Health Benefit Costs Among Patients With Multiple Sclerosis

N.L. Kleinman, K. Rajagopalan, R.A. Brook, A.K. Melkonian

Human Capital Management Services (HCMS) Group, Cheyenne, WY, USA; Biogen Idec, Inc., Cambridge, MA, USA; The JSteRA Group, Newfoundland, NJ, USA

Introduction

- Multiple sclerosis (MS) is an acquired inflammatory and immune-mediated disorder of the central nervous system characterized by inflammation, demyelination, and degeneration of axonal neurons that affects more than 2 million people worldwide, and estimates range from 350,000 to 440,000 patients in the United States.1,2
- MS usually affects young adults between the ages of 20-40 years, with a female-to-male risk ratio between 1.5 and 3.6.3
- Several studies have reported that patients with MS have difficulty maintaining employment due to the condition.

Methods

- A retrospective analysis was performed on data (1/1/2001 to 6/30/2007) from the Human Capital Management Services (HCMS) Research Reference Database consisting of approximately 500,000 employees representative of the US employed civilian labor force (2004).
- Employer payroll and disability insurance records were analyzed for work absence costs (including sick leave, short-term disability (STD), long-term disability (LTD), and workers’ compensation (WC)).
- Anonymity of person-level data was maintained in accordance with the Health Insurance Portability and Accountability Act guidelines.

- Healthcare was provided through managed care plans contracted for managed care.
- International Classification of Diseases-9 (ICD-9) codes were used to identify patients with MS (ICD-9 code of 340.XX).
- Patients with available prescription claims were assigned to therapy cohorts and followed for 1 year after their initial prescription (Index date).

Statistical Analysis

- Demographic characteristics of the cohorts were compared using t-tests for continuous variables and chi-square (χ²) tests for discrete variables. Differences were significant at P<0.05.
- Two-part regression analysis was used to model the health benefit cost differences between the cohorts using separate regression models for days from each type of cost.

Objective

- The objective of this study was to assess the objective differences in health benefit costs among employees treated with DMTs for MS in a real-world setting.

Results

- Records of 785 patients with MS (ICD-9 code of 340.XX) were extracted with 5 years of data beyond the employee’s index date. Of these:
  - 311 received a DMT (Avonex, Betaseron, Rebif) and were eligible for analysis.

- From the 311 treated patients with MS (Table 2), total health benefit costs were lower for Avonex ($18,167) and Betaseron ($17,953) compared with Rebif ($26,970) and Copaxone ($21,314). Among the 4 DMTs:
  - Avonex patients reported the lowest total SL and STD costs.
  - Avonex patients had significantly higher (P<0.05) lower SL ($523 vs $969) and STD ($87 vs $1056) costs than Copaxone patients.
  - All other absence comparisons between the cohorts were not significant.

- On a percentage basis (Table 3):
  - The Avonex cohort had the smallest percentage of individual costs for all cohorts, while the percentage of indirect costs for the Copaxone and Rebif cohorts was 3.2 and 2.9 times higher, respectively.
  - Prescription drug costs were a higher proportion of the total benefit costs among employees in the Betaseron cohort than among employees in the Copaxone cohort (P<0.05).

Table 1. Demographic Comparisons

<table>
<thead>
<tr>
<th>Variable</th>
<th>Avonex</th>
<th>Betaseron</th>
<th>Rebif</th>
<th>Cohort Mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>41.48</td>
<td>41.62</td>
<td>41.62</td>
<td>41.62 (0.90)</td>
</tr>
<tr>
<td>Race, %</td>
<td>White</td>
<td>70.2</td>
<td>60.9</td>
<td>70.4</td>
</tr>
<tr>
<td>Hispanic, %</td>
<td>5.3</td>
<td>10.9</td>
<td>7.0</td>
<td>15.4</td>
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<tr>
<td>Marital status, %</td>
<td>Single</td>
<td>3.0</td>
<td>3.0</td>
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<tr>
<td>Patient’s tenure, years</td>
<td>9.79</td>
<td>8.80</td>
<td>7.01</td>
<td>8.62 (1.03) (0.71) (1.63)</td>
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</tbody>
</table>

Table 2. Annual Health Benefit Costs for Employees With Multiple Sclerosis by Treatment

<table>
<thead>
<tr>
<th>Cost category</th>
<th>Employees with Avonex (n=156)</th>
<th>Employees with Betaseron (n=55)</th>
<th>Employees with Rebif (n=87)</th>
<th>Employees with Copaxone (n=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare</td>
<td>$18,167 $21,314 $17,953 $26,970</td>
<td>$17,953 $21,932 $17,953 $26,970</td>
<td>$17,953 $21,932 $17,953 $26,970</td>
<td>$17,953 $21,932 $17,953 $26,970</td>
</tr>
<tr>
<td>Prescription</td>
<td>$523</td>
<td>$87</td>
<td>$969</td>
<td>$1056</td>
</tr>
<tr>
<td>SL</td>
<td>$523</td>
<td>$87</td>
<td>$969</td>
<td>$1056</td>
</tr>
<tr>
<td>STD</td>
<td>$87</td>
<td>$969</td>
<td>$1056</td>
<td>$1056</td>
</tr>
<tr>
<td>Total costs</td>
<td>$18,167</td>
<td>$21,932</td>
<td>$17,953</td>
<td>$26,970</td>
</tr>
</tbody>
</table>

Table 3. Contribution of Direct Medical, Prescription, and Indirect Costs by Disease-Modifying Therapy

<table>
<thead>
<tr>
<th>Cost category</th>
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<th>Rebif</th>
<th>Cohort Mean (SE)</th>
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</thead>
<tbody>
<tr>
<td>Healthcare</td>
<td>$18,167</td>
<td>$17,953</td>
<td>$21,314</td>
<td>$26,970</td>
</tr>
<tr>
<td>Prescription</td>
<td>$523</td>
<td>$87</td>
<td>$969</td>
<td>$1056</td>
</tr>
<tr>
<td>SL</td>
<td>$523</td>
<td>$87</td>
<td>$969</td>
<td>$1056</td>
</tr>
<tr>
<td>STD</td>
<td>$87</td>
<td>$969</td>
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<td>$26,970</td>
</tr>
</tbody>
</table>

Limitations

- While this study adds to the body of evidence about health benefit costs among employees treated for MS, the study has the same limitations characteristic of database studies using administrative claims (ie, lack of severity classification, MS stage or type) and may not be representative of patients with MS who are not diagnosed, treated, or able to maintain employment.
- Furthermore, the small sample sizes in some of the cohorts suggest results should be interpreted with caution.
- Despite such limitations, the study attempted to control for age, gender, employment status, and severity using the Charlson comorbidity score and thus represents an important addition to the literature.

Conclusions

- Overall the study results suggest that, among employees treated for MS with DMTs, patients receiving Avonex:
  - Reported the lowest SL and STD costs compared with the other 3 DMTs.
  - Had significantly lower SL costs and STD costs compared with patients receiving glatiramer acetate.

- These differences in absence suggest that patients with MS treated with 1 DMT (Avonex) may have higher productivity and lower disability than employees treated with other interferons or glatiramer acetate.

References


S36

Funding for this study was provided by Biogen Idec, Inc.
Health Benefit Costs Among Employees With Multiple Sclerosis

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Introduction

- Multiple sclerosis (MS) is an acquired inflammatory and immune-mediated disorder of the central nervous system characterized by inflammation, demyelination, and degeneration of axonal neurons that affects more than 2 million people worldwide, and estimates range from 350,000 to 440,000 patients in the United States.1,2
- MS usually affects young adults between the ages of 20–40 years, with a female-to-male risk ratio between 1.5 and 3.6
- Several studies have reported that patients with MS have difficulty maintaining employment due to the condition.
- Disease-modifying therapies (DMTs, immunomodulators) for MS aim to reduce the frequency and severity of relapses, delay disability, and postpone the onset of the progressive phase of the disease. Available DMTs include the following:
  - Interferon (IFN):
    - Avonex® (intramuscular [IM] IFN-β1a)
    - Betaseron® (IFN-β1b)
    - Rebif® (subcutaneous [SC] IFN-β1a)
  - Copaxone® (glatiramer acetate)
  - Tysabri® (natalizumab)
- While efficacy data on the DMTs exist, limited objective differences in health benefit costs among employed individuals with MS.

Objective

- The objective of this study was to assess the objective differences in health benefit costs among employees treated with DMTs for MS in a real-world setting.

Methods

- A retrospective analysis was performed on data (1/1/2001 to 6/30/2007) from the Human Capital Management Services (HCMS) Research Reference Database consisting of approximately 500,000 employees representative of the US employed civilian labor force (2004).
- Employer payroll and disability insurance records were analyzed for work absence costs (including sick leave, short-term disability [STD], long-term disability [LTD], and workers’ compensation [WC]).
- Anonymous person-level data was maintained according to the Health Insurance Portability and Accountability Act guidelines.

- Healthcare was provided through managed care plans covering all enrolled employees.
- International Classification of Diseases-9 (ICD-9) codes were used to identify patients with MS (ICD-9 code of 340.XX).
- Patients with available prescription claims were assigned to therapy cohorts and followed for 1 year after their initial prescription (Index date).

Statistical Analysis

- Demographic characteristics of the cohorts were compared using t tests for continuous variables and chi-square (χ²) tests for discrete variables. Differences were considered significant at P<0.05.
- Two-part regression analysis was used to model the health benefit cost differences between the cohorts using separate regression models for days from each type of cost.

- Costs were adjusted using regression modeling, controlling for age, gender, exempt/nonexempt status (exempt employees are not paid on an hourly basis and are paid for overtime work), full-time work status, salary, and Charlson Comorbidity Index score.
- Only employees eligible for each specific benefit were included in the regression models for that benefit.

- Indirect costs for diseases such as sick leave (SL), STD, LTD, and WC include all costs from claims begun at some point during the year following the Index date.
- Percentages of costs attributable to each type of cost were compared using Wilcoxon rank sum tests.

Results

- Records of 785 patients with MS (ICD-9 code of 340.XX) were extracted with 5 years of data beyond the employee’s index date (Table 1).
- From the 311 treated patients with MS (Table 2), total health benefit costs were lower for Avonex ($18,167) and Betaseron ($17,953) compared with Rebif ($26,970) and Copaxone ($21,934). Among the 4 DMTs:
  - Avonex patients reported the lowest total SL and STD costs.
  - Avonex patients had significantly (P<0.05) lower SL ($523 vs $694) and STD ($87 vs $106) costs than Copaxone patients.
  - All other absence comparisons between the cohorts were not significant.

- On a percentage basis (Table 3):
  - The Avonex cohort had the smallest percentage of indirect costs for all costs, while the percentage of indirect costs for the Copaxone and Rebif cohorts was 3.1% and 2.9% times higher, respectively.
  - Prescription drug costs were a higher proportion of the total benefit costs among employees in the Betaseron cohort than among employees in the Copaxone cohort (P<0.05).

Limitations

- While this study adds to the body of evidence about health benefit costs among employees treated for MS, the study has the same limitations characteristic of database studies using administrative claims (ie, lack of severity classification, MS stage or type) and may not be representative of patients with MS who are not diagnosed, treated, or able to maintain employment.
- Furthermore, the small sample sizes in some of the cohorts suggest results should be interpreted with caution.
- Despite such limitations, the study attempted to control for age, gender, employment status, and severity using the Charlson comorbidity score and thus represents an important addition to the literature.

Conclusions

- Overall the study results suggest that, among employees treated for MS with DMTs, patients receiving IM-IFN-β1a:
  - Reported the lowest SL and STD costs compared with the other 3 DMTs.
  - Had significantly lower SL costs and STD costs compared with patients receiving glatiramer acetate.
- The differences in absence suggest that patients with MS treated with 1 IM-IFN-β1a may have higher productivity and lower disability than employees treated with other interferons or glatiramer acetate.

References


Table 2. Annual Health Benefit Costs for Employees With Multiple Sclerosis by Treatment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Avonex (IM IFN-β1a)</th>
<th>Betaseron (glatiramer acetate)</th>
<th>Rebif (SC IFN-β1a)</th>
<th>Copaxone (glatiramer acetate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost category</td>
<td>Adj mean cost</td>
<td>Adj mean cost</td>
<td>Adj mean cost</td>
<td>Adj mean cost</td>
</tr>
<tr>
<td>Healthcare</td>
<td>$15,604.7</td>
<td>$15,604.7</td>
<td>$15,604.7</td>
<td>$15,604.7</td>
</tr>
<tr>
<td>Prescription</td>
<td>$2,562.5</td>
<td>$2,562.5</td>
<td>$2,562.5</td>
<td>$2,562.5</td>
</tr>
<tr>
<td>Total costs</td>
<td>$18,167</td>
<td>$18,167</td>
<td>$18,167</td>
<td>$18,167</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Cost category</th>
<th>Healthcare</th>
<th>Prescription</th>
<th>Total costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM-IFN-β1a</td>
<td>27.3%</td>
<td>16.7%</td>
<td>38.8%</td>
</tr>
<tr>
<td>IFN-β1b</td>
<td>17.0%</td>
<td>10.9%</td>
<td>20.5%</td>
</tr>
<tr>
<td>SC IFN-β1a</td>
<td>32.7%</td>
<td>25.5%</td>
<td>41.2%</td>
</tr>
<tr>
<td>Glatiramer</td>
<td>58.6%</td>
<td>45.6%</td>
<td>72.1%</td>
</tr>
</tbody>
</table>

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Introduction

• Multiple sclerosis (MS) is an acquired inflammatory and immune-mediated disorder of the central nervous system characterized by inflammation, demyelination, and degeneration of axonal neurons that affects more than 2 million people worldwide, and estimates range from 350,000 to 440,000 patients in the United States. 1,2

• MS usually affects young adults between the ages of 20–40 years, with a female-to-male risk ratio between 1.5 and 3.6. 1,3

• Several studies have reported that patients with MS have difficulty maintaining employment due to the condition. 4–7

• Disease-modifying therapies (DMTs, immunomodulators) for MS aim to reduce the frequency and severity of relapses, delay disability, and postpone the onset of the progressive phase of the disease. Available DMTs include the following:
  - Interferon (IFN):
    - Avonex® (intramuscular [IM] IFN-1a)
    - Betaseron® (IFN-1b)
  - Rebif® (subcutaneous [SC] IFN-1a)
  - Copaxone® (glatiramer acetate)
  - Tygaci® (natalizumab)

• While efficacy data on the DMTs exist, limited objective data are available on the differences in health benefit costs among employed individuals with MS.

Objective

• The objective of this study was to assess the objective differences in health benefit costs among employees treated with DMTs for MS in a real-world setting.

Methods

• A retrospective analysis was performed on data (1/1/2001 to 6/30/2007) from the Human Capital Management Services (HCMS) Research Reference Database consisting of approximately 500,000 employees representative of the US employed civilian labor force (2004).

• Employer payroll and disability insurance records were analyzed for work absence costs (including sick leave, short-term disability [STD], long-term disability [LTD], and workers’ compensation [WC]).

• Anonymity of person-level data was maintained according to the Health Insurance Portability and Accountability Act guidelines.

• Healthcare was provided through managed care plans contracted with MS (ICD-9 code of 340.xx).

• Patients with available prescription claims were assigned to therapy cohorts and followed for 1 year after their initial prescription (Index date).

• Asymptomatic patients were included in the regression models for that benefit.

• Indirect costs for claims due to sick leave (SL), STD, and LTD, and WC include all costs from claims begun at some point following the index date.

• Percentages of costs attributable to each specific benefit were compared using Wilcoxon rank sum tests.

• For the 313 treated patients with MS (Table 2), total health benefit costs were lower for Avonex ($15,167) and Betaseron ($17,953) compared with Rebif ($26,970) and Copaxone ($21,194). Among the 4 DMTs:
  - Avonex patients reported the lowest total SL and STD costs.
  - Avonex patients had significantly (P <0.05) lower SL ($523 vs $969) and STD ($87 vs $1056) costs than Betaseron and Rebif patients.
  - All other absence comparisons between the cohorts were not significant.

• On a percentage basis (Table 3):
  - The Betaseron cohort had the smallest percentage of indirect costs for all cohorts, while the percentage of indirect costs for the Copaxone and Rebif cohorts was 3.2 and 2.9 times higher, respectively.
  - Prescription drug costs were a higher portion of the total benefit costs among employees in the Betaseron cohort than among employees in the Copaxone cohort (P <0.05).

References


4. Kantarci O et al. 5. Pearson S et al. 6. Charlson ME et al. 7. recessive classification, MS stage or type and may not be representative of patients with MS who are not diagnosed, treated, or able to maintain employment.

• Furthermore, the small sample sizes in some of the cohorts suggest results should be interpreted with caution.

• Despite such limitations, this study attempted to control for age, gender, employment status, and severity using the Charlson comorbidity score and thus represents an important addition to the literature.

Conclusions

• Overall the study results suggest that, among employees treated for MS with DMTs, patients receiving IFN-1b:
  - Reported the lowest SL and STD costs compared with the other 3 DMTs.
  - Had significantly lower SL costs and STD costs compared with patients receiving glatiramer acetate.

• These differences in absence suggest that patients with MS treated with 1 IM IFN-1a may have higher productivity and lower disability than employees treated with other interferons or glatiramer acetate.

Limitations

• While this study adds to the body of evidence about health benefit costs among employees treated for MS, the study has the same limitations characteristic of database studies using administrative claims (ie, lack of severity classification, MS stage or type) and may not be representative of patients with MS who are not diagnosed, treated, or able to maintain employment.

• The small sample sizes in some of the cohorts suggest results should be interpreted with caution.

• Despite such limitations, the study attempted to control for age, gender, employment status, and severity using the Charlson comorbidity score and thus represents an important addition to the literature.
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Multiple sclerosis (MS) is an acquired inflammatory and immune-mediated disorder of the central nervous system characterized by inflammation, demyelination, and degeneration of axonal neurons that affects more than 2 million people worldwide, and estimates range from 350,000 to 440,000 patients in the United States.\(^1\) MS usually affects young adults between the ages of 20–40 years, with a female-to-male risk ratio between 1.5 and 3.\(^2\)

Several studies have reported that patients with MS have difficulty maintaining employment due to the condition.\(^3\)

Disease-modifying therapies (DMTs, immunomodulators) for MS aim to reduce the frequency and severity of relapses, delay disability, and postpone the onset of the progressive phase of the disease. Available DMTs include the following: – Interferon (IFN):
– Avonex® (intramuscular IFNβ-1a)
– Betaseron® (IFNβ-1b)
– Rebif® (subcutaneous IFNβ-1a)
– Copaxone® (glatiramer acetate)
– Tygucin® (natalizumab)

While efficacy data on the DMTs exist, limited objective data are available on the differences in health benefit costs among employed individuals with MS.

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Methods

A retrospective analysis was performed on data (1/1/2001 to 6/30/2007) from the Human Capital Management Services (HCMS) Reference Research Database consisting of approximately 500,000 employees representative of the US employed civil labor force (2004).

Employer payroll and disability insurance records were analyzed for work absence costs (including sick leave, short-term disability (STD), long-term disability (LTD), and workers’ compensation (WC)).

Anonymity of personnel data was maintained according to the Health Insurance Portability and Accountability Act guidelines.

Healthcare was provided through managed care plans contracted for by respective employers.

• International Classification of Diseases-9 (ICD-9) codes were used to identify patients with MS (ICD-9 code of 340.xx).
• Patients with available prescription claims were assigned to therapy cohorts and followed for 1 year after their initial prescription (Index date).

Statistical Analysis

• Demographic characteristics of the cohorts were compared using F tests for continuous variables and chi-square (χ²) tests for discrete variables. Differences were considered significant at P<0.05.
• Two-part regression analysis was used to model the health benefit cost differences between the cohorts using separate regression models for days from each cost category.

Results

• Records of 785 patients with MS (ICD-9 code of 340.xx) were extracted with 3 years of data beyond the employee’s index date.
• From the 311 treated patients with MS (Table 2), total health benefit costs were lower for Avonex ($15,637) and Betaseron ($17,953) compared with Rebif ($26,970) and Copaxone ($21,145). Among the 4 DMTs:
– Avonex patients reported the lowest total SL and STD costs.
– Avonex patients had significantly (P<0.05) lower SL ($523 vs $969) and STD ($87 vs $1056) costs than Copaxone patients ($1046).
– All other absence comparisons between the cohorts were not significant.

• On a percentage basis (Table 3):
– The Avonex cohort had the smallest percentage of indirect costs for all cohorts, while the percentage of indirect costs among employees in the Betaseron cohort was higher than among employees in the Copaxone cohort (P<0.05).

Conclusions

• Overall the study results suggest that, among employees treated for MS with DMTs, patients receiving IFNβ-1a:
– Reported the lowest SL and STD costs compared with the other 3 DMTs.
– Had significantly lower SL costs and STD costs compared with patients receiving glatiramer acetate.

• These differences in absence suggest that patients with MS treated with IFNβ-1a may have higher productivity and lower disability than employees treated with other interferons or glatiramer acetate.

References


Limitations

• While this study adds to the body of evidence about health benefit costs among employees treated for MS, the study has the same limitations characteristic of database studies using administrative claims (i.e., lack of severity classification, MS stage or type) and may not be representative of patients with MS who are not diagnosed, treated, or able to maintain employment.

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Avonex</th>
<th>Betaseron</th>
<th>Copaxone</th>
<th>Rebif</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (yr)</td>
<td>43.48</td>
<td>41.62</td>
<td>46.31</td>
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<tr>
<td>Mean age in yr</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Female, %</td>
<td>62.4</td>
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<td>63.4</td>
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<tr>
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<td>Tenure, years</td>
<td>9.79</td>
<td>8.80</td>
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</table>

Table 2. Annual Health Benefit Costs for Employees With Multiple Sclerosis

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<tr>
<th>Cost category</th>
<th>Avonex ($1M), N=156</th>
<th>Betaseron ($1M), N=55</th>
<th>Copaxone ($1M), N=87</th>
<th>Rebif ($1M), N=13</th>
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</thead>
<tbody>
<tr>
<td>Healthcare compensation cost</td>
<td>156 $4047</td>
<td>55 $2984</td>
<td>87 $5127</td>
<td>13 $17,934</td>
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<tr>
<td>Long-term disability cost</td>
<td>156 $13,292</td>
<td>55 $13,634</td>
<td>87 $14,863</td>
<td>13 $20,077</td>
</tr>
<tr>
<td>Prescription drug costs</td>
<td>156 $13,292</td>
<td>55 $13,634</td>
<td>87 $14,863</td>
<td>13 $20,077</td>
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<tr>
<td>Total costs</td>
<td>156 $15,392</td>
<td>55 $15,828</td>
<td>87 $16,910</td>
<td>13 $27,970</td>
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Table 3. Contribution of Direct Medical, Prescription, and Indirect Costs by Disease-Modifying Therapy

<table>
<thead>
<tr>
<th>Cost category %</th>
<th>Avonex (IFNβ-1a)</th>
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<th>Copaxone (glatiramer acetate)</th>
<th>Rebif (SC IFNβ-1a)</th>
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<td>Healthcare compensation cost</td>
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<td>55 $2984</td>
<td>87 $5127</td>
<td>13 $17,934</td>
</tr>
<tr>
<td>Long-term disability</td>
<td>55 $0</td>
<td>55 $0</td>
<td>55 $0</td>
<td>55 $0</td>
</tr>
<tr>
<td>Prescription drug</td>
<td>156 $13,292</td>
<td>55 $13,634</td>
<td>87 $14,863</td>
<td>13 $20,077</td>
</tr>
<tr>
<td>Total cost</td>
<td>156 $15,392</td>
<td>55 $15,828</td>
<td>87 $16,910</td>
<td>13 $27,970</td>
</tr>
</tbody>
</table>

Funding for this study was provided by Biogen Idec, Inc.