

# PND43: THE BURDEN OF MULTIPLE SCLEROSIS IN JAPAN

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## ABSTRACT

**Objectives:** Multiple sclerosis (MS) is a disabling autoimmune disease that affects the central nervous system. Although a number of studies have been conducted in the West, few studies have examined the effect of MS on patient outcomes in Japan. The objective of this study was to quantify the burden of MS in Japan with respect to health status, work-related impairment, activity impairment, and healthcare resource utilization.

**Methods:** Data from the Japan 2008-2014 National Health and Wellness Survey (NHWS) were used (N=153,277). The NHWS is a nationally representative patient-reported health survey of adults in Japan which assesses information on demographics, health history, and health outcomes. Respondents who self-reported a diagnosis of MS were compared with respondents who did not report a diagnosis of MS with respect to health status (assessed via the mental [MCS] and physical component summary [PCS] scores from the Short Form-36v2), work-related impairment (assessed via the WPAI-GH instrument), and self-reported healthcare resource utilization in the past 6 months. Comparisons were made using one-way ANOVAs.

**Results:** A total of N=91 respondents reported a diagnosis of MS (62.6% were female; mean age=47.6). Respondents with MS reported significantly worse MCS (40.4 vs. 46.0), PCS (41.3 vs. 51.3), and health utilities (0.63 vs. 0.74), and significantly greater overall work impairment (46.6% vs. 22.7%), activity impairment (47.0% vs. 24.8%), physician visits (7.9 vs. 4.7), hospitalizations (2.6 vs. 0.7), and emergency department visits (0.1 vs. 0.0) (all p<.05).

**Conclusions:** The results suggest that the presence of MS in Japan is associated with poorer health status, greater work-related impairment (leading to higher indirect costs), and greater healthcare resource utilization (leading to higher direct costs). Improved management of MS could benefit both the patient and society.

\*Note original abstract submitted was based on preliminary analysis (with a smaller sample size)

## INTRODUCTION

Multiple sclerosis (MS) is a disabling autoimmune disease that affects the central nervous system [1].

Predominantly affecting women in their 20s, 30s, and 40s, MS has been found to be associated with poorer quality of life and higher societal costs [1-3].

However, most of the research has been conducted in Western countries, with an absence of literature in Japan. The present study sought to address this gap.

## OBJECTIVE

To quantify the burden of MS with respect to health status, work productivity loss, and healthcare resource use in Japan.

## METHODS (1)

### Data source

Data from the 2008-2014 Japan National Health and Wellness Survey (NHWS) were used. Multiple years were included to maximize the sample size for patients with MS, given its low prevalence.

The Japan NHWS is an annual, Internet-based health survey administered to a nationwide sample of adults (aged 18 or older).

Potential respondents of the Japan NHWS are recruited from various Internet panels through an email invitation. The sampling was conducted in a random stratified manner in order to ensure the final sample matched the age, sex, and region distribution of the adult Japan population.

## METHODS (2)

### Measures

- MS.** Respondents who reported a diagnosis of MS were considered part of the MS group. Those who did not report a diagnosis of MS served as the "no MS" control group.
- Demographics.** Age, education, household income, and health insurance was assessed for all respondents.
- Health history.** Smoking habits, exercise behavior, alcohol use, body mass index (BMI) category (coded based on the World Health Organization recommendation for Asian populations: underweight [ $<18.5\text{kg/m}^2$ ], acceptable risk [ $18.5$  to  $<23\text{kg/m}^2$ ], increased risk [ $23$  to  $<27.5\text{kg/m}^2$ ], high risk [ $\geq 27.5\text{kg/m}^2$ ] or decline to provide weight), and the Charlson comorbidity index (CCI; a measure of comorbidity burden) were also included.
- Health outcomes.** Health status was assessed using the physical (PCS) and mental component summary (MCS) scores from the Short Form-12 version 2 (SF-12v2)/ Short Form-36 version 2 (SF-36v2). Health utility scores, derived from the SF-12v2/SF-36v2 were also included (Short Form-6 Dimensions [SF-6D]). Work productivity and impairment was assessed using the Work Productivity and Activity Impairment – General Health (WPAI-GH) questionnaire. Healthcare utilization was defined by the number of healthcare providers seen in the past six months, the number of emergency room (ER) visits, and the number of times hospitalized in the past six months.

## METHODS (3)

### Statistical analysis

- Demographic and health history differences between respondents with MS and all no MS controls were made using chi-square tests and one-way analysis of variance (ANOVA) tests.
- In order to address the large differences in sample size and baseline differences between respondents with and without MS, a propensity score weighting method was used: Toolkit for Weighting and Analysis of Nonequivalent Groups (TWANG) [4].
  - Controls which had demographic and health history values outside the range of those with MS were removed (i.e., controls older than 77 years; N=1,540). MS patients with a CCI value of greater than 30 were also removed to improve model fit (N=16 were removed).
  - Using the remaining cases, all demographic and health history variables were entered into a generalized boosted regression to predict MS group membership (MS vs. control). Propensity score values were saved and used to calculate sampling weights.
  - Comparisons between MS and no MS controls with respect to health outcomes were then made applying the calculated sampling weights, which adjusted for the imbalance between demographic and health history values.
  - Because differences in age and the CCI were still significant even after applying these sampling weights, generalized linear models were then conducted to predict health outcomes from group

## RESULTS (1)

- After removal of outliers, a total of N=153,277 respondents were included in the analyses. N=91 self-reported a diagnosis of MS.
- Patients with MS were significantly more likely to be female and significantly less likely to be employed, have an annual income above ¥8 million, consume alcohol, and have an increased risk based on their BMI level relative to controls (see Table 1). Patients with MS also had a significantly greater comorbidity burden as assessed by the CCI.

## RESULTS (2)

Table 1. Demographic and health history differences between patients with MS and controls.

	Total	MS Control	Diagnosed MS	P Value
N =	153,277	153,186	91	
Age (years) (Mean ± Std Dev)	47.6 ± 15.3	47.6 ± 15.3	47.6 ± 14.4	0.965
Female (%)	74,849 (48.8%)	74,792 (48.8%)	57 (62.6%)	0.008
Currently employed (%)	92,517 (60.4%)	92,479 (60.4%)	38 (41.8%)	<.001
University educated (%)	72,885 (47.6%)	72,845 (47.6%)	40 (44.0%)	0.492
Annual household income				0.002
<¥3million (%)	27,203 (17.7%)	27,176 (17.7%)	27 (29.7%)	
¥3million to <¥5million (%)	39,092 (25.5%)	39,075 (25.5%)	17 (18.7%)	
¥5million to <¥8million (%)	38,701 (25.2%)	38,677 (25.2%)	24 (26.4%)	
¥8million or more (%)	32,443 (21.2%)	32,434 (21.2%)	9 (9.9%)	
Decline to answer (%)	15,838 (10.3%)	15,824 (10.3%)	14 (15.4%)	
Type of insurance				0.036
National Health Insurance (%)	68,487 (44.7%)	68,436 (44.7%)	51 (56.0%)	
Social Insurance (%)	76,265 (49.8%)	76,233 (49.8%)	32 (35.2%)	
Late Stage Elderly Insurance (%)	1,028 (0.7%)	1,027 (0.7%)	1 (1.1%)	
Other (%)	2,728 (1.8%)	2,724 (1.8%)	4 (4.4%)	
None of the above (%)	4,769 (3.1%)	4,766 (3.1%)	3 (3.3%)	
Body mass index (BMI) category				0.005
Underweight (%)	16,355 (10.7%)	16,339 (10.7%)	16 (17.6%)	
Acceptable risk (%)	77,637 (50.7%)	77,583 (50.6%)	54 (59.3%)	
Increased risk (%)	42,428 (27.7%)	42,418 (27.7%)	10 (11.0%)	
High risk (%)	10,717 (7.0%)	10,710 (7.0%)	7 (7.7%)	
Decline to provide weight (%)	6,140 (4.0%)	6,136 (4.0%)	4 (4.4%)	
Consume alcohol (%)	109,029 (71.1%)	108,982 (71.1%)	47 (51.6%)	<.001
Smoking behavior				0.135
Never smoked (%)	83,583 (54.5%)	83,537 (54.5%)	46 (50.5%)	
Former smoker (%)	37,079 (24.2%)	37,061 (24.2%)	18 (19.8%)	
Current smoker (%)	32,615 (21.3%)	32,588 (21.3%)	27 (29.7%)	
Regularly exercise (%)	67,512 (44.0%)	67,481 (44.1%)	31 (34.1%)	0.055
Charlson comorbidity index (Mean ± Std Dev)	0.1 ± 0.5	0.1 ± 0.5	1.2 ± 4.2	<.001

## RESULTS (3)

- Applying sample weights derived from the propensity score values, all differences between patients with MS and weighted controls were eliminated with the exception of age and the CCI (see Table 2). Patients with MS were slightly younger (47.6 vs. 48.5 years) and had a greater comorbidity burden (CCI: 1.2 vs. 0.4) (both p<.05).

## RESULTS (4)

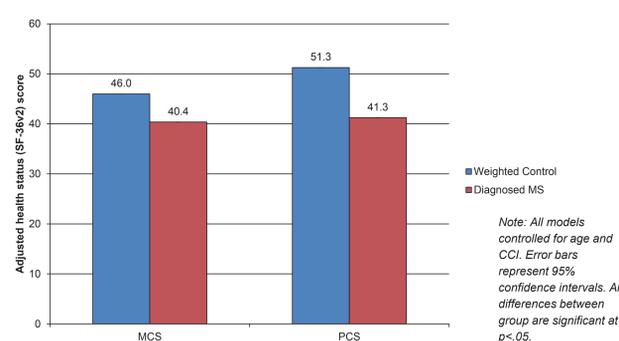
Table 2. Post-weighting demographic and health history differences between patients with MS and weighted controls.

	Total	MS Weighted Control	Diagnosed MS	P Value
N =	153,277	153,186	91	
Weighted N =	176	85	91	
Age (years) (Mean ± Std Dev)	48.1 ± 0.8	48.5 ± 0.2	47.6 ± 1.5	<.001
Female (%)	110 (62.3%)	53 (62.0%)	57 (62.6%)	0.902
Currently employed (%)	73 (41.5%)	35 (41.1%)	38 (41.8%)	0.906
University educated (%)	75 (42.5%)	35 (40.9%)	40 (44.0%)	0.551
Annual household income				0.973
<¥3million (%)	52 (29.4%)	25 (29.0%)	27 (29.7%)	
¥3million to <¥5million (%)	33 (19.0%)	16 (19.4%)	17 (18.7%)	
¥5million to <¥8million (%)	44 (25.1%)	20 (23.7%)	24 (26.4%)	
¥8million or more (%)	18 (10.3%)	9 (10.7%)	9 (9.9%)	
Decline to answer (%)	29 (16.2%)	15 (17.1%)	14 (15.4%)	
Type of insurance				0.995
National Health Insurance (%)	98 (55.8%)	47 (55.6%)	51 (56.0%)	
Social Insurance (%)	62 (35.1%)	30 (35.1%)	32 (35.2%)	
Late Stage Elderly Insurance (%)	2 (0.9%)	1 (0.8%)	1 (1.1%)	
Other (%)	8 (4.5%)	4 (4.7%)	4 (4.4%)	
None of the above (%)	6 (3.6%)	3 (3.9%)	3 (3.3%)	
Body mass index (BMI) category				0.999
Underweight (%)	30 (17.1%)	14 (16.6%)	16 (17.6%)	
Acceptable risk (%)	106 (60.0%)	52 (60.7%)	54 (59.3%)	
Increased risk (%)	19 (10.9%)	9 (10.9%)	10 (11.0%)	
High risk (%)	13 (7.5%)	6 (7.3%)	7 (7.7%)	
Decline to provide weight (%)	8 (4.4%)	4 (4.5%)	4 (4.4%)	
Consume alcohol (%)	90 (51.0%)	43 (50.3%)	47 (51.6%)	0.801
Smoking behavior				0.647
Never smoked (%)	92 (52.0%)	46 (53.6%)	46 (50.5%)	
Former smoker (%)	36 (20.4%)	18 (21.1%)	18 (19.8%)	
Current smoker (%)	49 (27.6%)	22 (25.3%)	27 (29.7%)	
Regularly exercise (%)	58 (32.8%)	27 (31.4%)	31 (34.1%)	0.591
Charlson comorbidity index (Mean ± Std Dev)	0.8 ± 0.2	0.4 ± 0.1	1.2 ± 4.4	<.001

## RESULTS (5)

- Patients with MS reported significantly worse levels of mental (40.4 vs. 46.0, p<.05) and physical health status (41.3 vs. 51.3, p<.05), even after applying weights and adjusting for age and the CCI (see Figure 1).

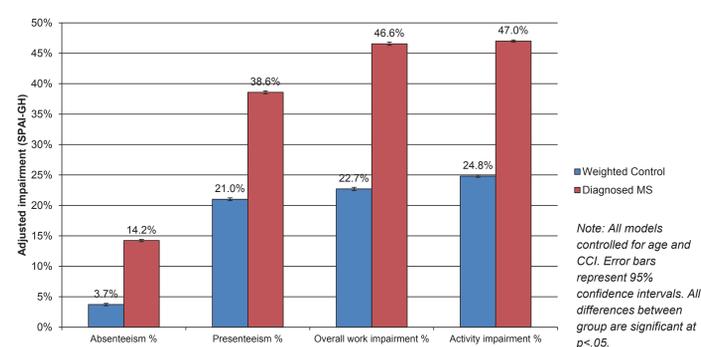
Figure 1. Post-weighting adjusted health status differences between patients with MS and weighted controls.



## RESULTS (6)

- Patients with MS also reported significantly greater levels of absenteeism (14.2% vs. 3.7%), presenteeism (38.6% vs. 21.0%), overall work impairment (46.6% vs. 22.7%), and activity impairment (47.0% vs. 24.8%) (all p<.05) (see Figure 2).

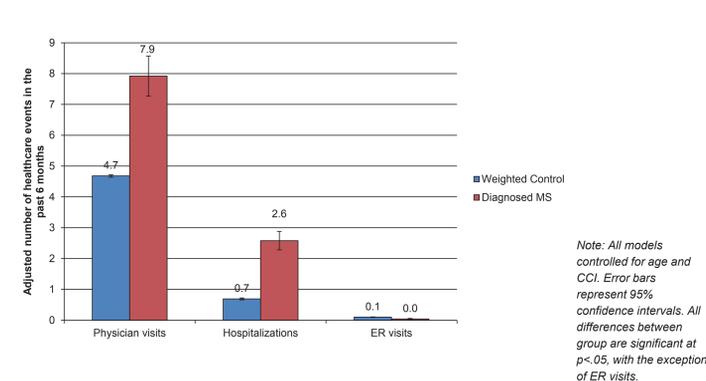
Figure 2. Post-weighting adjusted impairment differences between patients with MS and weighted controls.



## RESULTS (7)

- Patients with MS also reported significantly more physician visits (7.9 vs. 4.7) and hospitalizations (2.6 vs. 0.7) (both p<.05). No differences in ER visits were observed (0.04 vs. 0.1) (see Figure 3).

Figure 3. Post-weighting adjusted healthcare resource use differences between patients with MS and weighted controls.



## LIMITATIONS

- As with any survey, the data are self-reported and cannot be verified by patients' medical charts or other objective data.
- The data are cross-sectional in nature and do not allow for causal explanations to be made.
- Although the NHWS is demographically representative of the adult population in Japan, it is unclear the extent to which the MS sample is representative of the adult MS population in Japan.

## CONCLUSION

- MS imposes a significant health status burden on patients, with levels of physical health status more than a full standard deviation below weighted control respondents.
- Among those employed, MS also contributes to substantial economic losses. Levels of work-related impairment were approximately double that of weighted control respondents and the number of healthcare resource use visits was also substantially higher.
- These findings suggest a substantial unmet need exists for patients with MS. Greater disease management could help to improve quality of life and reduce societal costs.

## REFERENCES

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