.99	16.37	NA	NA
Tennessee	2.90	3.11	3.98	1.19	3.45	2.32	3.83	10.37	NA	NA
Virginia	6.32	8.42	7.53	4.74	2.36	5.84	4.87	9.41	NA	NA
West Virginia	14.34	17.77	17.81	10.15	7.16	13.04	19.56	22.90	NA	NA
Southwest	3.64	4.32	4.52	1.65	2.51	3.24	4.32	9.22	NA	NA
Arizona	6.55	7.98	7.36	2.57	5.51	6.48	9.24	9.61	NA	NA
New Mexico	9.65	11.23	14.36	9.06	4.89	7.81	8.27	11.88	NA	NA
Oklahoma	7.94	9.68	11.10	4.78	2.67	6.97	6.93	19.71	NA	NA
Texas	1.73	1.96	1.92	0.78	1.78	1.61	2.17	7.21	NA	NA

See footnotes at end of table.

Table 9—Continued

Percent of Total Personal Health Care Expenditures for State Residents Incurred Outside the State of Residence (Outflow Rate)[1] in Region and State of Residence, by Type of Service[2]: Calendar Year 1991

Region and State of Residence	Personal Health Care Expenditures									
	Total	Hospital Services	Physician Services[3]	Home Health Care[4]	Nursing Home Care[4]	Other Professional Services[5]	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
Rocky Mountains	6.36	7.89	8.49	3.24	3.02	6.02	6.14	7.56	NA	NA
Colorado	2.80	3.29	3.46	1.96	2.17	3.05	2.74	4.84	NA	NA
Idaho	16.96	20.87	22.85	9.61	5.55	16.56	16.72	22.80	NA	NA
Montana	8.20	9.97	13.36	2.59	1.93	6.66	9.43	10.39	NA	NA
Utah	2.96	3.41	4.12	2.47	1.96	3.82	2.71	3.08	NA	NA
Wyoming	20.99	25.23	31.26	6.75	10.73	18.93	17.28	22.95	NA	NA
Far West	2.17	2.79	2.16	1.86	1.93	2.14	2.34	4.48	NA	NA
Alaska	6.56	7.86	10.21	24.61	2.43	4.42	4.35	6.73	NA	NA
California	1.23	1.56	1.05	1.26	1.60	1.37	1.41	3.40	NA	NA
Hawaii	1.69	1.90	2.21	4.20	1.30	2.33	1.78	2.85	NA	NA
Nevada	10.56	13.69	12.54	4.36	9.54	7.07	10.50	11.65	NA	NA
Oregon	5.92	7.68	7.12	7.36	2.31	7.09	6.33	13.16	NA	NA
Washington	3.82	5.21	4.58	1.64	1.93	3.36	3.72	6.19	NA	NA

[1] Expenditures by residents for services provided in non-resident States divided by total expenditures incurred by residents of a State.
[2] National Health Account categories.
[3] Includes independent laboratory services.
[4] Services provided by freestanding facilities.
[5] Includes expenditures for end stage renal disease in freestanding facilities.

NOTE: NA is not applicable; no outflows or inflows occur for services marked NA.

SOURCE: Health Care Financing Administration, Office of the Actuary: Estimates prepared by the Office of National Health Statistics, 1996.

because out-of-State spending was generally higher in the Medicare 65-70 age group than in other age groups or across all age groups.[11] The border-crossing rate for nursing home services in total population (around 2.4 percent) was found to be significantly lower than either Medicare (4.3 percent) or non-Medicare non-Medicaid rates (around 4.6 percent), attributable to a large proportion of Medicaid population using this service (48 percent against a range of 2-15 percent for other services). The hospital care and physician service show moderate to high border-crossing rates (around 6 percent), slightly above the average for all services. The border-crossing rates for these services in the total population, although lower than either Medicare or non-Medicare non-Medicaid rates, were comparable with them. For other professionals and dental services, the border-crossing rates were closest to the average for all services (about 5 percent).

The statewide distribution of inflow and outflow rates indicate significant variations across States. The Plains region shows the highest rates (9.69 and 7.33 percent), while the Far West shows the least (2.94 and 2.17 percent). This pattern was generally observed across all services. The pattern was also similar to the Medicare pattern. The regions having net outflows were the Mideast, Great Lakes, and Rocky Mountains. Although the States with higher inflow than outflow rates were generally those with high per capita expenditures (e.g., the District of Columbia, Massachusetts, Connecticut, Pennsylvania), the outflow rates were above inflow rates in majority (30 out of 51) States. The inflow rates, however, varied more widely than

[11] Although this was also true for physician services, the higher inflow and outflow rates for physician services for Medicare patients was partially the result of separately adjusting laboratory expenditures (Medicare border-crossing rate for laboratory services was very high, as indicated in Table 1) before combining them with physician expenditures. For non-Medicare, non-Medicaid, laboratory expenditures were included under physician expenditures and were not separately adjusted.

outflow rates across States. A major part of such variation could be attributed to a much higher inflow rate to the District of Columbia, which was nearly 4 times higher than the outflow rate (33.22 percent against 9.18 percent) from that area. This explains the significant decline in per capita spending in that area (2.41 times the U.S. average to 1.77) as a result of the border-crossing adjustment, although the per capita spending still remained high because of its high initial level relative to the U.S. average.[12] A significant part of these expenditures was for hospital services, contributed by large inflows to hospitals in that area.

CONCLUSION

The article presents the results from an effort to estimate PHC expenditures by State of provider and State of beneficiary residence. Because of limited data on non-Medicare sources, the Medicare border-crossing pattern was used with refinement to account for the non-elderly travel pattern. The article presents the combined estimates for both Medicare and non-Medicare expenditures by State, before and after the border-crossing adjustment is made. The effect on per capita expenditure estimates is analyzed in light of the inflow and outflow rates for each State. The data shows that border-crossing adjustment caused an upward adjustment in per capita expenditures in 30 out of 51 States. These were the States in which outflows exceeded inflows of expenditures. The NHA categories displaying higher border-crossing rates were medical durables, physician services, and hospital services. Those displaying lower rates were home health and nursing homes. The border-crossing adjustment was also found to have reduced the variation in per capita expenditures across States significantly, especially for hospital care and physician services.

The data base for per capita expenditures and inflow and ouflow rates developed in this study will be useful to the State policymakers in considering options to restructure their health care systems. This is the first attempt by HCFA to furnish a unified data base on per capita PHC expenditures comprising all services and total population. Because of its unique nature, the creation of this data base required making several methodological assumptions which were carefully tested. The data provide opportunities for further analysis where the impact of the factors causing per capita expenditure variation can be measured by each service. HCFA is also working to create this data base for other years, in order to build a time series of flow ratios and to produce valid data for per capita spending over years.

ACKNOWLEDGMENTS

The author wishes to acknowledge the contributions of Fu Associates, who served as the contractor for a significant part of the project, and Katharine Levit of the Office of the Actuary, who reviewed the draft of this report and provided valuable comments and suggestions. The author is also thankful to the following HCFA staff members: Richard Foster, Daniel Waldo, Helen Lazenby, and William Buczko.

[12] A comparison with Medicare estimates shows that, as a result of the adjustment made for border crossing, per capita spending for Medicare declined from 1.95 times the U.S. average to 1.36.

REFERENCES

Adams, K., Houchens, R., Wright, G., and Robbins, J.: Predicting Hospital Choice for Rural Medicare Beneficiaries: The Role of Severity of Illness. *Health Services Research* 26(5): 583-610, 1991.

Basu, J., Lazenby H.C., and Levit K.R.: Medicare Spending by State: The Border-Crossing Adjustment. *Health Care Financing Review* 17(2): 219-241, 1995.

Buczko, W.: Factors Affecting Interstate Use of Inpatient Care by Medicare Beneficiaries. *Health Services Research* 27(3):294-313, 1992.

Buczko, W.: Differences in Hospitalizations Among Seasonal Migrants, Adjacent-State and In-State Aged Beneficiaries. *Medical Care* 32(3): 308-314, 1994.

Executive Office of the President: *Standard Industrial Classification Manual*, 1987. Pub. No. NTIS (PB)87-10012. Office of Management and Budget. Washington. U.S. Government Printing Office, 1987.

Folland, S.T.: Predicting Hospital Market Shares: *Inquiry* 20: 34-44, 1983.

Fu Associates: Expenditure Flows Related to Interstate Migration for Health Care Services, Final Report. Prepared for HCFA under Conract Number 500-92-0044. Washington, DC. 1993.

Fu Associates: Expenditure Flows Related to Interstate Migration for Inpatient Services, Methodological Report. Prepared for HCFA under Contract Number 500-92-0333. Washington, DC. 1994.

Hogan, C.: Patterns of Travel for Rural Individuals Hospitalized in New York State: Relationships Between Distance, Destination and Casemix. *The Journal of Rural Health* 4(2): 29-41, 1988.

Holahan, J. and Zuckerman, S.: Border Crossing for Physician Services: Implications for Controlling Expenditures. *Health Care Financing Review* 15(1): 101-122, 1993.

Kleinman, J.C., and Makuc, D.: Travel for Ambulatory Medical Care. *Medical Care* 21(5): 543-555, 1983.

Levit, K.R., Lazenby, H.C., Sivarajan, L., et al.: National Health Expenditures, 1994. *Health Care Financing Review* 17(3): 205-242, 1996.

Levit, K.R., Lazenby, H.C., Cowan, C.A., et al.: State Health Expenditure Accounts: Building Blocks for State Health Spending Analysis. *Health Care Financing Review* 17(1): 201-229, 1995.

Makuc, D., Haglund, B., Ingram, D., et al.: Health Service Areas for the United States. (PHS) 92-1386: 1-16, 1991.

Mayer J.D.: The Distance Behavior of Hospital Patients: A Disaggregated Analysis. *Social Science and Medicine* 17(2): 819-827, 1983.

Miller, M., and Welch, W.: State Border Crossing for Medicare Hospital Admissions. *Medical Care* 30(11):1053- 1058, 1992.

Radany, H.R., and Luft, H.S.: Estimating Hospital Admission Patterns using Medicare Data. *Science and Medicine* 37(12): 1431-1439, 1993.

U.S. General Accounting Office: *Health Care Spending*. Pub. No. HRD-92-36:1-25, 1992.

Reprint Requests: Anna Long, Office of the Actuary, Health Care Financing Administration, 7500 Security Boulevard, N3-02-02, Baltimore, Maryland 21244-1850.