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## **Analysis of the Budget Neutrality of the Demonstration of Coverage of Chiropractic Services under Medicare\***

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## **A. Objectives**

This analysis examines the effects of expanded coverage for chiropractic services under the demonstration on Medicare payments for the treatment of neuromusculoskeletal (NMS) diagnoses. It compares payments in the demonstration areas to matched comparison areas during the year before the demonstration and the two years of the demonstration from April 1, 2005 through March 31, 2007. The focus is on two populations: (1) all beneficiaries with NMS diagnoses and (2) the subgroup of beneficiaries who received chiropractic services. Medicare payments of interest include both institutional and non-institutional services. The former includes hospitalizations and admissions to skilled nursing or rehabilitation facilities; while the latter includes both chiropractic services and ambulatory services by other types of providers. The analysis examines overall effects of the demonstration on Medicare payments and also examines effects in each demonstration area, rural and urban areas, health provider shortage areas (HPSA) and non-shortage areas and in different diagnostic subgroups of beneficiaries. Finally, demonstration findings are projected to effects on national Medicare payments if expanded coverage for chiropractic services were extended to all Medicare beneficiaries.

## **B. Background**

The demonstration of expanded coverage for chiropractic services was required by Section 651 of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA) (Public Law 108-173). This statute required the Secretary of Health and Human Services to ensure that aggregate payments made under the demonstration did not exceed the amount that would have been paid by Medicare in its absence. CMS subsequently indicated in the *Federal Register* (Volume 70, Number 18, January 28, 2005), that it would assess budget neutrality by determining the changes in Medicare payments based on a pre-post comparison and the rate of change for specific diagnoses that are treated by chiropractors and physicians in the demonstration sites and control sites. CMS specifically stated that it would not limit the analysis to chiropractor claims alone because it was concerned that expanded coverage for chiropractor services might also affect other Medicare costs. To assure budget neutrality, CMS is required to recoup from chiropractors any net increase in Medicare payments that are attributable to the demonstration.

## C. Methods

**Overview:** This analysis of the budget neutrality includes fee-for-service beneficiaries who received Medicare-covered services for principal neuromusculoskeletal (NMS) diagnoses from providers in the demonstration areas during the two-year demonstration period. It calculates the impacts of the demonstration on residents who received care within the demonstration areas and, then, uses national data on in-migration for health care to estimate the effects of “border crossers” (individuals who lived outside the demonstration areas but came within it to receive treatment). The analytical model compares payments in matched cohorts of beneficiaries who received services in demonstration areas to matched comparison areas. The total cost of the demonstration, therefore, is the product of differences in payments per user and the number of beneficiaries treated in the demonstration areas. Analyses were performed for two distinct populations: (1) all beneficiaries who received any type of service for a principal NMS diagnosis during the demonstration period, whether or not they received chiropractic services; and (2) the subgroup of beneficiaries who received chiropractic services for the treatment of their NMS diagnoses. The **all NMS user analysis** includes all beneficiaries with NMS diagnoses, and the **chiropractic user analysis** is limited to those who received chiropractic services. The former reflects an ‘intent-to-treat’ approach, while the latter is focused on beneficiaries who are most likely to be affected by expanded coverage under the demonstration. The latter approach is less vulnerable to external influences, but may be susceptible to selection effects. The NMS diagnostic codes covered under the demonstration appear in **Appendix A**.

**Time Period of the Analysis:** The analysis included the year preceding the demonstration (4/1/04 through 3/31/05) and the two years of the demonstration (4/1/05 through 3/31/07). To ensure that late-submitted claims were included, final data requests were fulfilled at least 12 months after the demonstration ended, when datasets are typically at least 99% complete.

**Population Studied:** The study population includes all fee-for-service Medicare beneficiaries, aged 65 or above or under age 65 with a disability, who were residents of a demonstration area and had at least one Medicare claim from a provider within the demonstration area for a principal NMS diagnosis during the two-year demonstration period. The comparison sample includes similar beneficiaries from matched comparison counties. Beneficiaries who crossed state or

county borders to receive NMS services are not included in the analysis directly, but are accounted for as described below.

**Border Crossers:** The analysis assumes that border-crossing is bidirectional and equal in magnitude between demonstration counties and bordering counties or states. This assumption is based on estimates for Medicare beneficiaries in a 2004 tabulation from CMS' Office of the Actuary that showed net outflows of beneficiaries for medical services in all demonstration states. Though immigration might be encouraged by the financial incentives provided by the demonstration in beneficiaries seeking chiropractic services, the impact of these incentives will be limited by the fact that most beneficiaries have Medicare supplemental insurance policies that are likely to cover expanded chiropractic services and that most were not aware of the demonstration. These factors mitigate any concerns that expanded chiropractic coverage will have differentially attracted beneficiaries into the demonstration areas for treatment. See **Appendix B** for additional discussion of border crossers.

**Analytic Approach:** Claims for NMS services were summarized for each beneficiary in each model year: the pre-demonstration year and the two years of the demonstration. First, descriptive analyses were performed to assess Medicare reimbursements for all beneficiaries with NMS diagnoses including those who received chiropractic services. In each year, a beneficiary was assigned a cost of \$0 if there were no claims. Following this descriptive analysis, regression analyses were performed to assess demonstration effects, in aggregate and adjusted for patient characteristics and regional differences.

As the first part of the descriptive analyses, the direct effect of the demonstration was calculated as the cost of expanded chiropractic services. This cost was simply the Medicare payments for expanded chiropractic services to chiropractors in demonstration areas during the demonstration period. Since there was no coverage for such services prior to the demonstration, Medicare payments for these services prior to or outside of demonstration areas were automatically zero.

The total impact of the demonstration was based on all Medicare payments, not just those for expanded chiropractic services. Payments were classified by type of service into institutional

services (mainly Part A and including hospital inpatient, skilled nursing facility (SNF) and home health agency files) or non-institutional (mainly Part B and including outpatient, physician, and durable medical equipment files). Analyses examined payments by file type, NMS diagnosis category (spine only, spine and extremities, extremities only, and with neurological co-morbidity), state, urban/rural status, and HPSA/non-HPSA status.<sup>1</sup> The last two analyses were based on urban/rural and HPSA variables assigned at the county level.

Hierarchical linear modeling (HLM) was performed to derive estimates of demonstration effects. This technique is used in situations where one effect is nested inside another. In this study, beneficiaries were nested within groups of counties. The HLM technique takes account of this structure and the resulting correlation among units within the same group (i.e. beneficiaries within the same group of counties). These analyses used key independent variables including age (<65, 65-74, 75-84, 85 or greater), gender, race, urban or rural area, HPSA or non-HPSA area, and adjusted for the clustering of outcomes within the triplet composed of each demonstration county and its two matched comparison counties. Time periods were the year before the demonstration, the two demonstration years, and the interaction between demonstration status and time period. Regressions were performed on total reimbursements and also on subtotals for institutional and non-institutional services.

**Regression Models:** Annual institutional, non-institutional, and total Medicare reimbursements for each beneficiary with an NMS diagnosis were calculated for each year studied. Then, pre-post demonstration effects were estimated using HLM with beneficiaries nested within triplets of counties (demonstration county and two comparison counties) and three years of data (pre-demonstration year and two demonstration years). The model included individual and county level covariates and time variables (t = post 1 and post 2, with the pre-demonstration time period as the reference category) to adjust for yearly trends. In the models, coefficients for the time variables capture general increases in Medicare reimbursements beyond the demonstration, and interactions between the demonstration indicator and time variables reflect the demonstration effect per beneficiary during each post-year.

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<sup>1</sup> Health Professions Shortage Areas (HPSAs) are determined by the Health Services Resource Administration (HRSA) Bureau of Health Professions (<http://bhpr.hrsa.gov/shortage/>).

The dependent variables in the analytical model are annual Medicare payments during the pre-demo year ( $y_{pre}$ ) and the two-year demonstration period ( $y_1$  and  $y_2$ ) for claims with a principal NMS diagnosis for beneficiaries who resided in a demonstration or comparison area. The main outcomes are total Medicare payments for NMS services. To achieve a more complete understanding of cost differences, subtotals were calculated separately for institutional and non-institutional services.

The general form of the model is:

$$(4) \quad y_{i,t} = a_0 + b_1 w_1 + \dots + b_m w_m + c_1 x_1 + \dots + c_n x_n + d_1 t_1 + d_2 t_2 + g_1 x_1 * t_1 + g_2 x_1 * t_2 + e_{i,t},$$

where  $i$  denotes the Medicare beneficiary, the  $w_i$ 's are beneficiary characteristics;  $x_i$ 's are characteristics of the county in which the beneficiary resides (including  $x_1$  which indicates participation in the demonstration);  $t_i$  are the time period (year) indicators; and the model contains interactions between demonstration status ( $x_1$ ) with time period indicators ( $t_1$  and  $t_2$ ). The  $e_{i,t}$  term represents the individual random error for each beneficiary,  $i$ , in each time period  $t$ . The hierarchical nature of the model comes from use of the technique of generalized least squares (GLS) to generate unbiased parameter estimates. The letters  $a$ ,  $b$ ,  $c$ ,  $d$ , and  $g$  denote fixed coefficients estimated by the model. The key coefficients in the model are the interaction terms,  $g_1$  and  $g_2$ . These coefficients provide estimates of the differential change in cost per demonstration NMS diagnosed Medicare beneficiary (or chiropractic user) in each year during the demonstration period, after controlling for other factors. The  $g_1$  and  $g_2$  coefficients then are the estimated "adjusted pre-post difference-in-difference effects of the demonstration" in years 1 and 2, respectively, in dollars per beneficiary per year, as described in the *Federal Register*.

With respect to budget neutrality, the sign, magnitude, and standard error of the  $g_1$  and  $g_2$  coefficients (for the interaction terms) in the all NMS user analysis are all of interest. They represent the estimated direction, size, and accuracy of the demonstration effect per year for each beneficiary. If the sum of these coefficients is significantly negative, then the budget neutrality conclusion is that demonstration has reduced costs to Medicare, and budget neutrality calculations require no recoup of funds. If  $g_1$  plus  $g_2$  is not significantly different from zero, based on a 95% level of significance, then the analysis would conclude that the demonstration

had no significant impact on Medicare costs and no recoup is indicated. If  $g_1$  plus  $g_2$  is significantly positive, however, the analysis would conclude that the demonstration increased Medicare costs. In this case the demonstration effect must be calculated, as the basis for recouping of funds. Furthermore, if the sum of  $g_1$  plus  $g_2$  is statistically significant, then the total impact of the demonstration on the Medicare budget would be estimated as  $(g_1+g_2) \cdot n_{\text{target}}$ , where  $n_{\text{target}}$  is the number of beneficiaries in the target population.

**All NMS versus Chiropractic User Analysis:** Conceptually, the potential effects of the demonstration fall into several categories. First, expanded coverage allows chiropractors to bill Medicare for allowed services that previously were not delivered, were delivered by other qualified providers, or were delivered by chiropractors but paid by supplemental insurers or “out-of-pocket” by beneficiaries. These are the direct effects of the demonstration on costs. Second, expanded coverage may increase the likelihood that beneficiaries with NMS diagnoses will seek and receive care from chiropractors during the demonstration. Third, the provision of expanded services by chiropractors may substitute for or, alternatively, stimulate additional services by providers other than chiropractors. Fourth, expanded coverage may affect the amount and type of already covered chiropractic services received by a user. The regression analyses give the overall effects of the demonstration on Medicare payments. Subtracting these direct effects from the total costs gives the indirect effects of the demonstration. For the demonstration to be budget neutral, its indirect effects would have to be cost saving (negative) and sufficiently large in magnitude to offset the direct effect on costs.

Both analytic approaches –the **all NMS user analysis** and the **chiropractic user analysis** – account for Medicare payments to chiropractors for expanded coverage of chiropractic services under the demonstration. Both approaches also account for Medicare payments for all NMS-related services received by beneficiaries during the demonstration. The “all NMS” analysis includes all beneficiaries with NMS diagnoses and accounts for changes in the proportion that sees chiropractors at all. Both approaches use the same hierarchical linear model with the same covariates and adjustments for clustering within county. In the chiropractic user analysis, the estimate of demonstration effects per user will be larger than that per beneficiary with NMS. However, if the demonstration were the only major factor influencing Medicare costs, then the

two models' estimates of total demonstration effect (derived by multiplying the cost difference per beneficiary times the number of beneficiaries) would have the same mean and differ only by how much each is affected by external factors, selection issues, and other validity threats.

**Alternatives to Per-Person Weighting:** Both analytic approaches to calculating demonstration effects on Medicare payments, to this point, are based on per-person effects and population sizes. Using this per person approach, larger population centers, and especially Chicago, heavily weight the results. As a sensitivity analysis, two alternative weighting schemes were examined. These were equal weighting for each county that participated in the demonstration and trimmed weights for high population counties. These alternative weights were not used to address the direct effects of the demonstration. They do, however, provide useful additional approaches to estimating indirect effects of the demonstration through possible substitution (or offsets) of services provided by chiropractors in place of services that would have been provided by other physicians, and potential additional services provided by other physicians that were stimulated by the expanded benefits for chiropractors.

**National Projections:** National cost projections are based on the incremental costs of the demonstration per fee-for-service beneficiary in demonstration areas projected nationally to all Medicare beneficiaries. Projections apply to beneficiaries enrolled in Medicare Advantage under the assumption that cost increases would be passed on to Medicare Advantage plans. The 2005 Area Resource File (2005 ARF) indicates that there were 1,788,187 Medicare beneficiaries in the counties covered by the chiropractic demonstration. The national number of Medicare beneficiaries during the same time period was 22.3 times as large (i.e. 39,875,305). A simple national projection was estimated by multiplying the demonstration effect by this factor. To produce a more accurate estimate, however, demonstration counties were stratified into four categories, based on their urban/rural status and HPSA/non-HPSA classifications, and a weighted national cost projection was calculated.

## **D. Results**

**Direct Costs of Expanded Chiropractic Services:** Expanded chiropractic services were not reimbursed by Medicare in either demonstration or comparison areas during the pre-demonstration period. In demonstration areas, payments increased to \$15.7 million in the first

year of the demonstration and to \$19.1 million in the second year, for a total increase in Medicare payments of \$34.8 million, while remaining at zero in the comparison areas.

**All NMS User Analysis:** The overall demonstration effect was to increase Medicare payments by \$114 million (**Table 1**). This amount was obtained by multiplying the average per NMS beneficiary effect of \$109 by the 1,049,963 beneficiaries with treatments for NMS diagnoses. The results indicate that the demonstration was associated with higher institutional costs (largely inpatient care) as well as substantial increases in non-institutional (largely ambulatory care) costs.

**Table 1: Demonstration Effects for All Beneficiaries with NMS Diagnoses**

Type of Service	Baseline Payments Per Person	Effect in Year 1 (SE)	Effect in Year 2 (SE)	Total Effect per Person (SE)	Total Effect in Million \$ (SE)
Institutional	\$470	\$32** (\$5)	\$21** (\$5)	\$52** (\$9)	\$55** (\$10)
Non-institutional	\$577	\$10** (\$3)	\$47** (\$3)	\$56** (\$4)	\$59** (\$5)
All Medicare Covered Services	\$1,047	\$42** (\$7)	\$67** (\$7)	\$109** (\$11)	\$114** (\$12)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per beneficiary with an NMS diagnosis. Components may not add exactly to totals due to rounding. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Demonstration Effects by Diagnostic Subgroup:** The effects varied considerably among diagnostic subgroups of beneficiaries (**Table 2**). Nearly half (44%) of beneficiaries were treated for diagnoses involving both the spine and extremities; followed by diagnoses of the extremities (31%), diagnoses including the neurological system (16%), and diagnosis limited to the spine (8%). The latter was surprisingly low given the fact that traditional Medicare reimbursements for chiropractic services cover only manipulation of the spine. Per-person increments in Medicare payments ranged from \$45 for beneficiaries with only a spine diagnosis to \$140 for those with a neurological problem and \$156 for those with problems of both the spine and extremities. Total demonstration effects on payments varied from approximately \$4 million for

beneficiaries with problems limited to the spine to \$72 million for those with both spine and extremity diagnoses.

**Table 2: Breakdown of Demonstration Effects by Diagnostic Group in the All NMS Analysis**

Diagnosis Group	NMS Beneficiaries	Per Person Effect Year 1 (SE)	Per Person Effect Year 2 (SE)	Total Effect per Person (SE)	Total Effects in Million \$ (SE)
Spine Only	88,254	\$20** (\$8)	\$25** (\$8)	\$45** (\$14)	\$4** (\$1)
Extremities Only	326,024	\$21* (\$9)	\$41** (\$9)	\$63** (\$15)	\$20** (\$5)
Spine and Extremities	464,299	\$60** (\$10)	\$96** (\$10)	\$156** (\$18)	\$72** (\$8)
Including a Neurological Component	171,386	\$64** (\$22)	\$76** (\$22)	\$140** (\$38)	\$24** (\$7)
All NMS Beneficiaries	1,049,963	\$42** (\$7)	\$67** (\$7)	\$109** (\$11)	\$114** (\$12)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per beneficiary with an NMS diagnosis. Components may not add exactly to totals due to rounding. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Demonstration Effects by Type of Market Area:** Table 3 shows results by type of market area defined by the combination of HPSA status and urban or rural location. Effects varied greatly by these characteristics. The nearly 80% of beneficiaries who were treated in urban non-HPSA counties (specifically, Illinois) had by far the largest demonstration effect with an increase of \$149 per beneficiary. Also of interest is that the per-beneficiary effect in urban non-HPSA market areas nearly doubled in the second year of the demonstration as compared with its first year. Demonstration effects per beneficiary were small and not statistically significant in urban HPSA counties and rural non-HPSA counties, but showed significant, negative effects in rural

HPSA counties (-\$133,  $p < .01$ ), indicating cost savings. All the negative effect in rural HPSA counties was in Year 1 of the demonstration.

**Table 3: Breakdown of Demonstration Effects by Market Area in the All NMS Analysis**

Market Area	NMS Beneficiaries	Effect in Year 1 (SE)	Effect in Year 2 (SE)	Total Effect per Person (SE)	Total Effect Million \$ (SE)
Urban Non-HPSA	779,620	\$55** (\$8)	\$94** (\$8)	\$149** (\$14)	\$116** (\$11)
Urban HPSA	8,979	\$32 (\$50)	-\$46 (\$50)	-\$13 (\$87)	\$0.1 (\$0.8)
Rural Non-HPSA	220,534	\$22 (\$13)	-\$5 (\$13)	\$17 (\$23)	\$4 (\$5)
Rural HPSA	40,830	-\$142** (\$28)	\$9 (\$28)	-\$133** (\$49)	-\$5* (\$2)
All NMS Beneficiaries	1,049,963	\$42** (\$7)	\$67** (\$7)	\$109** (\$11)	\$114** (\$12)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per beneficiary with an NMS diagnosis. Components may not add exactly to totals due to rounding. Statistical significance is indicated by: \* ( $p < 0.05$ ) and \*\* ( $p < 0.01$ ).

**Demonstration Effects by State:** The overall demonstration effect was significantly positive (i.e., increase in costs) due to the large per person effect in Illinois (\$213,  $p < .01$ ), coupled with the large number of Illinois beneficiaries. Per-person effects were negative in the other four states, with the results being statistically significant in all except Scott County, IA (**Table 4**). Chicago and its immediate suburbs were responsible for the overall effect of Illinois as shown in **Table 5**. The positive net impact of the demonstration (i.e., increase in costs) was completely due to the \$240 per beneficiary effect of Chicago ( $t = 13.7$ ,  $p < .01$ ); while the effect of the other demonstration counties was a negative \$31 ( $t = 2.1$ ,  $p < .05$ ).

**Table 4: Breakdown of Demonstration Effects by State in the All NMS Analysis**

State	Number of NMS Beneficiaries Served in Demonstration Regions	Effect in Year 1 (SE)	Effect in Year 2 (SE)	Total Effect per Person (SE)	Total Effect in Million \$ (SE)
Illinois	681,063	\$73** (\$8)	\$140** (\$8)	\$213** (\$15)	\$145** (\$10)
Iowa	14,952	-\$56 (\$46)	-\$92* (\$46)	-\$148 (\$79)	-\$2 (\$1)
Maine	139,237	-\$5 (\$23)	-\$104** (\$23)	-\$109** (\$40)	-\$15* (\$6)
New Mexico	130,592	-\$119** (\$16)	\$9 (\$16)	-\$110** (\$27)	-\$14** (\$4)
Virginia	84,119	\$52** (\$19)	-\$130** (\$19)	-\$78* (\$33)	-\$7* (\$3)
All NMS Beneficiaries	1,049,963	\$42** (\$7)	\$67** (\$7)	\$109** (\$11)	\$114** (\$12)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per beneficiary with an NMS diagnosis. Components may not add exactly to totals due to rounding. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Table 5: Breakdown of Demonstration Effects between the Chicago Area and All Other Demonstration Areas in the All NMS Analysis**

Region	NMS Beneficiaries	Effect in Year 1 (SE)	Effect in Year 2 (SE)	Total Effect per Person (SE)	Total Effect in Million \$ (SE)
Chicago and suburbs	534,431	\$80** (\$10)	\$160** (\$10)	\$240** (\$17)	\$128** (\$9)
Remainder of Demonstration Areas	515,532	-\$2 (\$8)	-\$29** (\$8)	-\$31* (\$15)	-\$16* (\$7)
All NMS Beneficiaries	1,049,963	\$42** (\$7)	\$67** (\$7)	\$109** (\$11)	\$114** (\$12)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per beneficiary with an NMS diagnosis. Components may not add exactly to totals due to rounding.. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Chiropractic User Analysis:** This analysis focuses on the subgroup of 155,086 beneficiaries with NMS diagnoses in the demonstration areas who received chiropractic services. Results parallel those presented previously in the All NMS Analysis. The total impact of the demonstration was \$322 per chiropractic user (Table 6), as compared with \$109 per person in the analysis of all beneficiaries with NMS diagnoses (Table 1). This amount included \$287 per person (89%) for non-institutional services and \$35 (11%) for institutional services. The demonstration’s total impact was \$50 million compared to \$114 million in the All NMS Analysis. Of this \$50 million, \$45 million was for non-institutional services including the \$34.8 million for the direct costs of expanded chiropractic services.

**Table 6: Breakdown of Demonstration Effects by Type of Service in the Chiropractic User Analysis**

Type of Service	Per Person Payments during the Pre-Demo Year	Effect per User in Year 1 (SE)	Effect per User in Year 2 (SE)	Total Effect per User (SE)	Total Effect in Million \$ (SE)
Institutional	\$364.86	\$17 (SE) (\$12)	\$18 (SE) (\$12)	\$35 (SE) (\$21)	\$5 (SE) (\$3)
Non-institutional	\$764.61	\$117** (SE) (\$7)	\$170** (SE) (\$7)	\$287** (SE) (\$12)	\$45** (SE) (\$2)
All Medicare Covered	\$1,129.48	\$134** (SE) (\$16)	\$188** (SE) (\$16)	\$322** (SE) (\$27)	\$50** (SE) (\$4)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per user of expanded chiropractic services. Components may not add exactly to totals due to rounding. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Demonstration Effects by Diagnosis:** Chiropractic users have a very different diagnostic breakdown than all NMS users that includes higher proportions of beneficiaries with diagnoses involving the spine and extremities (61% vs. 44%) and spine alone (17% vs. 8%); slightly higher proportions with a neurological diagnosis (21% vs. 16%); and lower proportions with diagnoses of extremities only (1% vs. 31%) (**Table 7**). Two-thirds of the total cost increase was accounted for by the spine plus extremities group both because it included 61% of the total population and because of the relatively high per person cost of \$355 per user. The second largest increase in total cost was in beneficiaries being treated for a neurological diagnosis. Especially important with respect to the comparison of the demonstration’s effects in chiropractic users and all beneficiaries with NMS diagnoses is the much higher frequency of the treatments for extremities-only problems in the all NMS group (31% vs. 1% in the chiropractic user population).

**Table 7: Breakdown of the Demonstration Effects by Diagnosis Group in the Chiropractic User Analysis**

Type of Service	Chiropractic Users	Effect per User in Year 1 (SE)	Effect per User in Year 2 (SE)	Total Effect per User (SE)	Total Effect in Million \$ (SE)
Spine Only	26,166	\$65** (\$9)	\$75** (\$9)	\$142** (\$16)	\$4** (\$0.4)
Extremities Only	1,712	\$83 (\$125)	\$255* (\$125)	\$339 (\$216)	\$0.6 (\$0.4)
Spine and Extremities	95,174	\$152** (\$20)	\$203** (\$20)	\$355** (\$35)	\$34** (\$3)
Including a Neurological Component	32,034	\$134* (\$55)	\$223** (\$55)	\$357** (\$95)	\$11** (\$3)
All Chiropractic Users	155,086	\$134** (\$16)	\$188** (\$16)	\$322** (\$27)	\$50** (\$4)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per user of expanded chiropractic services. Components may not add exactly to totals due to rounding.. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Demonstration Effects by Type of Market Area:** In chiropractic users, the largest per- person effects were found in urban non-HPSA and rural non-HPSA areas (**Table 8**). These results are not substantially different from all NMS analysis (**Table 3**). The effects in urban and rural HPSA areas were small and not statistically significant.

**Table 8: Breakdown of Demonstration Effects by Type of Market Area in the Chiropractic User Analysis**

Market Area	Chiropractic Users Served	Effect per User in Year 1 (SE)	Effect per User in Year 2 (SE)	Total Effect per User (SE)	Total Effect in Million \$ (SE)
Urban Non-HPSA	104,797	\$166** (\$20)	\$238** (\$20)	\$404** (\$34)	\$42** (\$4)
Urban HPSA	1,293	-\$78 (\$112)	-\$19 (\$112)	-\$97 (\$195)	\$0.1 (\$0.3)
Rural Non-HPSA	41,437	\$79** (\$29)	\$170** (\$29)	\$249** (\$49)	\$10** (\$2)
Rural HPSA	7,559	-\$45 (\$70)	\$60 (\$70)	\$16 (\$122)	\$0.1 (\$1)
All Chiropractic Users	155,086	\$134** (\$16)	\$188** (\$16)	\$322** (\$27)	\$50** (\$4)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per user of expanded chiropractic services. Components may not add exactly to totals due to rounding. Standard errors are in parentheses. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Demonstration Effects by State:** The analyses of chiropractic users presented in Tables 9 and 10 confirm results of the all NMS analysis and show that Illinois accounts for \$49 million of the total \$50 million increase in Medicare payments and that Chicago and its suburbs alone accounts for 40% of all chiropractic users and 78% of the increase in costs. Costs per chiropractic user increased by \$485 in Illinois and by \$632 in Chicago and its suburbs. Small increases in per person and total costs were found in Maine and Virginia, and small decreases occurred in Iowa and New Mexico, but these changes were not statistically significant. Differences between Illinois and the Chicago area and other demonstration areas were not as dramatic in chiropractic users as they were in all NMS users. For example, **Table 10** shows a statistically significant positive effect in demonstration areas outside of Chicago in chiropractic users; while **Table 5** shows a small but statistically significant negative effect in all NMS users. This result probably reflects the fact that care for chiropractic users is directly impacted by expanded coverage of chiropractic services, while the effects are diluted in all NMS users because only a small fraction (about 10 percent) of them receive chiropractic services.

**Table 9: Breakdown of Demonstration Effects by State in the Chiropractic User Analysis**

State	Chiropractic Users	Effect in Year 1 (SE)	Effect in Year 2 (SE)	Total Effect per Person (SE)	Total Effect in Million \$ (SE)
Illinois	101,793	\$201** (\$19)	\$283** (\$19)	\$485** (\$33)	\$49** (\$3)
Iowa	6,211	-\$63 (\$112)	-\$115 (\$112)	-\$178 (\$195)	-\$1 (\$1)
Maine	18,916	\$40 (\$61)	-\$5 (\$61)	\$35 (\$105)	\$1 (\$2)
New Mexico	21,754	-\$78 (\$43)	\$19 (\$43)	-\$59 (\$74)	-\$1 (\$2)
Virginia	6,412	\$131** (61)	\$5 (\$61)	\$136 (\$106)	\$1 (\$1)
All Chiropractic Users	155,086	\$134** (\$16)	\$188** (\$16)	\$322** (\$27)	\$50** (\$4)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per user of expanded chiropractic services. Components may not add exactly to totals due to rounding. Standard errors are in parentheses. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Table 10: Breakdown of Demonstration Effects between the Chicago Area and other Demonstration Areas in the Chiropractic User Analysis**

Region	Chiropractic Users	Effect in Year 1 (SE)	Effect in Year 2 (SE)	Total Effect per Person (SE)	Total Effect Million \$ (SE)
Chicago and Suburbs	61,396	\$247** (\$27)	\$385** (\$27)	\$632** (\$46)	\$39** (\$3)
Remainder of Demonstration Areas	93,690	\$73** (\$19)	\$65** (\$19)	\$138** (\$33)	\$13** (\$3)
All Chiropractic Users	155,086	\$134** (\$16)	\$188** (\$16)	\$322** (\$27)	\$50** (\$4)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Separate effects in Year 1 and Year 2 are per user of expanded chiropractic services. Components may not add exactly to totals due to rounding. Standard errors are in parentheses. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Summary of Findings and Additional Considerations.** The overall effect of the demonstration was to increase Medicare costs by \$114 million in the analysis of all NMS users and by \$50 million in the analysis limited to users of chiropractic services. **Table 11** provides a breakdown of these total costs by type of service. The costs of expanded chiropractic services were \$34.8 million in both analyses; while increases in costs for other types of medical services varied widely from \$79.2 million in the all NMS analysis to \$15.2 million in the chiropractic user analysis. The increased costs for other types of medical services reflect both institutional costs (e.g. hospitalizations or admissions to skilled nursing facilities) and non-institutional costs (e.g. for ambulatory care by medical physicians or other types of providers). These costs may be effects of the demonstration or may be unrelated to it. Since they are derived from difference-in-difference analyses, they do control for effects that occurred in both demonstration and matched comparison areas, e.g. inflation in Medicare rates.

**Table 11. Demonstration Effects on Medicare Costs Overall and by Type of Service (in Millions of Dollars)**

	Total Cost Difference	Direct Costs of Expanded Chiropractic Services	Costs Due to Other Types of Services
All NMS Analysis	\$114.0	\$34.8	\$79.2
Chiropractic User Analysis	\$50.0	\$34.8	\$15.2

Notation: NMS denotes neuromusculoskeletal

The results in **Table 11** are based on analyses that count each person in demonstration or comparison areas equally. The results based on alternative weighting schemes are shown in **Appendix C**. These alternatives examined variability in the effects of the demonstration among counties that represent market effects beyond those controlled in the original matching of demonstration to comparison counties. They showed that, although the results varied widely by county, the mean budget impact on the use of other types of medical services by chiropractic users was quite similar to the \$15.2 million cost shown above using per person weighting of results. These results increase confidence in the validity of results shown above for the per-person analysis of chiropractic users.

**Projected Costs of Extending Expanded Coverage for Chiropractic Services to All Medicare Beneficiaries:**

The cost of a national rollout of Medicare coverage for expanded chiropractic services will vary according to whether it applies to all beneficiaries with NMS diagnoses or only chiropractic users and also by whether it includes all Medicare payments or only those for chiropractic services. Based on the ratio of national to demonstration area population sizes, the estimated annual costs for a national rollout would be \$1.27 billion based on demonstration effects in all NMS users, \$556 million based on chiropractic users only, and \$468 million in the direct cost for chiropractic services. **Tables 12 and 13** summarize national cost estimates. Weights are provided by the ratios of the national number of Medicare beneficiaries to numbers in each type of market area within demonstration areas. This weighted analysis gives a national annual cost estimate of \$1.15 billion (SE \$0.106 billion) based on all NMS users and \$582 million (SE \$49 million) based on chiropractic users only.

**Table 12: National Estimate of Medicare Costs by Market Area in the All NMS Analysis**

Market Area	Annual Estimated Effect in Million \$ (SE)	Medicare Beneficiaries in Demo Areas	Medicare Beneficiaries Nationally	Market Area Weights	Estimated Annual Costs for National Coverage in Million \$ (SE)
Urban Non-HPSA	\$58** (\$5)	1,346,884	26,728,316	19.8	\$1,155** (\$106)
Urban HPSA	\$0.1 (\$0.4)	18,869	450,287	23.9	-\$1 (\$9)
Rural Non-HPSA	\$2 (\$3)	354,907	11,139,005	31.4	\$60 (\$79)
Rural HPSA	-\$3** (\$1)	67,527	1,554,697	23.0	-\$62** (\$23)
All Beneficiaries	\$57** (\$6)	1,788,187	39,872,305	NA	\$1,151** (\$135)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Components may not add exactly to totals due to rounding. Standard errors are in parentheses. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

**Table 13: National Estimate of Medicare Costs by Market Area in the Chiropractic User Analysis**

Market Area	Annual Estimated Effects in \$ Million (SE)	Medicare Beneficiaries within Demo Areas	Medicare Beneficiaries Nationally	Market Area Weights	Estimated Annual Costs for National Coverage in \$ Million (SE)
Urban Non-HPSA	\$21** (\$2)	1,346,884	26,728,316	19.8	\$420** (\$35)
Urban HPSA	\$0.1 (\$0.1)	18,869	450,287	23.9	-\$1 (\$3)
Rural Non-HPSA	\$5** (\$1)	354,907	11,139,005	31.4	\$162** (\$32)
Rural HPSA	\$0.1 (\$0.5)	67,527	1,554,697	23.0	\$1 (\$11)
All Beneficiaries	\$25** (\$2)	1,788,187	39,872,305	NA	\$582** (\$49)

Positive numbers indicate higher costs associated with the demonstration. Standard errors are in parentheses. Standard errors are in parentheses. Components may not add exactly to totals due to rounding. Standard errors are in parentheses. Statistical significance is indicated by: \* (p<0.05) and \*\* (p<0.01).

## E. Discussion

**Strengths and Weaknesses of the Analysis:** The All NMS user and Chiropractic user analyses each provides a useful perspective, and each also has potential advantages and disadvantages. The analysis of all NMS users provides a broader view by including all beneficiaries with the diagnoses that were targeted by the demonstration and are or could be candidates for chiropractic services. Also, it is well-suited to account for unintended consequences of the demonstration, such as the effects of increasing competition between chiropractors and physicians of other disciplines who treat these diagnoses. The all NMS user analysis also guards better against threats to validity caused by differences in the characteristics of chiropractic users between demonstration and matched comparison areas.

Despite these advantages, the all NMS user analysis also has practical limitations. First, it does not control well for the effects of external events and attributes all differences in utilization and costs of services to the chiropractic demonstration. Second, beneficiaries with NMS diagnoses are a heterogeneous group only some of whom are likely to be (or become) chiropractic service users. Third, the heterogeneity of the group also increases the likelihood of changes in the use of health care services that are unlikely to be affected by chiropractors (e.g. SNF, home health services) and, hence, be falsely attributed to the demonstration. Fourth, the diagnostic mix of all NMS beneficiaries was very different than that of chiropractic users. For example, 31% of the NMS population had diagnoses involving only the extremities compared with only 1% of chiropractic service users. Finally, the geographic distribution of NMS beneficiaries differed from that of chiropractic users. For example, Chicago and its suburbs make up over 50% of all NMS beneficiaries but fewer than 40% of chiropractic users.

Analyses based on chiropractic users also have advantages and disadvantages. First, chiropractic users were more likely to have been directly affected by expanded coverage under the demonstration -- in the types and frequencies of services received and in reduced out-of-pocket costs for these services. Second, cost offsets for the increased use of chiropractic services from resulting reduced use of other types of ambulatory services or reduced hospitalizations were, at least, theoretically possible effects. Third, the focus on chiropractic users limits the potential effects of external events unrelated to the demonstration that may impact beneficiaries with broader spectrums of NMS diagnoses and types of treatment. Analysis based on chiropractic users, however, might miss indirect effects of the demonstration on services provided by other types of physicians in reaction to expanded coverage for chiropractors (i.e. provider efforts to retain levels of business). Finally, selection effects may have occurred in chiropractic users in demonstration areas that were difficult to adjust for and resulted in imperfect matching with those in comparison areas. Though demonstration and comparison areas were matched on important county-level characteristics, matching at the patient level was limited to diagnosis.

In summary, the all NMS user and chiropractic user analysis each has strengths and limitations. The former avoids selection effects by including all beneficiaries who might have been impacted by the demonstration, but also includes many who were not. The chiropractic user analysis, on

the other hand, misses potential unintended consequences of the demonstration and any indirect impacts on non-users of chiropractic services. On balance, the chiropractic user analysis appears to be more directly connected to the effects of the demonstration.

## **F. Conclusions**

This analysis of budget neutrality responded to Congress' requirement under Section 651 of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA) (Public Law 108-173) that this demonstration of expanded coverage for chiropractic services not increase aggregate Medicare payments and that CMS be required to recoup from chiropractors any net increases that are attributable to the demonstration. Both the all NMS user and chiropractic user analyses conclude that the demonstration increased Medicare payments for expanded chiropractic services by \$34.8 million. The all NMS analysis found that the demonstration's total effect was 3.3 times this direct increase in costs for expanded chiropractic services (\$114.0 vs. \$34.8 million); while the chiropractic user analysis found it was 1.4 times this amount (\$50.0 vs. \$34.8 million). In the all NMS user analysis, more than half of the total increase in costs was in beneficiaries who were never treated by a chiropractor. Most costs increases attributable to the demonstration were in Illinois and, especially, in the Chicago metropolitan area. In other areas, either small increases or decreases were found.

## APPENDICES

### Appendix A:

#### Expanded Coverage of Chiropractic Services: Procedure Codes and Diagnoses Covered

##### Procedure Codes (CPT/HCPCS):

##### **Chiropractic manipulation codes**

98943 extraspinal manipulation

##### **Evaluation and Management Codes**

99201 New patient 10 minutes  
99202 New patient 20 minutes  
99203 New patient 30 minutes  
99204 New patient 45 minutes  
99205 New patient 60 minutes  
99211 Established patient 5 minutes  
99212 Established patient 10 minutes  
99213 Established patient 15 minutes  
99214 Established patient 25 minutes  
99215 Established patient 40 minutes

##### **Test Codes**

95831 Muscle testing, manual w/ report; extremity or trunk  
95832 Hand, with or without comparison with normal side  
95833 Total evaluation of body, excluding hands  
95834 Total evaluation of body, including hands  
95851 Range of motion measurements and report; each extremity or each trunk section  
95852 Hand, with or without comparison with normal side  
95857 Tensilon test for myasthenia gravis  
95858 With electromyographic recording  
95860 Needle electromyography; one extremity with or without related paraspinal areas  
95861 Two extremities with or without related paraspinal areas  
  
95863 Three extremities with or without related paraspinal areas  
95864 Four extremities with or without related paraspinal areas  
95867 Cranial nerve supplied muscles, unilateral  
95868 Cranial nerve supplied muscles, bilateral  
Nerve conduction, amplitude and latency/velocity study, each nerve; motor, without F-  
95900 wave study  
95903 Motor, with F-wave study  
95904 Sensory

**Therapy codes**

- 64550 Application of surface (transcutaneous) neurostimulator
- 97012 traction, mechanical
- 97018 parafin bath
- 97020 Microwave
- 97024 Diathermy
- 97026 Infrared
- 97028 Ultraviolet
- 97032 electrical stimulation, constant attendance
- 97034 contrast baths
- 97035 Ultrasound
- 97039 unlisted modality
- 97110 therapeutic exercise
- 97112 neuromuscular reeducation
- 97113 aquatic therapy with exercise
- 97116 gait training
- 97124 Massage
- 97139 unlisted therapeutic procedure
- 97140 Manual therapy techniques
- 97150 therapeutic procedures, group
- 97504 orthotic fitting and training
  
- 97530 Therapeutic activities--dynamic activities to improve functional performance
- 97703 check out for orthotics and prosthetic use
  
- 97750 physical performance test or measurement, with written report
- 97799 unlisted physical medicine/rehabilitation service
  
- G0283 unattended electrical stimulation for other than wound care

**X rays**

- 72010 x-ray spine entire
- 72020 x-ray spine, 1 view
- 72040 x-ray spine cervical 2-3 views
- 72050 x-ray, spine cervical 4+ views
- 72052 x-ray spine cervical complete,
- 72069 x-ray spine standing for thoracolumbar
- 72070 x-ray spine thoracic 2 views
  
- 72072 x-ray spine thoracic 3 views
- 72074 x-ray, spine thoracic 4+ views
- 72080 x-ray spine thoracolumbar 2 views
- 72090 x-ray spine thoracolumbar supine and standing
- 72100 x-ray spine lumbosacral 2-3 views
- 72110 x-ray spine lumbosacral 4+ views
- 72114 x-ray spine lumbosacral complete

72120 x-ray spine lumbosacral bending only  
72170 x-ray pelvis, 1-2 views  
72190 x-ray pelvis complete  
72200 x-ray sacroiliac joints, up to 3 views  
72202 x-sacroiliac joints 3+ views  
72220 x-ray sacrum and coccyx 2+ views  
73000 x-ray clavicle complete  
73010 x-ray scapula complete  
73020 x-ray shoulder 1 view  
73030 x-ray shoulder 2+ views  
73050 x-ray acromioclavicular joint, bilateral  
73060 x-ray humerus, 2+ views  
73070 x-ray elbow 2 views  
73080 x-ray elbow 3+ views  
73090 x-ray forearm 2 views  
73100 x-ray wrist, 2 views  
73110 x-ray wrist, 3+ views  
73120 x-ray hand 2 views  
73130 x-ray hand 3+ views  
73140 x-ray finger(s) 2+ views  
73500 x-ray hip unilateral 1 view  
73510 x-ray hip unilateral 2+ views  
73520 x-ray hip bilateral 2+ views  
73550 x-ray femur 2 views  
73560 x-ray knee 1-2 views  
73562 x-ray knee 3 views  
73564 x-ray knee 4+ views  
73565 x-ray bilateral knees standing  
73590 x-ray tibia fibula 2 views  
73600 x-ray ankle 2 views  
73610 x-ray ankle 3+ views  
73620 x-ray foot, two views  
73630 x-ray foot, 3+ views  
73650 x-ray heel 2+ views  
73660 x-ray toe--2 or more views  
71100 x-ray ribs, unilateral; 2 views  
71110 x-ray ribs, bilateral 3 views  
71120 x-ray sternum, 2+ views  
71130 x-ray, sternum+sc joint

## Diagnosis (ICD-9) Codes

<b>Code</b>	<b>Description</b>	<b>Specific codes within the range</b>
307	Special symptoms	307.81
138	Late effects of poliomyelitis	
340	Multiple sclerosis	
		346.00-.01, 346.10-.11, 346.80- 346.90- 346.20-.21, .81, .91
346	Migraine	
350	Trigeminal neuralgia	350.1, 350.2
352	disorder cranial nerve	352.4
		353.0, 353.1, 353.2, 353.4, 353.6
353	plexus Mononeuritis, upper limb	354.0, 354.1, 354.2, 354.3, 354.4, 354.8, 354.9
354	and multiple	355.0, 355.1, 355.2, 355.3, 355.4, 355.5, 355.6, 355.71, 355.79, 355.8, 355.9
355	Mononeuritis, lower limb	356.1, 356.4, 356.8, 356.9
356	Neuropathy, hereditary and idiopathic	
358	disorders myoneural	358.00, 358.01
		715.0x, 715.1x, 715.2x, 715.3x, 715.8x, 715.9x
715	Arthritis, osteoarthritis*	
		716.1x, 716.2x, 716.3x, 716.4x, 716.5x, 716.6x, 716.8x, 716.9x
716	Arthropathies, NEC/NOS*	
		717.0-3, 717.40-43, 717.49, 717.5-7, 717.81- 84, 717.85, 717.89, 717.9
717	derangement, knee internal	718.0x, 718.1x, 718.6x, 718.8x, 718.9x, 718.48
718	derangement, other joint*	719.0x, 719.1x, 719.2x, 719.3x, 719.4x, 719.5x, 719.6x, 719.7, 719.8x, 719.9x
719	disorder, joint NEC/NOS* Spondylitis, ankylosing and other inflammatory	
720	spondylopathies	720.0, 720.1, 720.2, 720.81, 720.89, 720.9
	Spondylosis and allied	721.0, 721.1, 721.2, 721.3, 721.41, 721.42, 721.5, 721.6, 721.7, 721.8, 721.90, 721.91
721	disorders	722.0, 722.10-.11, 722.2, 722.30-.32, 722.39-.4, 722.51-.52, 722.6, 722.70-.73, 722.81-.83, 722.91-.93
722	disorder, intervertebral disc	723.0, 723.1, 723.2, 723.3, 723.4, 723.5, 723.6, 723.7, 723.8, 723.9
723	disorder cervical spine	724.00-02, 724.1-6, 724.70, 724.71, 724.79, 724.8, 724.9
724	disorders, back NEC/NOS	
		726.0, 726.10-.12, .19, 726.2, 726.30-.32, .39, 726.4, .5, 726.60-.65, .69, 726.70-.73, .79, 726.8, .90, .91
725	Polymyalgia rheumatica	
	enthesopathies, peripheral	
726	and allied syndromes	

	disorders, synovium tendon and bursa	727.00-.06, 727.09,.1, .2, .3, 727.40-.43, 727.49, 727.50-.51, 727.59, 727.60-.69, 727.81-.83, 727.89-.9
727		728.10-.12, 728.2, .3, .4, .5, .6, 728.71, 728.79, 728.81, 728.83, 728.85, 728.87, 728.89, 728.9
728	disorders, muscle, ligament and fascia	
	Other disorders of soft tissues	729.0-.2, 729.5, 729.8-.9
729		
	Other disorders of bone and cartilage	733.6, 733.92
733		735.0, 735.1, 735.2, 735.4, 735.5, 735.8, 735.9
735	deformity, toe acquired	736.00-.07, 736.09-.1, 736.20-.22, 736.29-.32, 736.39, 736.41-.42, 736.6, .70-.76, 736.79, 736.81, 736.89
736	Deformity, limbs acquired	737.0, 737.10, 737.11, 737.12, 737.19, 737.20-22, 737.29, 737.30-34, 737.40-43, 737.8, 737.9
737	Curvature spine	
738	deformity, acquired	738.2-9
739	Lesions, nonallopathic NEC	739.0-9
	Congenital musculoskeletal deformities	754.1, 754.2, 754.40-44, 754.50-53, 754.59, 754.60-62, 754.69, 754.70, 754.71, 754.79
754		
	Other congenital musculoskeletal abnormalities	756.10-15, 756.17, 756.19, 756.2, 756.3, 756.4, 756.82, 756.83, 756.89
756		
	Sprains and strains of shoulder and upper arm	840.1-9
840		
	Sprains and strains of elbow and forearm	841.0-.3, 842.00-02, 842.09-13, 842.19
841		
	Sprains and strains of wrist and hand	843.0, 843.1, 843.8, 843.9
842		
	Sprains and strains of hip and thigh	844.0-844.3, 844.8, 844.9
843		
	Sprains and strains of knee and leg	845.00-03, 845.09-13, 845.19
844		
	Sprains and strains of ankle and foot	846.0-3, 846.8, 846.9
845		
	Sprains and strains of the sacroiliac region	
846		
	Sprains and strains of back NEC/NOS	847.0-4, 847.9
847		
	Sprains and strains, ill-defined, NEC	848.3, 848.40-42, 848.49, 848.8, 848.9
848		
	Late effects, musculoskeletal and connective tissues injuries	905.1-9
905		
	Late effects, injuries to the nervous system	907.0, 907.1-5, 907.9
907		
	Contusion, trunk	922.1, 922.31, 922.32, 922.33, 922.8
922		

923	Contusion, upper limb	923.00-03, 923.09-11, 923.20-21, 923.3, 923.8, 923.9
924	Contusion, lower limb	924.00, 924.01, 924.10-11, 924.20-21, 924.3-5, 924.8, 924.9
955	Injury, peripheral nerve(s) of shoulder girdle and upper limb	955.0-9
956	Injury, peripheral nerve(s) of pelvic girdle and lower limb	956.0-5, 956.8, 956.9
958	Certain traumatic complications	958.6
784	Symptoms involving head and neck	784.0

**\* = "x" specifies anatomic site, and any value would be appropriate**

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## Appendix B

### Technical Note on Border Crossing

The analysis assumes that individuals who cross borders to receive health care services are representative of all beneficiaries with NMS diagnoses and that border-crossing is bidirectional and equal in magnitude. Net migration was estimated using a 2004 report from CMS' Office of the Actuary that examined state-specific health expenditures based on state of provider and state of beneficiary residence. These results provide the important perspective of net crossing for large areas (e.g., states or large groups of adjacent counties). **Table B.1** shows an abridged version of results for the demonstration states. While these data concern all medical services for Medicare beneficiaries, they should be representative, since NMS-diagnosed beneficiaries represent over 55% of all beneficiaries in the demonstration states. The table shows values of 100% or greater for each demonstration state indicating net outflow of beneficiaries for medical services. Hence, results in this report are conservative in assuming zero net border-crossing for beneficiaries in demonstration states.

In the case of the subgroup of NMS-beneficiaries who receive chiropractic services, a net positive inflow into demonstration areas might be expected due to the financial incentives provided by expanded coverage and resultant reductions of out-of-pocket costs for beneficiaries. The impact of such incentives, however, is likely to be limited by several factors. First, most beneficiaries already have Medicare supplemental insurance.<sup>2</sup> The survey of beneficiaries reported in Chapter III of the pending project report found that about 70% of Medicare beneficiaries who were chiropractic users reported private insurance coverage for chiropractic services; and more comprehensive policies are likely to cover expanded chiropractic services. Second, out-of-area beneficiaries may not have heard of the expanded chiropractic coverage or, even if they had, would have to travel further and change their chiropractic providers to take advantage of it. Third, the defined population of chiropractic service users included both beneficiaries who used only

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<sup>2</sup> Centers for Medicare & Medicaid Services. Current trends in MCBS, 2002. <http://www.cms.hhs.gov/mcbs/downloads/HHC2003chapter2.pdf>. Accessed Feb.25, 2009

services that are traditionally reimbursed by Medicare and those who used expanded chiropractic services. Together, these factors mitigate potential concerns that expanded chiropractic coverage attracted beneficiaries into the demonstration areas for treatment.

**Table B.1. Net Flow Ratios of Medicare Personal Health Care Expenditures to Residents of Each Demo State by Type of Service, Region, and State of Residence: Calendar Year 2004\***

Region and State of Residence	Total	Hospital Care	Physician & Clinical Services	Other Professional Services	Dental Services	Home Health Care	Drugs and Other Medical Non-durables	Durable Medical Products	Nursing Home Care	Other Personal Health Care
Maine	103%	103%	105%	101%	100%	101%	100%	100%	103%	100%
Illinois	105%	106%	105%	103%	100%	102%	100%	100%	101%	100%
Iowa	106%	107%	106%	103%	100%	101%	100%	100%	104%	100%
Virginia	102%	103%	102%	103%	100%	100%	100%	100%	100%	100%
New Mexico	109%	111%	110%	103%	100%	103%	100%	100%	103%	100%
Average, demo states	<b>105%</b>	<b>106%</b>	<b>106%</b>	<b>103%</b>	<b>100%</b>	<b>101%</b>	<b>100%</b>	<b>100%</b>	<b>102%</b>	<b>100%</b>
<b>United States</b>	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

SOURCE: Centers for Medicare & Medicaid Services, Office of the Actuary, National Health Statistics Group.

\*Expenditures by State of residence divided by expenditures by state of provider. Ratios greater than 100% mean that residents consume more health care than the state produces; ratios less than 100% mean that the state produces more health care than its residents consume. For Dental Services, Drugs and Other Medical Nondurables and Other Personal Health Care, no adjustments were made between state-of-provider and state-of-residence (net flow ratios are 100% for all states). Home health includes services provided by freestanding facilities only. Additional hospital-based service expenditures of this type are included with hospital services.

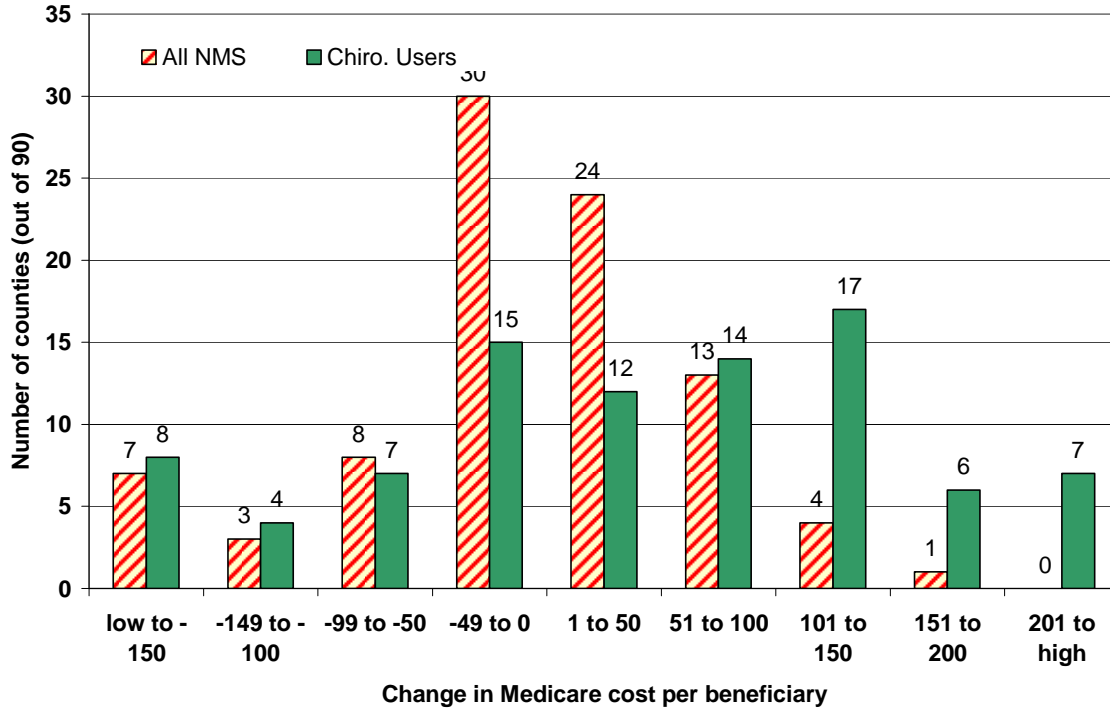
## Appendix C

### **Demonstration Effects on Medicare Costs Using Alternatives to Per-Person Weighting**

The main estimates of the demonstration's effects on Medicare payments were based on per-person effects and population sizes. Using this approach, larger population centers, and especially Chicago, heavily weight the results. In this appendix, alternative weighting schemes are examined, including equal weighting for each county and trimmed weights for high population counties. This appendix does not address the direct Medicare payments paid to chiropractors for expanded services under the demonstration. Rather, it addresses indirect costs related to possible substitution (or offsets) of services provided by chiropractors in place of services that would have been provided by other physicians, and potential additional services provided by other physicians that were stimulated by the expanded benefits for chiropractors.

A total of 92 counties in the five demonstration areas participated in the demonstration. **Figure C1** displays demonstration effects per beneficiary for 90 of these 92 counties. Solid bars refer to chiropractic service users, and cross-hatched bars refer to all NMS users. Two counties with outlier averages at extreme ends of the distribution were omitted to allow for a legible display of detail. The bars for all NMS users show a fairly symmetrical distribution of counties with positive or negative effects on costs per beneficiary with the mode showing a small decrease in total Medicare costs per beneficiary. Data for chiropractic users show more consistent increases in costs. Even among chiropractic users, however, a substantial proportion of counties (34 of 90) showed net negative effects on costs during the demonstration.

**Figure C1: Histogram of Demonstration Effects by County under All NMS and Chiro User Analyses \***



\* The horizontal axis is the net cost per person with an NMS diagnosis aggregated over 2 years. Results are aggregated into categories with a width of \$50 per person. The vertical axis is the number of demonstration counties in that category.

Three different weighting schemes for county level analyses of the demonstration’s effects on costs are shown in **Table C1**: weights by population size (i.e.) equal weight per beneficiary; equal weight per beneficiary with trimming for high population counties; and equal weights per county. These weighting schemes lead to striking differences in cost estimates in the **all NMS** analysis from \$79.2 million if counties are weighted by population size to \$14.7 million if they are equally weighted. Differences for the **chiropractic user** analysis vary much less, from \$15.2 million to \$12.1 million. This contrast suggests that the additional costs in the All NMS Analysis were due to extreme results in a few highly populated counties and may not be representative of the true effects of expanded chiropractic benefits. The tight clustering of effects in the chiropractic analysis, on the other hand, suggests a more reliable estimate of true effects.

**Table C1: Demonstration Effects on Costs by Type of County Weighting (in Millions)**

	Counties weighted by population size	Weights trimmed in high population counties	Counties equally weighted
All NMS Analysis	\$79.2	\$65.3	\$14.7
Chiropractic User Analysis	\$15.2	\$12.6	\$12.1

Notation: NMS denotes neuromusculoskeletal