Atlas of MS 3rd edition

PART 2:

Clinical management of multiple sclerosis around the world

Key findings about the diagnosis and clinical management of MS

ms international federation
April 2021

About this report

This report was prepared by Rachel King, International Evidence Manager, Dr. Clare Walton, Research Projects Lead and Dr. Anne Helme, Head of Research and Access - Multiple Sclerosis International Federation (MSIF).

This report is part 2 of the 3rd edition of the Atlas of MS. Part 1 – 'Mapping multiple sclerosis around the world: key epidemiology findings' – was published in September 2020.

Contributors

MSIF would like to thank the extensive number of collaborators and contributors involved in this global report, without whom it would not have been possible. You can find a full list of acknowledgements at the end of the report.

For additional data, information and documents

Please visit our website to access the interactive chart and map tool, country factsheets, the full dataset and other materials to help you use the Atlas of MS: **www.atlasofms.org**

Citation

The Atlas of MS is open-source, but we would be grateful if you could use the following citation if you use the data:

The Multiple Sclerosis International Federation – Atlas of MS – 3rd Edition, part 2: clinical management of multiple sclerosis around the world (April 2021).

Published by

The Multiple Sclerosis International Federation (MSIF), April 2021.

Report Design

Osomi | www.osomi.co.uk

Foreword

Our previous Atlas of MS report, published in September 2020, showed us that there are an estimated 2.8 million people living with MS globally. This includes many young people under the age of 18. It is vital that each and every one of them gets the care and support they need to enable them to live their best lives.

There have been many important changes in the healthcare landscape for people with MS in recent years. Continued improvement in diagnostic guidelines – such as the 2017 revisions to the McDonald criteria and their global adoption – is enabling many people with MS to be diagnosed earlier in the disease course. In some parts of the world, an earlier diagnosis opens up the window for earlier intervention with effective disease modifying therapies, protecting the brain and nervous system, and offering the possibility to postpone the accumulation of disability.

We have also seen a rapid expansion of drug therapies available for people with MS, bringing hope to many more people living with the disease. Although therapy options have increased worldwide, the Atlas of MS highlights that 7 in 10 low income countries have no or very limited access to licensed disease modifying therapies. Additionally our data shows that the cost of MS medications is a barrier to access in many countries. Equitable access to treatment is a vitally important issue for the global MSIF movement to address, and one that we continue to focus on through our policy and advocacy work.

This report of the second part of the Atlas of MS reveals the many barriers and inequalities that exist in getting a diagnosis, as well as accessing disease modifying therapies and rehabilitation. We recognise that difficulties in accessing healthcare are likely to be exacerbated in the current climate, as services are cut and health professionals are redeployed to focus on COVID-19. We are concerned that the escalating cost of the pandemic could mean that services will be unable to get back to normal and we call on health authorities around the globe to work together to ensure that people with MS and similar conditions get the care and treatment they need.

We are greatly saddened by the huge numbers of people who have lost their lives to COVID-19 but heartened to see the global research and healthcare community come together to develop several vaccines in record time. The development of vaccines against COVID-19 brings hope of a return to normal life for the many people with MS who are shielding or who have had their care disrupted, though we acknowledge the challenge of accessing these vaccines in many countries.

We hope for a brighter future for every single person with MS and know that together we are stronger. We encourage people affected by MS, their MS organisations, healthcare professionals, researchers and the healthcare industry to make use of the Atlas of MS to advocate for, and make changes to improve the quality of life of people affected by MS wherever they live.

Peer Baneke
CEO of the MS International Federation

> ***This 3rd edition of the Atlas of MS shines a spotlight on the barriers to accessing diagnosis and disease modifying therapies around the world. These issues are particularly evident in low and middle income countries but high income countries are not exempt. This report highlights the need for major policy changes to ensure early diagnosis and improved access to a range of treatments, to guarantee the best possible outcomes for people with MS. Information from the Atlas of MS should be used to guide policy-makers, health planners and specialists, in order to close the gaps in care, decrease inequities globally and provide a better future for people with MS and their families.***

Professor Mai Sharawy
Professor of Neuro-Ophthalmology at Cairo University - Egypt.
Founder of MS Care and Chair of MSIF Board

What is MS?

- **Multiple sclerosis (MS) is a neurological condition that affects the brain and spinal cord (the central nervous system), which control all bodily functions.**
- **MS causes damage to the coating that protects the nerves (myelin). Myelin insulates nerves, acting like the covering of an electric wire. The loss of myelin (demyelination) is accompanied by a disruption in the ability of the nerves to conduct electrical impulses to and from the brain. This causes a range of MS symptoms, such as blurred vision, weak limbs, tingling sensations, dizziness and fatigue.**
- **MS symptoms vary widely between people. For some people, MS is characterised by periods of relapse and remission while for others it has a progressive pattern. For everyone with MS, it makes life unpredictable. It is a common life-long condition and in many countries, it is the leading cause of non-traumatic neurological disability in young adults. This has major implications for the quality of life of people with MS and their families and friends, and for the cost to society if their condition is not adequately managed.**

Introduction

Global information on MS epidemiology and healthcare accessibility for people affected by MS is fragmented. The Atlas of MS aims to bring together all available information in an open-source data set to allow a more complete understanding of the burden of the disease and provide useful insights on how it varies across the world.

The first Atlas of MS – published in 2008 as a joint project by the MS International Federation (MSIF) and the World Health Organization – was one of the most cited global resources on MS. The 2013 edition has been used to inform research initiatives as well as for campaigning and advocacy.

> **The Atlas of MS is unique in that it is not a standard review of the published literature, but instead seeks to reach out to organisations and experts in every country in the world asking them to provide the most up-to-date information on MS.**

Together with our international working group, panel of expert advisors and our methodology partner McKing Consulting Corporation, we have strived to improve the volume, reach and accuracy of the data in this 3rd edition. Additionally, we have focused on making the data more accessible by improving the website as well as providing extra materials such as country factsheets. This edition of the Atlas collected data around the following themes:

- **Part 1: Epidemiology of MS:** focuses on the number of people with MS, how this varies across the globe, as well as demographic data such as age and gender.
- **Part 2: Clinical management of MS:** looks at the clinical management of MS and places particular emphasis on the barriers to accessing healthcare and disease modifying therapies.

This report focuses on the key clinical management findings. The report and data relating to part 1, the epidemiology of MS, can be found on the website **www.atlasofms.org**

Summary of key findings

Diagnosing MS

An early diagnosis is vital to enable early treatment with disease modifying therapies that can minimise relapses and reduce future disability. Even if disease modifying therapies are not available, an early diagnosis is still crucial as it allows for lifestyle changes to help manage the disease and improve quality of life.

The Atlas of MS finds:

1. The majority (83%) of countries worldwide have barriers that prevent early diagnosis of MS. Globally the most commonly reported barrier is a lack of awareness of MS symptoms amongst the public and healthcare professionals. In low and lower middle income countries[1] other barriers are also common, including the availability of qualified healthcare professionals as well as the availability and cost of the diagnostic equipment and tests.

2. Use of the most recent criteria for diagnosing MS (McDonald 2017) correlates with country wealth. There is almost universal use (98%) in high income countries compared to less than half (40%) of low income countries using the criteria. The most common barrier cited for not using McDonald 2017 is a lack of awareness or training for neurologists.

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[1] https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

Disease modifying therapies for MS

Early treatment with disease modifying therapies (DMTs) can change the course of a person's MS and reduce future disability.

The Atlas of MS finds:

3

Access to DMTs is not universal – experts in 14% of countries surveyed report having no licensed DMTs available for people with MS. This increases to 60% of African countries and 70% of low income countries.

4

A quarter (25%) of countries worldwide do not use high efficacy licensed DMTs[2] and this increases to 50% of lower middle income countries and 100% of low income countries.

5

Use of off-label DMTs (therapies that have not been approved specifically for MS) is common. Experts in 87% of countries report the use of off-label drugs to treat MS.

6

72% of countries cite barriers to accessing DMTs. Globally the most common barrier is the cost to the government, healthcare system or insurance provider, which is cited by experts in around half of all reporting countries. In addition to cost, experts in low income countries often report both a lack of healthcare professionals and a lack of knowledge of DMTs amongst professionals as a barrier to accessing therapies.

7

Experts in almost half of countries worldwide report problems with the continuous provision of DMT treatment, meaning that once initiated on a DMT, people with MS are unable to receive future doses without interruption or delay. The main reasons cited are an irregular supply of DMT (27% of all countries) or the delays associated with people needing to get their reimbursement renewed (19%) or the need to take regular tests to prove continued eligibility (13%).

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[2] In our analysis we classify alemtuzumab, natalizumab and ocrelizumab as high efficacy licensed DMTs.

Rehabilitation and symptom management

Rehabilitation and use of symptomatic therapies are important aspects of MS management to help people with MS maintain function and have a good quality of life.

The Atlas of MS finds:

8

There is high unmet need for rehabilitation and symptom management, especially in lower middle and low income countries. Therapies for fatigue and cognitive impairment are not available in two-fifths of countries worldwide.

The wider healthcare system

Many types of healthcare professional contribute to the overall care and support for people with MS. Overarching national plans or guidelines for MS and standards for the care expected can help improve MS healthcare overall and reduce inequalities of access within countries.

The Atlas of MS finds:

9

There is huge global variation in the number of neurologists per 100,000 people. This ranges from a median prevalence of 4.6 neurologists per 100,000 people in high income countries to 0.05 in low income countries. Globally, 5% of all neurologists are reported to have a special interest in MS[3].

10

At least 1.8 million people – two-thirds of the world's population of people with MS – are living in countries that do not have national guidelines for the diagnosis and treatment of MS and do not have national standards in place to guide MS care.

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[3] See Healthcare professionals section for the definition of specialist MS neurologist that was used in the survey.

Recommendations

The Atlas of MS is a powerful tool to raise awareness and drive change to improve the quality of life of people affected by MS across the globe. Given the vastly different contexts around the world, countries need to take an individual approach to turning the Atlas of MS data into evidence-based advocacy activity.

By working together to review the Atlas data for their countries, people affected by MS, their MS organisations, healthcare professionals and healthcare authorities can compare the situation in their country to other countries in their region or income band and to the global picture, and make plans to address the challenges they face.

A

Each country should have a national plan or guidelines for the healthcare of people with MS.

- Such plans should aim to include: relevant standards; the most recent global diagnostic criteria for MS; guidance on the selection and management of different disease modifying therapies; and a pathway for accessing rehabilitation and symptomatic therapies.

B

A range of DMTs should be available, to provide people with MS the most appropriate treatment for their disease and individual circumstances.

- In particular, countries should focus advocacy efforts on improving access to high efficacy DMTs, and ensuring continuity of treatment.

- Given the widespread use of off-label DMTs, evidence-based guidance on the use of off-label DMTs should be made available to support clinical decision-making and reimbursement decisions.

C

Affordability of DMTs needs to be improved.

- There are already drug access schemes that allow people with MS to be treated with DMTs at reduced cost in many countries. Despite this, DMTs for MS are still too costly in many settings. The cost of DMTs should be addressed to create fair and sustainable solutions for the payers (such as governments, healthcare systems and insurance providers) as well as for the pharmaceutical industry, and others involved in the chain of healthcare provision.

- Focus should also be placed on ensuring costs for people with MS are affordable and in line with local income levels.

D

Organisations/networks that focus on neurological conditions should work together to enable earlier diagnosis, effective treatment and support for neurological conditions, including MS.

- In particular, they should collaborate on shared challenges such as:

  a The number and training of neurologists, and other professionals involved in neurological care

  b Access to cost-effective diagnostic tests, equipment and medicines

  This will help shape the forthcoming WHO global action plan on epilepsy and other neurological disorders[4].

E

Healthcare authorities, research institutions, MS organisations, and healthcare professionals should collaborate in the collection of data relating to MS, needed to establish and monitor standards for MS healthcare.

- MS data collection will need to improve in most countries to understand and track progress against national and international standards. Healthcare authorities, research institutions, MS organisations, and healthcare professionals should work together to develop, communicate and implement minimum data requirements for MS surveillance.

> ***Findings from this edition of the Atlas of MS highlight the global inequities of access to MS healthcare. As the Chairs of MSIF's International Medical and Scientific Board, we encourage our neurological colleagues across the world to support global, regional and national efforts by MS organisations and healthcare authorities to improve access to clinicians with expertise in the diagnosis and care of persons with MS and the availability and affordability of a range of DMTs and symptomatic therapies. We recognize the imperative for ongoing data collection in order to more effectively advocate for the needs of the MS communities worldwide. By working together we can improve outcomes for everyone affected by MS.***

Professor Brenda Banwell

Chief of Child Neurology and Professor of Neurology and Pediatrics at The Children's Hospital of Philadelphia and Perelman School of Medicine, University of Pennsylvania, and Chair of MSIF's International Medical and Scientific Board.

Professor Jorge Correale

Head of Neuroimmunology and Demyelinating Diseases at the Dr Raúl Carrea Institute for Neurological Research in Buenos Aires, and Vice Chair of MSIF's International Medical and Scientific Board.

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[4] https://apps.who.int/gb/ebwha/pdf_files/WHA73/A73_ACONF2-en.pdf

Using clinical management data as an advocacy tool

The information in the Atlas of MS can be a powerful advocacy tool, shining a spotlight on MS and raising awareness of the barriers to accessing diagnosis and care for people with MS worldwide.

Egypt's Treat and Teach initiative helps increase the number of trained neurologists in the African region

Collecting data on the number of neurologists shows that this region of the world has particularly few in relation to its population. A lack of neurologists is a key barrier to accessing diagnosis, treatment and care for MS. Egypt's 'Treat and Teach' initiative shows how neurological organisations have come together across the African region to tackle this challenge.

Ain Shams University Hospital (ASUH) is a 4000 bed teaching hospital in Eastern Cairo serving between 1.5-2 million patients per year. The Ain Shams University Virtual Hospital (AVH) is an academic unit within the hospital which launched a 'Treat and Teach' initiative in January 2016. This initiative was designed to supplement neurology education programmes and increase the number of trained neurologists in the African region.

The programme starts by assessing the needs of the neurology service in the country, and then an action plan is developed. Delivering this plan involves blending telemedicine/online education with healthcare professionals travelling between countries to provide face-to-face support. The programme is completely flexible to suit the local situation – as well as workforce training, the AVH unit might support infrastructure improvements such as new equipment, quality control measures or medication availability in the partner country. Over the last 6 years the programme has delivered over 2000 medical consultations by telemedicine, provided around 400 hours of online lectures and conferences, and has hosted trainees from many countries.

In relation to MS, the AVH unit is working with neurologists across Egypt to establish MS centres supported by telemedicine. In addition, in countries where there is limited awareness of MS, and few neurologists available to diagnose the condition, the unit has established a telemedicine support service for neurology clinics.

With thanks to Prof. Magd Zakaria from Ain Shams University Hospital for sharing this example.

Methodology

The 3rd edition of the Atlas of MS is an ambitious project. We sought to make several improvements on the 2013 publication: broadening the reach by including new countries, achieving greater population coverage, increasing confidence in the data and accuracy of the global prevalence estimate, as well as improving the accessibility and usability of the statistics.

To help with this ambition, we recruited a working group and panel of expert advisors to help guide the project, the questionnaire design and the analysis, ensuring involvement of advisors from different parts of the globe. We also consulted with other expert stakeholders regarding the key messages arising from the data; namely MSIF's International Medical and Scientific Board (IMSB) and International Working Group on Access.

Furthermore, we partnered with methodology and analysis experts McKing Consulting Corporation in the US, to ensure the highest quality data collection and analysis approaches underpinned the project.

The Atlas working group

The working group consisted of representatives from 13 MSIF members across 12 countries, covering 5 of the 6 WHO regions.

The Atlas expert advisors

A panel of 16 expert advisors who brought epidemiological, clinical and access expertise from 15 countries covering all 6 WHO regions and all 4 World Bank income categories.

Data collection and response rates

Data was collected via an international online survey completed by experts in participating countries between October 2019 and April 2020. English, Spanish, French and PDF versions of the survey were available to encourage greater response rates and to encourage collaboration with other national experts.

The clinical management questionnaire covered the following topics: diagnostic criteria used, barriers to diagnosis, types of disease modifying therapies used and barriers to accessing them, symptomatic therapies and rehabilitation, numbers of health care professionals, national guidelines and standards for MS diagnosis and treatment. It was piloted prior to launch to test clarity, understanding and ease of completion.

138 countries[5] enrolled to take part in the Atlas of MS 3rd edition. Country coordinators were identified in each of these countries to be the focal point for gathering the relevant information; typically, they were representatives from MS organisations, neurologists, epidemiologists or researchers. Contacts were identified through MSIF's network of MS organisations (members and non-members), our International Medical and Scientific Board, International Working Group on Access, previous Atlas contacts, the World Federation of Neurology, the Atlas working group and expert advisors, the various regional International Committees for the Treatment and Research in Multiple Sclerosis (TRIMS) as well as from scientific literature. We thank everyone who was involved and helped us achieve a wider reach in this edition.

80 countries did not have an identified coordinator or did not agree to participate – these tended to be countries without MS organisations, where neurologists could not be identified or nations with small populations.

Country coordinators were asked to complete the questionnaire, making use of all possible sources of information available to them and collaborating with other experts in the country where possible/necessary.

A glossary of terms was provided within the survey, to improve the uniformity and comparability of the information received.

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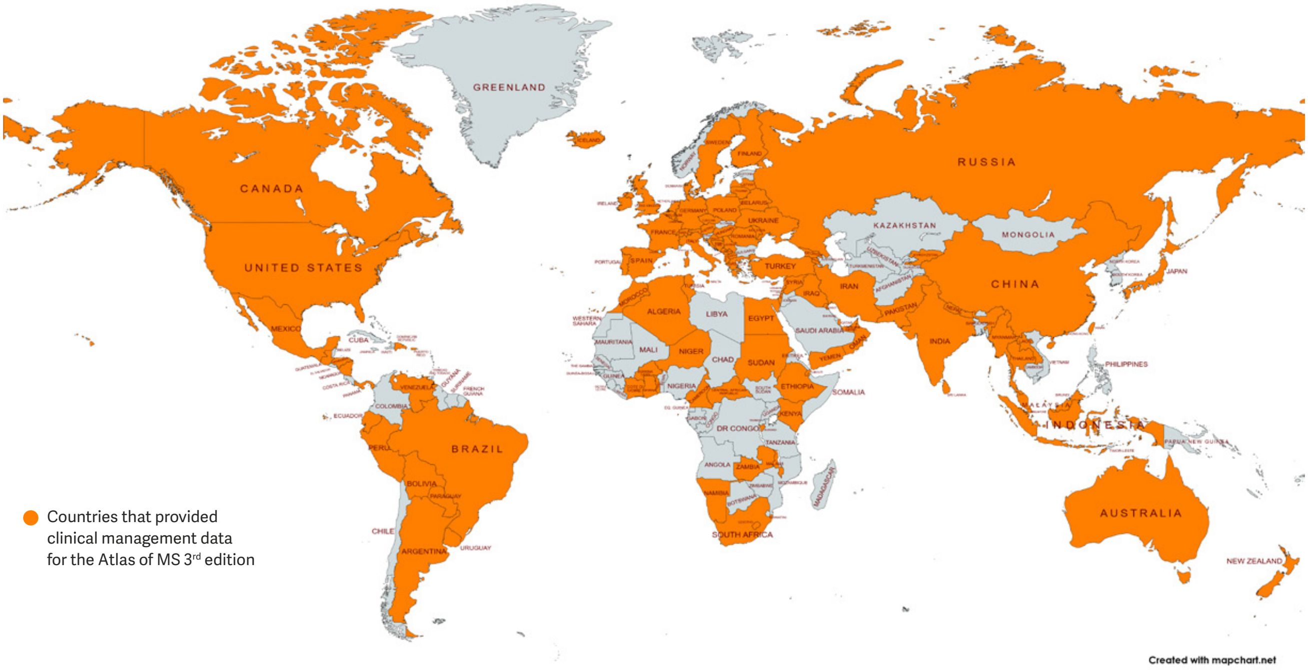
[5] The word 'countries' is used throughout to reference the 218 countries / territories that were recognised by this project (combining members of the United Nations (UN), the World Health Organization (WHO) and the World Bank).

Experts in 107 countries responded (a response rate of 78%) including 8 countries[6] that reported in 2008 but not 2013 and 11 countries from which data was reported to the Atlas of MS for the first time (Burundi, Central Africa Republic, Djibouti, Kosovo, Kyrgyzstan, Lao, Nepal, Niger, Puerto Rico, Sudan, and Togo). Additionally, there were 18 countries[7] that provided data in 2013 but not for this latest edition.

The map below shows the countries from which data was reported for the clinical management survey (in orange).



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[6] 8 countries took part in 2008 but not 2013 (Belarus, Burkina Faso, Georgia, Honduras, Hong Kong, Namibia, Syrian Arab Republic and Ukraine)

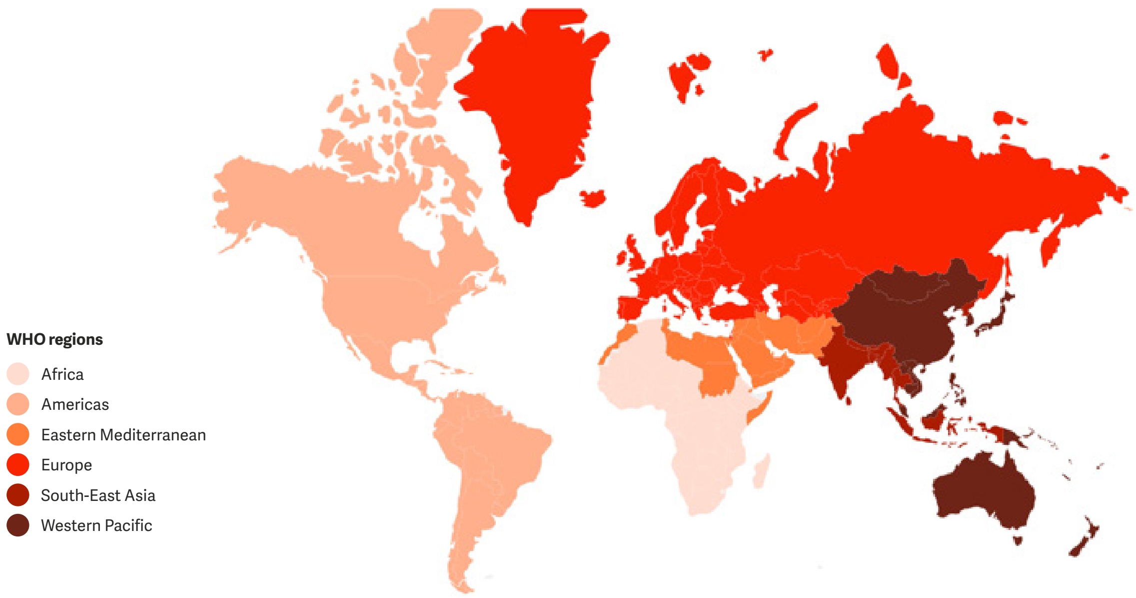
[7] 18 countries reported in 2013 but not in 2020 (Bahrain, Bangladesh, Bulgaria, Colombia, Democratic Republic of the Congo, Costa Rica, Cuba, Estonia, Guinea, Jordan, Liechtenstein, Mongolia, Nigeria, Norway, Slovakia, Slovenia, South Korea and Zimbabwe). Additionally, in this latest edition, 3 countries reported clinical management data but did not provide epidemiology data (Bolivia, Burkina Faso and Cote d'Ivoire).

Regional analysis

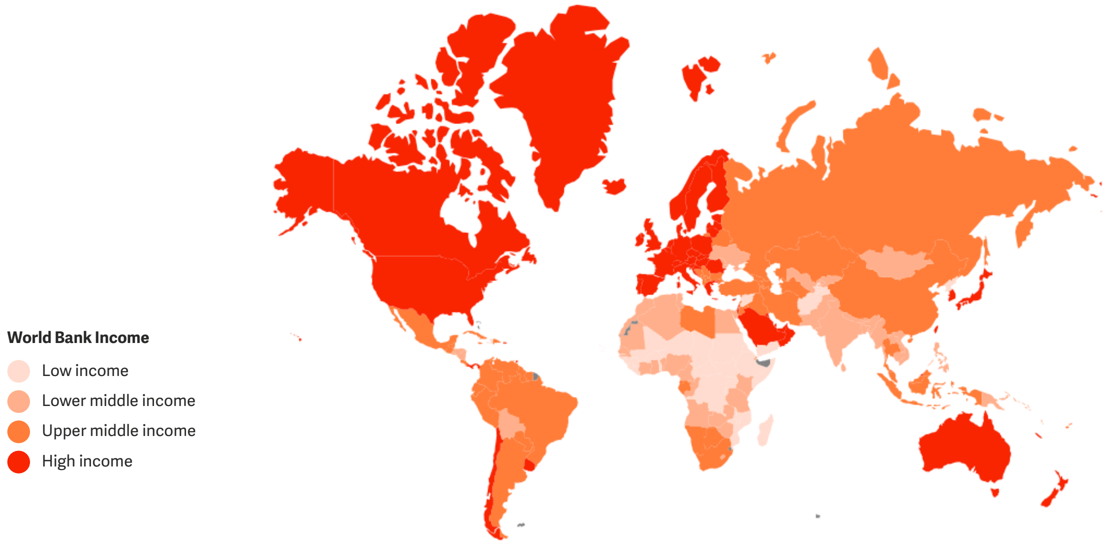
Countries were grouped into the six World Health Organization (WHO) regions (Africa, the Americas, Eastern Mediterranean, Europe, South-East Asia and Western Pacific) and four World Bank income levels (High, Upper Middle, Lower Middle and Low).

Population data from the 2019 UN population prospects was used for the analyses. The data was analysed using MS Excel.

The World Health Organization (WHO) regions

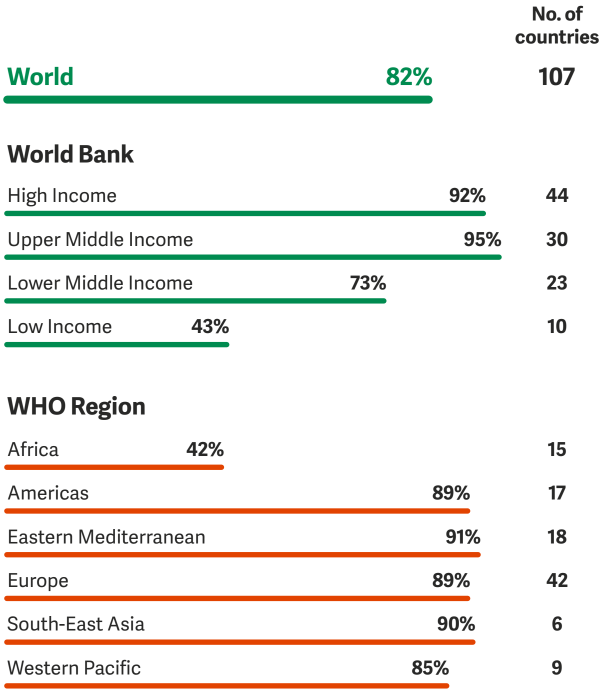


World Bank Income (June 2020)



Representativeness and data quality

Proportion of population covered by countries providing data



Experts from 107 countries took part in the Atlas clinical management survey. These countries represented 82% of the world population.

A high proportion of the population was represented within each of the World Bank Income categories and the WHO regions with the exception of the African region and the low income countries.

Please note, direct comparisons to the 2013 data is not possible due to the questionnaire being substantially adapted to allow improved understanding of the clinical management landscape in light of the rapid expansion of disease modifying therapies since the previous edition.

Limitations

The Atlas of MS is one of the most comprehensive global data sources on the clinical management of MS, but the data has some limitations.

Countries from the African region and those classified as low income are under-represented in the survey

- Our findings reveal that low income and African countries are often disadvantaged with regard to access to MS relevant healthcare. As our response rate for these countries is low and countries that did not respond are likely to have even poorer access, our global reporting of healthcare inequalities may be underestimated.

Use of expert opinion in the absence of published peer-reviewed data

- Very few peer-reviewed publications exist on the availability of and access to MS diagnosis and treatment. To build a comprehensive picture of healthcare in different countries, we therefore relied on the expert opinion of clinicians or specialists with knowledge of that country. To improve confidence in the data collected, we asked country coordinators to collaborate with other experts and to report data sources if available.

- Of the 107 countries that took part, 97 provided detail about their collaboration. 87 country coordinators (90%) consulted clinicians or other experts and in fact many collaborated with multiple specialists. Of the 10% who did not consult others, this was due to lack of other experts in the country (3%) or being time-poor (7%).

- For relevant questions in the survey, country coordinators were asked to indicate the source of the information. The majority of countries answering referenced independent evidence such as academic papers or patient data (surveys or registries) rather than relying solely on opinion. The only exception was the question relating to telemedicine, where independent sources were only referenced by 37% of countries who reported.

It is challenging to separate 'availability' from 'access'

- Part 2 of the Atlas of MS indicates if diagnosis, healthcare professionals and therapies are available within a country, but this doesn't mean that these can be accessed by every person living with MS. Availability can vary considerably within a country and access is affected by other factors. For example, there could be variations in distribution of healthcare in urban versus rural areas, or challenges in accessing treatments due to people with MS having different types of insurance cover, or even different prescribing practices across different regions within a country. Additionally there are other differences within countries such as cultural, socio-economic or environmental factors that can create inequalities and affect a person's ability to access the healthcare they need. It must be noted that the barriers to access are also most likely to reflect adult-onset MS diagnosis and care and that pediatric-specific issues may not be captured. The Atlas aims to allow comparison between countries and regions. The results therefore provide an overview of the major barriers to accessing healthcare in different countries but may not reflect all experiences of every single person with MS living in that country.

- Furthermore, the vast majority of our data collection took part prior to the start of the COVID-19 pandemic and therefore is likely to underestimate the current situation. According to the World Health Organization (WHO)'s rapid assessment of service delivery for non-communicable diseases (NCDs)[8], services have been severely disrupted across the globe and low income countries are most affected. This means that the access barriers we have highlighted in this report are likely to have been exacerbated by the current situation.

Putting the findings from the clinical management survey in context

Part 1 of the Atlas of MS 3rd edition showed that the prevalence of MS varies considerably around the world and is noticeably higher in Europe and the Americas (with 133 and 112 people with MS per 100,000 people respectively compared with 30 or fewer per 100,000 in the other 4 WHO regions). Within World Bank income categories, prevalence of MS is greatest in high income countries (174 per 100,000 people) compared with 15 or fewer per 100,000 in the other 3 income categories. These varying prevalence levels are useful context when interpreting the clinical management findings. It must be noted, however, our data shows that there are significant barriers to diagnosis and these issues are even more likely to exist in middle and low income countries as well as the lower prevalence WHO regions. This means that until there is equitable access to diagnosis worldwide, the true global prevalence pattern is yet to be fully understood.

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[8] https://www.who.int/publications/m/item/rapid-assessment-of-service-delivery-for-ncds-during-the-covid-19-pandemic

Main findings

Diagnosing MS

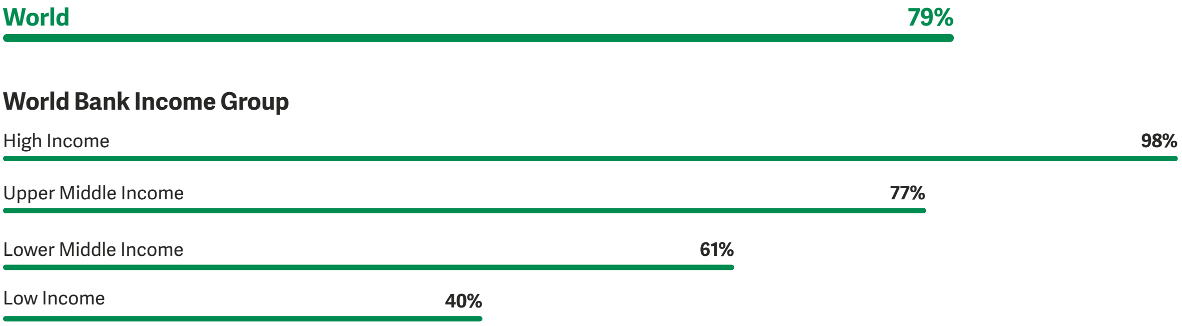
An early diagnosis is vital to enable early treatment with disease modifying therapies that can minimise relapses and reduce future disability. Even if disease modifying therapies are not available an early diagnosis is still crucial as it allows lifestyle changes to help manage the disease and improve quality of life.

Diagnostic criteria are guidelines used by clinicians to ensure they provide an accurate and early diagnosis of a disease. They encompass a specific combination of signs, symptoms and test results. The diagnostic criteria for MS have evolved over time as the understanding of the disease course has improved. The McDonald criteria makes use of advances in imaging techniques and was first published in 2001 to replace the Poser criteria (1983) and the Schumacher criteria (1965). Since 2001 the McDonald criteria have been updated several times, most recently in 2017.

Use of the McDonald 2017[9] criteria has been shown to lead to people being diagnosed earlier in the disease course[10], offering the potential for earlier treatment and support.

It is encouraging to see these criteria are the most commonly used for diagnosing MS across the world (79% of countries who reported). However, their use correlates with country wealth, with almost universal use (98%) in high income countries compared to less than half (40%) of low income countries (30% are using older McDonald versions, 20% are using Poser/Schumacher or another criteria and 10% of experts are unsure which criteria is most commonly used).

Proportion of countries where McDonald 2017 is most commonly used



n = 107 countries, representing 82% of the global population
(73-95% of the population covered in all groups with the exception of low income countries where 43% of the population is covered).

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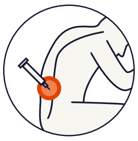
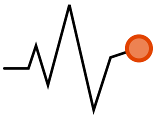
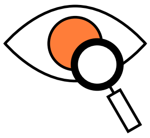
[9] Thompson AJ, Banwell BL, Barkhof F, Carroll WM, Coetzee T, Comi G, Correale J, Fazekas F, Filippi M, Freedman MS, Fujihara K, Galetta SL, Hartung HP, Kappos L, Lublin FD, Marrie RA, Miller AE, Miller DH, Montalban X, Mowry EM, Sorensen PS, Tintoré M, Traboulsee AL, Trojano M, Uit dehaag BMJ, Vukusic S, Waubant E, Weinshenker BG, Reingold SC, Cohen JA. Diagnosis of multiple sclerosis: 2017 revisions of the McDonald criteria. Lancet Neurol. 2018 Feb;17(2):162-173. doi: 10.1016/S1474-4422(17)30470-2. Epub 2017 Dec 21. PMID: 29275977.

[10] Schwenkenbecher P, Wurster U, Konen FF, et al. Impact of the McDonald Criteria 2017 on Early Diagnosis of Relapsing-Remitting Multiple Sclerosis. Front Neurol. March 2019:10:188. doi:10.3389/fneur.2019.00188

The most common barrier cited for not using McDonald 2017 is lack of awareness by or training for neurologists (mentioned by almost half of experts reporting that the McDonald 2017 is not used all the time or by all neurologists in the country).

There is no simple test for MS. Neurologists typically use multiple tests in combination to rule out alternative causes of the symptoms and give a positive diagnosis of MS.

Tests and procedures used to diagnosis MS

	Magnetic resonance imaging, or MRI for short, is a type of scan that uses strong magnetic fields and radio waves to produce detailed images of the inside of the body. Importantly, MRI scans can show there is damage to the central nervous system before the person experiences symptoms of MS.
	Lumbar punctures, which allow a sample of spinal fluid to be tested for immune cells and antibodies.
	Evoked potentials, which measure the time it takes for the brain to receive messages from the eyes, ears and skin.
	OCT (optical coherence tomography), which scans nerves in the back of the eye to detect signs of optic neuritis, a common early symptom of MS.

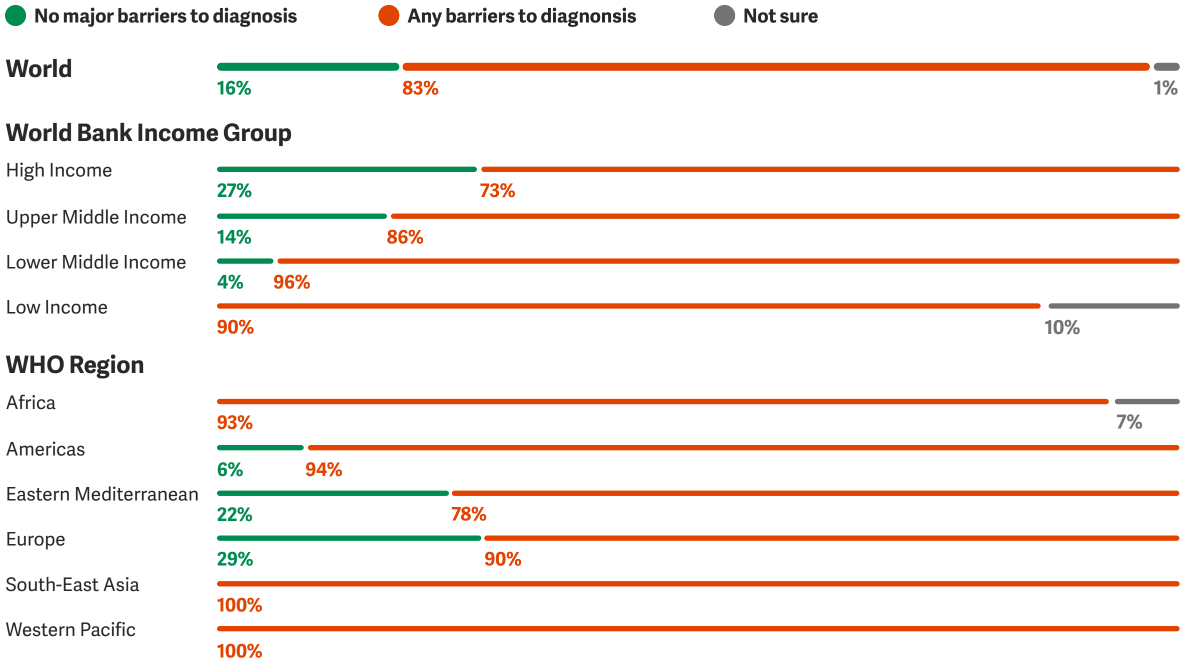
Whilst all 106 countries answering the question on diagnostic methods reported that neurological examinations are performed, use of other tests was <u>not</u> universal.

- MRI was <u>not</u> used for diagnosis by 3 in 10 low income countries, whereas it was used in all middle and high income countries. Not surprisingly, MRI machines not being readily available is cited as a barrier to early diagnosis in these countries.
- Low income countries were also less likely to typically use other types of test compared with wealthier nations:

    - Lumbar punctures, 60% versus 87-97% of middle and high income countries
    - Evoked potentials, 30% versus 57-77% of middle and high income nations
    - OCT, 20% versus 34-43% of middle and high income countries.

Despite the advances in diagnostic methods, the majority (83%) of countries worldwide experience issues that prevent early diagnosis of MS. Barriers to early diagnosis are present in every income band and region. There is a clear correlation with country wealth, with more countries in the lower middle and low income nations facing barriers. When looking at WHO regions, European and Eastern Mediterranean countries were least likely to report barriers.

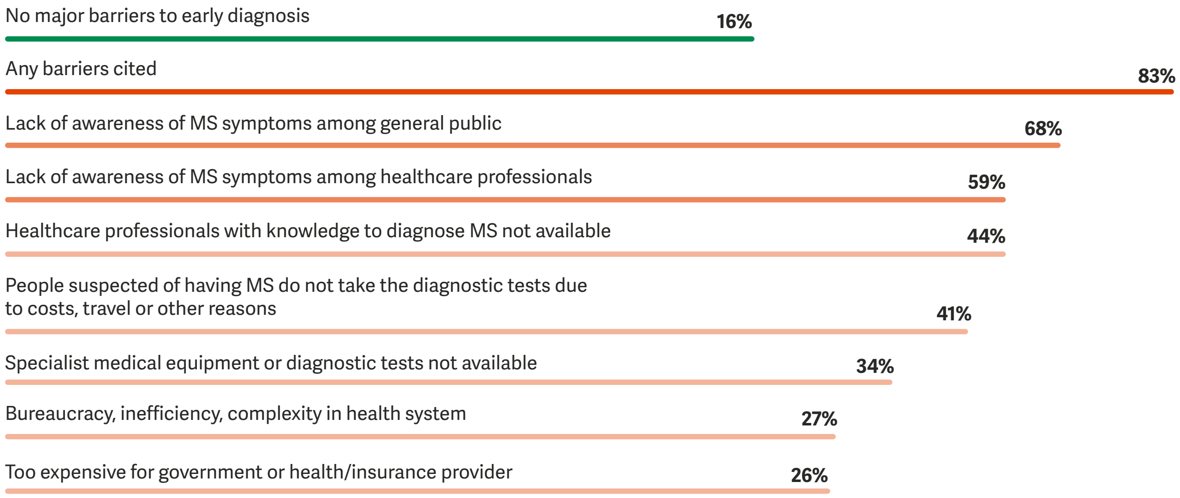
Proportion of countries with major barriers preventing an early diagnosis of MS



n = 106 countries, representing 82% of the global population (73-95% of the population covered in all groups with the exception of low income countries and Africa where 43% and 42% of the population is covered)

Globally, the most commonly reported barrier is a lack of awareness of MS symptoms amongst both the public (68% of countries) and healthcare professionals (59%). A lack of health professionals with specialist knowledge to diagnose MS was reported by experts in 44% of countries. This mostly reflected a lack of neurologists with specialist expertise in MS or radiologists. Experts in 4 in 10 countries reported people suspected of having MS being unable to take the diagnostic tests either due to prohibitive costs or travel requirements or concerns about safety or side effects.

Global barriers preventing an early MS diagnosis



n = 106 countries, representing 82% of the global population
63% of countries referenced independent evidence (patient data or published academic papers)

Lack of awareness of MS symptoms is a common barrier to early diagnosis across countries in all income categories. However for countries in the low and lower middle income groups, other barriers are also common, including the availability of qualified healthcare professionals as well as the availability and cost of the diagnostic equipment and tests.

Barriers preventing an early MS diagnosis by World Bank income level	**High Income**	**Upper Middle Income**	**Lower Middle Income**	**Low Income**
	n=44 countries, (representing 92% of the population	n=29 countries, (representing 95% of the population)	n=23 countries, (representing 73% of the population)	n=10 countries, (representing 43% of the population)
Lack of awareness of MS symptoms among general public	**55%**	**72%**	**83%**	**80%**
Lack of awareness of MS symptoms among healthcare professionals	45%	59%	**83%**	70%
Healthcare professionals with knowledge to diagnose MS not available	27%	45%	61%	**80%**
People suspected of having MS do not take the diagnostic tests due to costs, travel or other reasons	18%	48%	61%	70%
Specialist medical equipment or tests not available	16%	24%	61%	**80%**
Bureaucracy, inefficiency, complexity in health system	20%	41%	22%	30%
Too expensive for government or health/insurance provider	2%	28%	61%	50%
Not sure	0%	0%	0%	10%
No major barriers to early diagnosis	*27%*	*14%*	*4%*	*0%*

*Shading indicates the barriers cited by 50% or more countries in each income category. Numbers in bold show the most common answers.

The barriers that Abubeker faced in accessing a diagnosis in Ethiopia

In 2013, Abubeker from Ethiopia started to experience blurred vision, dizziness and a weakness in his legs but it was another two years before he was formally diagnosed with MS, by which time his balance issues had become severe and he was also experiencing fatigue.

MS is not a well-known condition in Ethiopia and Abubeker visited many doctors who, on different occasions, diagnosed typhoid, typhus and a number of stomach-related diseases. At the largest government hospital in Ethiopia, he was given an MRI scan but the doctors couldn't agree on the results. Finally he was able to see a neurologist at a private clinic and it was there that MS was first mentioned.

It is not possible to get a lumbar puncture in Ethiopia and so to get an official diagnosis Abubeker had to travel overseas. ***'My friends raised funds so I could travel to Thailand for another MRI scan and a lumbar puncture and get officially diagnosed.'***

Abubeker from Ethiopia first experienced symptoms in 2013

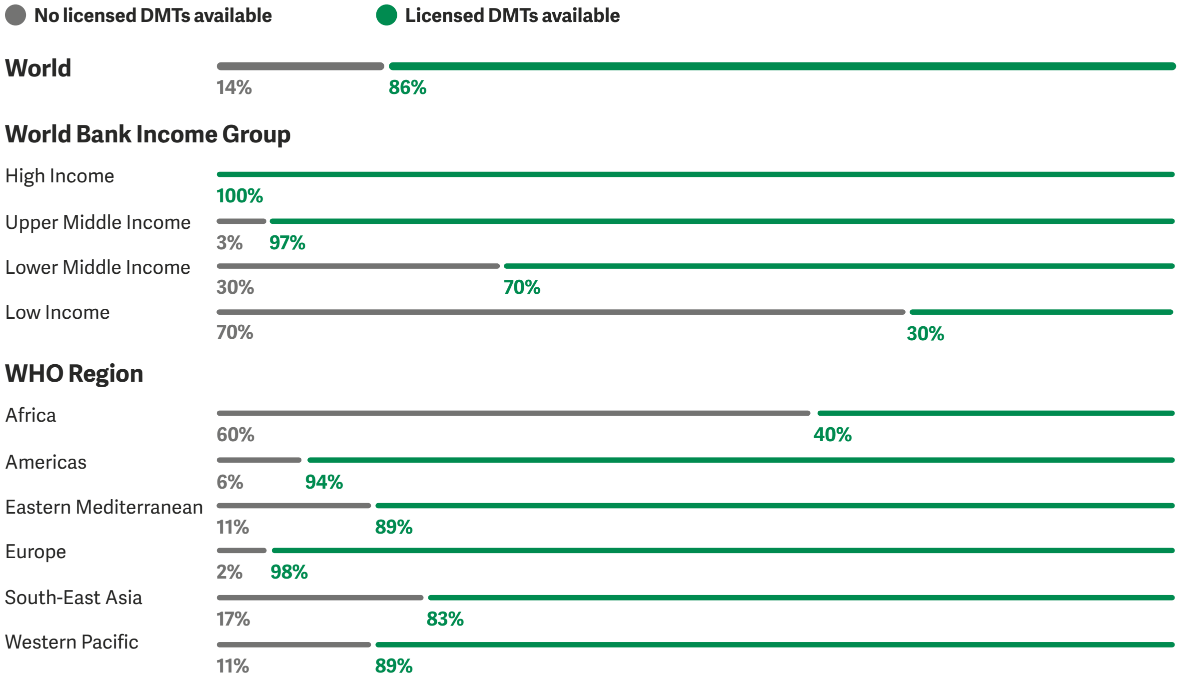
Disease modifying therapies for MS

Disease modifying therapies (DMTs) are medicines that target aspects of the inflammatory process of MS and reduce the accumulation of lesions within the brain and spinal cord. They can slow the progression of the disease as well as reduce the number, frequency and severity of relapses (worsening of symptoms and/or the appearance of new ones).

The first types of DMT (interferons) were approved in the early 1990s and since then there has been a rapid expansion of drug therapies. DMTs approved over the last 30 years include medicines with different frequency and modes of administration (oral, injection, infusion), as well as the first licensed DMTs for progressive MS (ocrelizumab) and for children with MS (fingolimod). DMTs that have been approved by a regulatory authority specifically for treating MS are referred to in this report as 'licensed'. Please note the list of DMTs included was comprehensive at the time of data collection but more have been approved in the interim period and are not therefore included in our reporting.

Across the globe, it is clear that there are many disparities in the availability of DMTs for people with MS. Experts in 14% of countries surveyed report having no licensed DMTs available in the country. In the African region this figure is 60%, and 70% of low income nations report no access to licensed DMTs. With countries in these categories being underrepresented in the Atlas of MS survey, the global figure could well be higher, as we hypothesise that the countries for which we do not have data are less likely to have access to licensed DMTs.

Proportion of countries with licensed DMTs available for people with MS

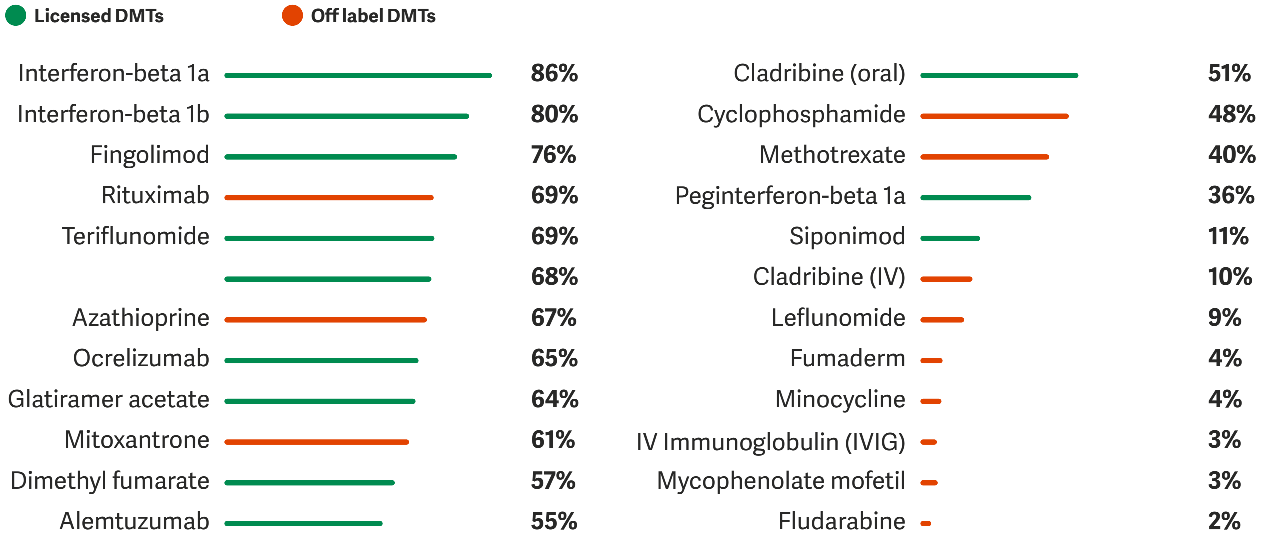


n = 106 countries, representing 82% of the global population (73-95% of the population covered in all groups with the exception of low income countries and Africa where 43% and 42% of the population is covered)

Early treatment with disease modifying therapies can change the course of a person's MS and reduce future disability[11]. It is important that people with MS have access to a wide range of affordable therapies to suit their disease course and personal circumstances. In countries where licensed DMTs are unavailable, it is sometimes possible for people with MS to access these from other countries if they can afford them and have the necessary contacts and paperwork.

A range of different types of DMT are being used to treat MS across the globe. It should be noted that the Atlas of MS survey collects information on the number of countries using each DMT but we do not have data on the scale of use, that is, the proportion of people with MS using each DMT.

% of countries using each DMT for MS



n = 102 countries, representing 81% of the global population. 72% of countries referenced independent evidence (patient data or published papers)

Please note: licensed and off-label here refers to the regulatory status in the majority of countries. In some countries these categories differ, e.g. mitoxantrone is licensed for use in the US but not in most other countries. The list indicates the DMT's licensed at the time of data collection but more have been approved in the interim period and therefore the list does not represent the full list of DMTs licensed at the time of publication

Experts in 89%[12] of countries report any type of licensed DMT being used to treat MS. Drugs can also be used 'off-label' to treat MS, which means that the DMT has not been approved by the regulatory agency to treat the disease. Use of off-label DMTs is common, reported by experts in 87% of countries worldwide.

There are a number of factors that can drive off-label DMT use[13], such as lack of availability of similar licensed DMTs in the country or unaffordability of licensed DMTs. A large proportion of countries in all World Bank income categories and WHO regions reported some use of off-label DMTs to treat MS.

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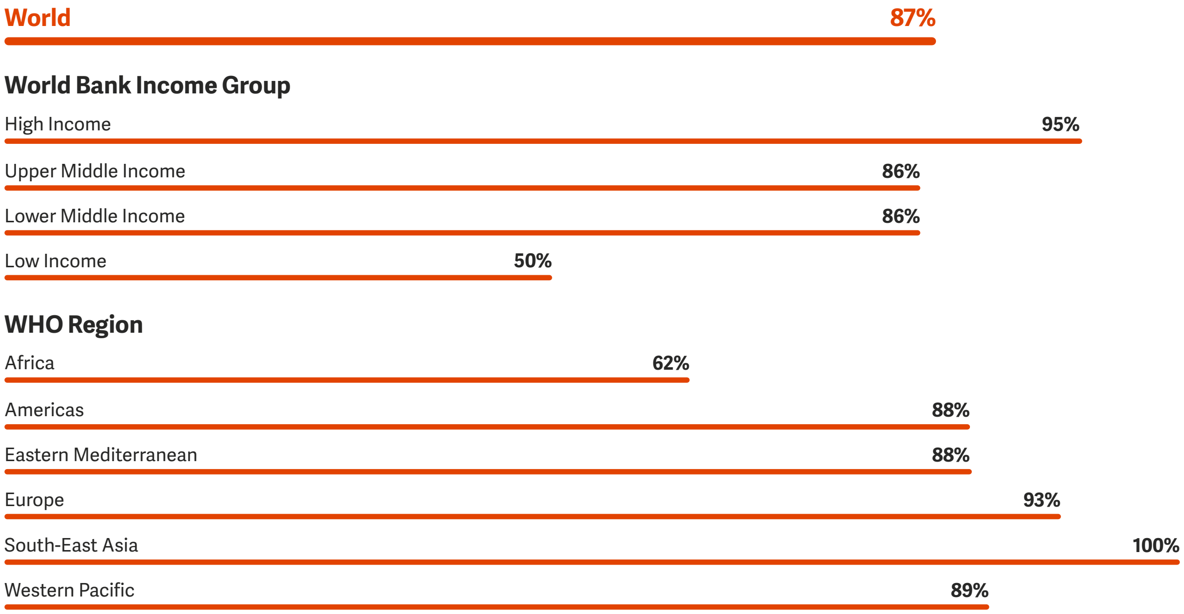
[11] https://www.msbrainhealth.org/perch/resources/brain-health-time-matters-in-multiple-sclerosis-policy-report.pdf - Appendix 1c (page 59)

[12] Please note the number of countries using approved DMTs (89%) is higher than those reporting DMTs are available (86%) – this is because people with MS are able to access DMTs from other countries.

[13] Study on off-label use of medicinal products in the European Union https://ec.europa.eu/health/sites/health/files/files/documents/2017_02_28_final_study_report_on_off-label_use_.pdf

Proportion of countries using at least one off-label DMT to treat MS



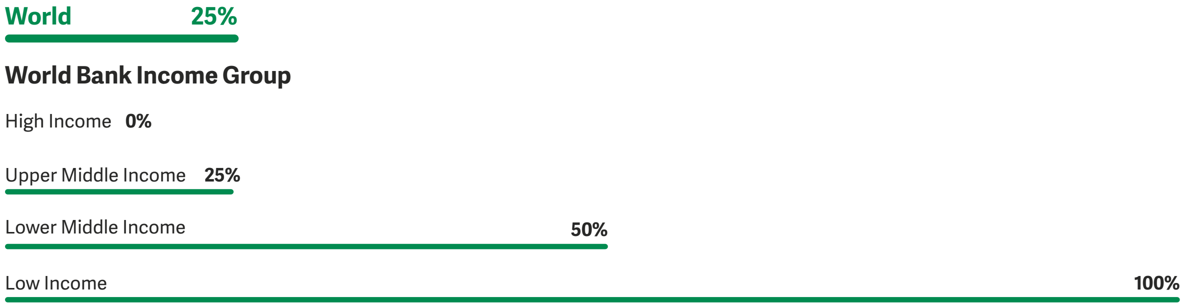
n = 102 countries, representing 81% of the global population 72% of countries referenced independent evidence (patient data or published papers)

To help understand the range of DMTs that people have access to, we have classified licensed DMTs[14] into three efficacy categories in our analysis, as shown in the table below.

High efficacy	Good efficacy	Moderate efficacy
Alemtuzumab	Cladribine (oral)	Glatiramer acetate
Natalizumab	Dimethyl fumarate	Interferon-beta 1a
Ocrelizumab	Fingolimod	Interferon-beta 1b
	Siponimod	Peginterferon-beta 1a
		Teriflunomide

Globally, 11% of countries do not use moderate efficacy licensed DMTs, and 20% of countries do not use good efficacy licensed DMTs. In particular, a quarter (25%) of countries report that they do not use high efficacy licensed DMTs. This strongly correlates with income, with half of lower middle income countries and 100% of low income nations not using high efficacy DMTs.

Proportion of countries not using licensed high efficacy DMTs (alemtuzumab, natalizumab, ocrelizumab)



n = 102 countries, representing 81% of the global population, 72% of countries referenced independent evidence(patient data or published papers)

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[14] The table indicates the DMTs licensed at the time of data collection but more have been approved in the interim period and therefore the list does not represent the full list of DMTs licensed at the time of publication

Off-label rituximab is considered to have a similar mode of action to ocrelizumab, and is often considered a high efficacy DMT. An additional 13 countries have access to rituximab; eight of these are low or lower middle income countries.

76 + **13** = **89**

76 countries use licensed high efficacy DMTs (alemtuzumab, natalizumab, ocrelizumab)

13 additional countries using off-label rituzimab

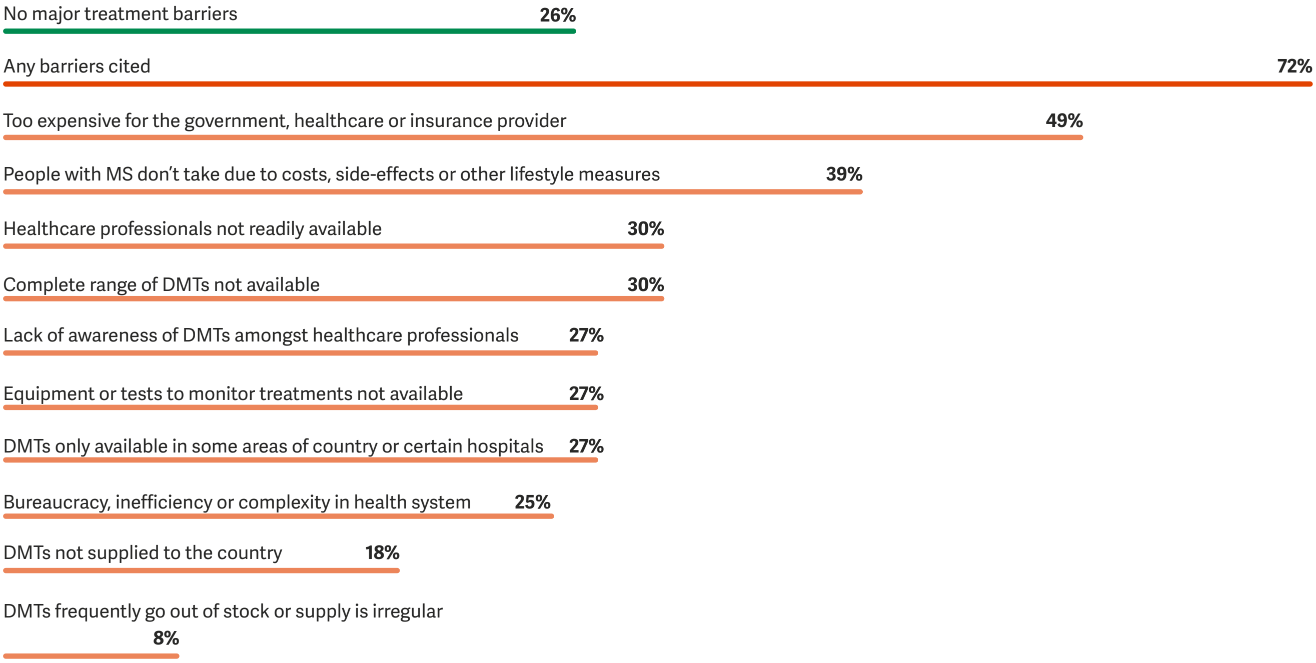
89 countries use licensed or off-label high efficacy DMTs

Barriers to accessing DMTs

72% of countries cite barriers to accessing DMTs. Globally the most important barrier is the cost to the government, healthcare system or insurance provider, cited by experts in around half of all reporting countries.

The second most common barrier, reported by experts from 41 participating countries (39%), is that people with MS do not take DMTs when offered them, often due to expense or concern about the side effects.

Global barriers to people with MS receiving DMTs



n = 106 countries, representing 82% of the global population 66% of countries referenced independent evidence (patient data or published papers)

In addition to cost, experts in low income countries are equally likely to cite both a lack of healthcare professionals and a lack of knowledge of DMTs amongst professionals as a barrier to accessing therapies. 25% of countries worldwide report bureaucracy, inefficiency or complexity within the healthcare system as a barrier to accessing DMTs. This highlights the importance of key services provided by many MS organisations which include programmes or resources to help people with MS navigate the complexity of accessing DMTs.

Barriers to people with MS receiving DMTs by World Bank income level	**High Income**	**Upper Middle Income**	**Lower Middle Income**	**Low Income**
	n= 44 countries (92% of the population)	n= 29 countries (95% of the population)	n= 23 countries (73% of the population)	n= 10 countries (43% of the population)
No major barriers	**55%**	10%	4%	0%
Too expensive for the government, healthcare or insurance provider	18%	**69%**	**74%**	**70%**
People with MS do not take DMTs due to costs, side-effects or preference for other treatments/lifestyle measures	**23%**	52%	52%	40%
Healthcare professionals not readily available	18%	28%	39%	**70%**
Complete range of DMTs not available	14%	38%	52%	30%
Lack of awareness of DMTs amongst healthcare professionals	11%	34%	30%	**70%**
Equipment or tests to monitor treatments not available	2%	31%	57%	60%
DMTs only available in some areas of the country or certain hospitals	11%	34%	48%	30%
Bureaucracy, inefficiency or complexity in health system	**23%**	34%	22%	20%
DMTs not supplied to the country	5%	10%	35%	60%
DMTs frequently go out of stock or supply is irregular	0%	7%	26%	10%

*Shading indicates the barriers cited by 50% or more countries in each income category. Numbers in bold show the most common answers.

Treatment challenges in Indonesia

Accessing treatment here is very difficult and time-consuming. I am using Rebif interferon-beta 1a but it is only available in certain pharmacies and I must contact the distributor directly.

Rebif is very expensive but my employee health insurance covers it. In Indonesia, there are only two medicines to treat MS. In the neurology practice guidance, the medicine for my MS is the one that I am able to access but this is only because of my work insurance scheme.

People who use BPJS (the government health insurance) will not be given this medicine. They are normally given immunosuppressants that are actually not specifically aimed for MS.

Sutji from Indonesia was diagnosed with MS in 2017

It is common for people with MS to have to pay some or all of the cost of their DMTs, sometimes referred to as 'out of pocket costs'. This was reported to occur in 60 countries (57%) worldwide, ranging from 39% of countries in Europe to 76% of countries in the Americas.

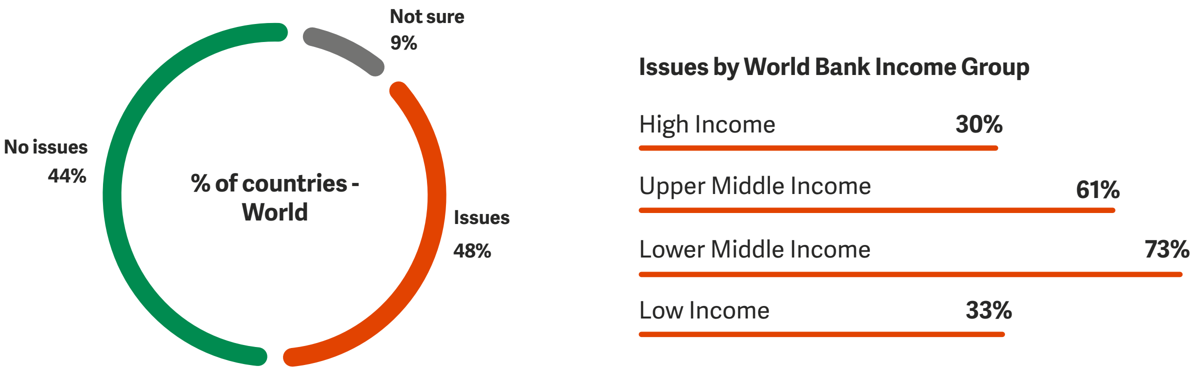
Out of pocket costs can be considerable (even if people are not paying the full amount) and this together with the high price of many MS drugs overall means DMTs are unaffordable for many people with MS. The reasons people have to pay for DMTs are varied. Of the 60 country coordinators reporting that people have to pay at least some of their DMT costs:

- 48% report the government, healthcare or insurance provider requires a co-payment or will only pay part of the cost
- 40% report that people with MS do not have health insurance
- 35% report that DMTs are not covered by health insurance
- 35% report that even if people with MS have health insurance, the DMT recommended is not approved or they don't meet the eligibility criteria

Even if people have access to DMTs, there are also barriers to the continuous provision of their treatment.

Experts in almost half of countries worldwide report problems with the continuous provision of DMT treatment, meaning that once initiated on a DMT, people with MS are unable to receive future doses without interruption or delay. The main reasons cited are an irregular supply of DMT (27% of all countries) or the delays associated with people needing to get their reimbursement renewed (19%) or the need to take regular tests to prove continued eligibility (13%). These types of issues affect middle income countries disproportionally, although half of the experts reporting for low income nations were unable to answer this question, so it is highly possible that continuation issues are under-reported in this setting.

Issues with the continuous provision of DMT treatment



n = 103 countries, representing 81% of the global population

Restrictive criteria make it difficult to secure access to treatment in Serbia

After having five relapses in one year, Ivana had been prescribed a DMT, but this was short-lived and after six months she was taken off it. ***'The administrative team told me it was more expensive and they needed to make some rotations because of the budget.'***

This backward step was frustrating because securing treatment in Serbia is difficult, with very restrictive criteria: you must have had at least two relapses in the previous two years and you must also be able to walk 300 metres unaided. ***'The problem is that at the beginning of the disease you cannot achieve these criteria because you don't have two relapses in the two years, but then by the time you are having two relapses a year you may no longer be able to walk 300 metres. There is a tiny window of time when you might be eligible for treatment.'***

Eventually she was moved onto another DMT but the whole process felt chaotic with very little transparency. When you consider this criteria plus the limited supply of treatment available you can understand why Ivana says: ***'A lot of it is down to luck. I was in the right place at the right time.'***

Ivana from Serbia was diagnosed with MS in 2010

Access to haematopoietic stem cell transplantation (HSCT)

Haematopoietic stem cell transplantation (HSCT) is increasingly being used as a treatment for active relapsing-remitting MS. HSCT aims to 'reset' the immune system. It involves using chemotherapy to wipe out the malfunctioning immune cells and then using stem cells from the person's own bone marrow or blood to restore the immune system with new cells. These stem cells, however, cannot regenerate damaged nerves or other parts of the brain and spinal cord.

HSCT is available for people with MS in 35% of countries worldwide and in a third of these countries people with MS fund the treatment themselves (12%). Access to HSCT is correlated with country wealth, available in 57% of high income countries, compared to 23% of middle income and 0% of low income nations. People with MS in middle-income countries are more likely to have to pay for the treatment themselves (75% versus 16% of the high income countries where HSCT is available for people with MS).

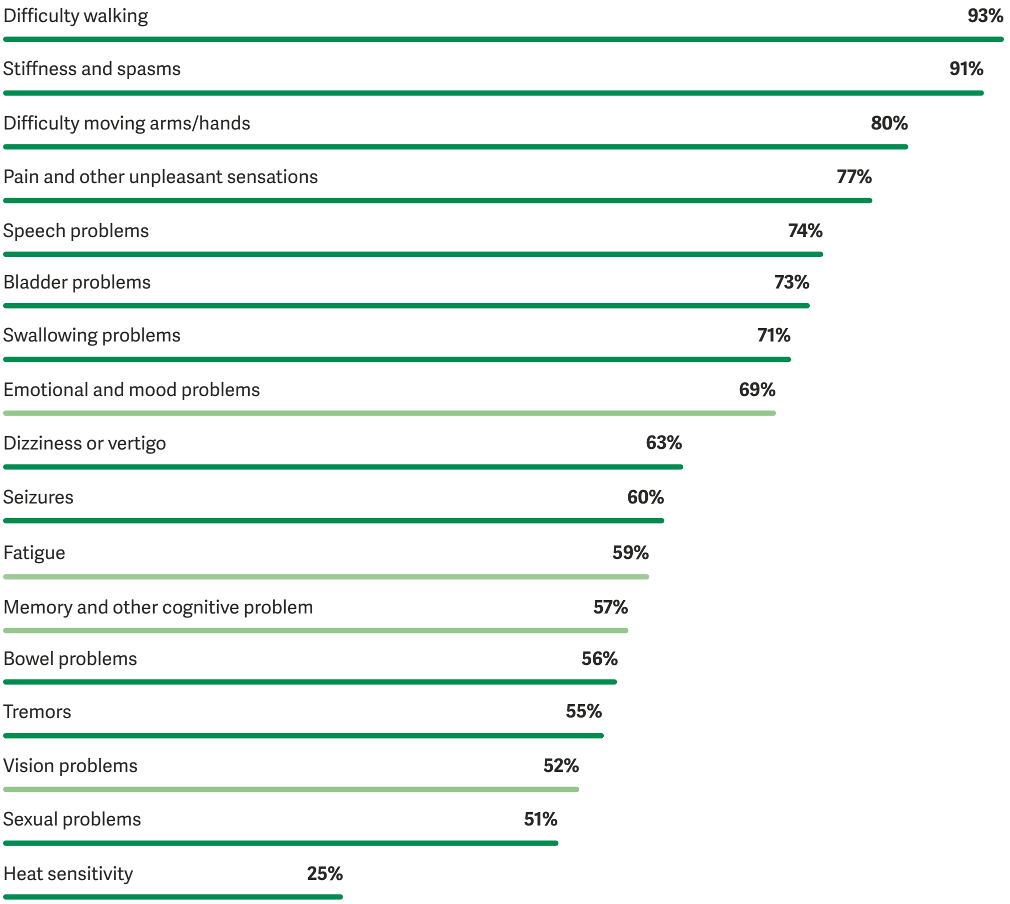
Rehabilitation and symptom management

Rehabilitation and use of symptomatic therapies are important aspects of MS management to help people with MS maintain function and have a good quality of life.

Rehabilitation to manage common mobility symptoms is available in over 90% of countries globally. However, rehabilitation and/or medicines to help manage more invisible symptoms of MS such as fatigue are only available for 6 in 10 countries worldwide, despite fatigue being the most commonly reported symptom[15]. Therapies for vision problems are not available in half of countries worldwide, yet maintaining visual function is a high priority for people with MS[16]. Furthermore, cognitive and mood-related symptoms of MS are often overlooked[17] and can have a significant impact on quality of life. Therapies to treat memory and cognition are only available in 57% of countries and those for emotional and mood symptoms such as depression are available in 69% of countries worldwide.

It should be noted that availability of rehabilitation is likely to have been affected by the COVID-19 pandemic[18], because many services have been reduced or changed to remote delivery. Whilst this is of course necessary to prevent virus spread and to protect healthcare resource, it is important that these services are resumed as soon as possible to ensure that people with MS get the care they need to maintain function and improve quality of life.

Symptoms that people are typically able to access therapies for (percentage of countries world)



n = 104 countries, representing 80% of the global population

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[15] The Sonya Slifka Longitudinal Multiple Sclerosis Study: methods and sample characteristics - S L Minden, D Frankel, L Hadden, J Perloff, K P Srinath, D C Hoaglin, 2006 (sagepub.com) and Fatigue is the most common symptom (experienced by 8 in 10 people with MS) https://www.physiotherapyalberta.ca/course_materials/sept_2020_ms_handout.pdf

[16] Heesen C, Haase R, Melzig S, Poettgen J, Berghoff M, Paul F, Zettl U, Marziniak M, Angstwurm K, Kern R, Ziemssen T, Stellmann JP. Perceptions on the value of bodily functions in multiple sclerosis. Acta Neurol Scand. 2018 Mar;137(3):356-362. doi: 10.1111/ane.12881. Epub 2017 Dec 3. PMID: 29205262. https://pubmed.ncbi.nlm.nih.gov/29205262

[17] ACNR volume 8 number 4 September/October 2008 - Cognition, Depression and Fatigue in Multiple Sclerosis. Jane Bradshaw, Lead Nurse Specialist in Neurology, Norfolk PCT. Anita Rose, Clinical Psychologist, Walton Centre of Neurology and Neurosurgery, Liverpool https://www.acnr.co.uk/SO08/ACNRSO08_cognition.pdf

[18] https://www.who.int/publications/m/item/rapid-assessment-of-service-delivery-for-ncds-during-the-covid-19-pandemic

There is high variability in symptomatic support available in countries across income categories, with less availability in lower income countries.

Symptoms people are typically ableto access rehabilitation or other therapies (e.g. medications) for...	High Income	Upper Middle Income	Lower Middle Income	Low Income
	n= 44 countries (92% of the population)	n= 28 countries (90% of the population)	n= 23 countries (73% of the population)	n= 9 countries (40% of the population)
Difficulty walking	98%	96%	91%	67%
Stiffness and spasms	95%	93%	91%	67%
Difficulty moving arms/hands	93%	79%	65%	44%
Pain and other unpleasant sensations	91%	68%	70%	56%
Speech problems	95%	75%	52%	22%
Bladder problems	91%	68%	61%	33%
Swallowing problems	93%	68%	48%	33%
Emotional and mood problems	77%	68%	70%	33%
Dizziness or vertigo	77%	57%	57%	22%
Seizures	68%	57%	65%	11%
Fatigue	70%	54%	52%	33%
Memory and other cognitive problems	73%	57%	39%	22%
Bowel problems	70%	57%	43%	11%
Tremors	77%	50%	39%	0%
Vision problems	70%	36%	43%	33%
Sexual problems	73%	43%	35%	11%
Heat sensitivity	39%	21%	9%	11%
Not sure	0%	4%	0%	33%

Shading indicates where fewer than 50% of countries report access to therapies for these symptoms

Experts in 84% of countries report that rehabilitation therapies are rationed or not available quickly enough for people with MS. The key reasons cited are a lack of national availability, and the expense to providers or people with MS.

Healthcare professionals

Many types of healthcare professionals contribute to the overall care and support of people with MS. Without sufficient numbers of these skilled healthcare professionals, MS cannot be diagnosed, and treatments cannot be initiated or monitored.

In total there are around 300,000 **neurologists** in the 98 countries providing data to the Atlas of MS. This represents a median[19] prevalence of 2 neurologists per 100,000 people. There is huge global variation in the number of neurologists per 100,000 people. This ranges from a median of 4.6 neurologists per 100,000 people in high income countries to 0.05 in low income countries.

Globally, 5% of all **neurologists** are reported to have a **special interest in MS** (which we define as having more experience in diagnosing/treating MS). Out of the 97 experts reporting, 8 (all from low and middle income countries) said there were no MS neurologists in their country. There is a clear correlation between the median number of MS specialist neurologists per 100,000 people and country income (0.4 in high income countries compared with 0.01 in low income countries). Globally 3% of all neurologists were reported to be pediatric

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[19] The median value is the middle number in a sorted, ascending or descending, list of prevalence numbers. We use the median rather than the average value because prevalence of neurologists can vary considerably between countries and this prevents any very high or low values skewing the average of the values.

specialists. They were not available in 7 out of our 83 reporting countries and even if they are available this does not necessarily mean they are trained in MS.

74 countries provided information on the number of neurologists in both the previous and current editions of the Atlas. The number of neurologists in these countries has increased by 26% (90,000 in 2020 compared with almost 72,000 in 2013). As this data only represents 52% of the world's population and only one low income country, it is not possible to compare the results by World Bank income bands or WHO regions.

How MS Ireland used the Atlas data in an advocacy campaign to increase access to neurologists

The information in the Atlas of MS can be a powerful advocacy tool, shining a spotlight on MS and raising awareness of the barriers to accessing diagnosis and care for people with MS worldwide. In 2008 the Atlas found that Ireland, with only 14 neurologists, had the lowest number of neurologists per 100,000 people in Europe. It was one of the tools that MS Ireland and the Neurological Alliance of Ireland used to persuade the government to make a commitment to ensure that there is one neurologist per 100,000 people.

Since then there has been a steady increase in numbers rising to 26 (0.6 per 100,000) in 2013 and in 2020 there were 37 (0.8 per 100,000). Despite this positive trend, the numbers of this vital workforce still lag behind Ireland's target and indeed the levels seen in all other European countries.

With thanks to Ava Battles and Aoife Kirwan from MS Ireland for sharing this example.

MS nurses play a crucial role in supporting people with MS and their families[20]. They offer holistic care, providing advice to help people with MS understand more about their condition and treatment options, as well as emotional support. Furthermore, MS nurses can support other healthcare professionals by increasing the capacity of neurologists, and improving knowledge amongst less specialist professionals such as general practitioners, social care staff, other nurses and therapists.

In total, 5,400 nurses with a special interest in MS were reported by 59 out of 84 countries which means 30% did not have any MS nurses. In addition, 37 out of 62 countries reported having neurology nurses – which have a similar role supporting people with a range of neurological conditions, including MS.

Radiologists are another key healthcare professional in MS, responsible for conducting and interpreting scans of the brain and spinal cord (such as MRI or CT scans). Just over 109,000 radiologists (median of 1.8 per 100,000 people) were reported by experts from 65 countries representing 53% of the global population. Analysis by region/income is not feasible due to the small sample sizes. This data was not collected in 2013.

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[20] Multiple Sclerosis specialist nurses in Australia 2017 https://www.msaustralia.org.au/sites/default/files/MSA%20MS%20Specialist%20Nurses%20Report%202017_0.pdf
Evidence for MS Specialist Services: Findings from the GEMSS MS specialist nurse evaluation project https://mstrust.org.uk/sites/default/files/GEMSS%20final%20report.pdf

Telemedicine

What is telemedicine?

Telemedicine is where technology is used to deliver care remotely in place of an in-person consultation with a clinician.

Some examples include:

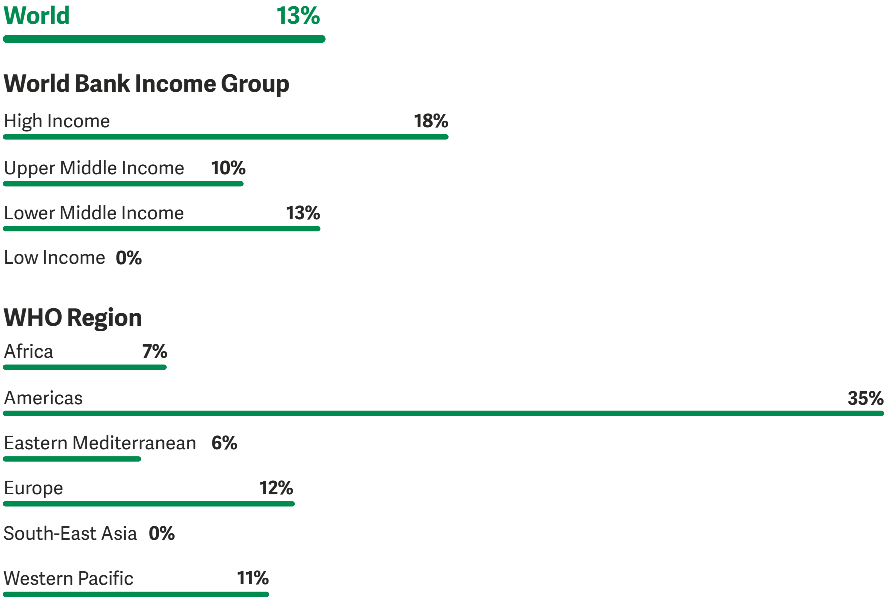
- Video calls to support diagnosis and treatment initiation
- Remote follow up and monitoring of treatments via text messages, emails, phone or video calls
- Digital transmission of medical images,remote medical diagnosis and evaluations or other clinical data (such as blood pressure readings or adherence to treatment plans)

Telemedicine uses telecommunication technology to deliver diagnosis and clinical care from a distance. Video or telephone consultations are used instead of in-person visits and can help address some of the inequalities in accessing diagnosis and ongoing specialist care for people with MS[21].

Prior to the COVID-19 pandemic, only 13% of countries worldwide used telemedicine as an accepted part of clinical care. The need for physical distancing to protect healthcare workers and patients during the pandemic has undoubtedly led to the rapid global adoption of telemedicine solutions.

As might be expected, high income countries are the most likely to use telemedicine as part of routine clinical practice, whilst its use is non-existent in low income settings. When comparing WHO regions, use is more widespread in the Americas with a third of countries in this region using it compared to no countries in South-East Asia.

Proportion of countries where telemedicine is an accepted part of clinical practice



n = 106 countries, representing 82% of the global population 37% of countries provided independent evidence for this data

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[21] Bove R, Garcha P, Bevan CJ, et al. Clinic to in-home telemedicine reduces barriers to care for patients with MS or other neuroimmunologic conditions. *Neurol Neuroimmunol Neuroinflamm. 2018;5(6):e505.doi:10.1212/NXI.0000000000000505*

Once the COVID-19 pandemic has eased it will be important to understand to what extent telemedicine becomes embedded in healthcare systems. Learning from innovation that has arisen due to the pandemic restrictions has the potential to improve access to therapies worldwide, as long as technological barriers are taken into consideration.

Whilst telemedicine can provide benefits for those that might be underserved by more traditional healthcare models, it is important to understand how its use can be optimised for people with MS. It is also vital to ensure that those who cannot take full advantage of this innovation (such as those with cognitive issues, communication disabilities or those who cannot afford or do not have access to reliable internet connections) are not marginalised, further exacerbating inequities in healthcare access.

Quality of MS care – national guidelines and standards

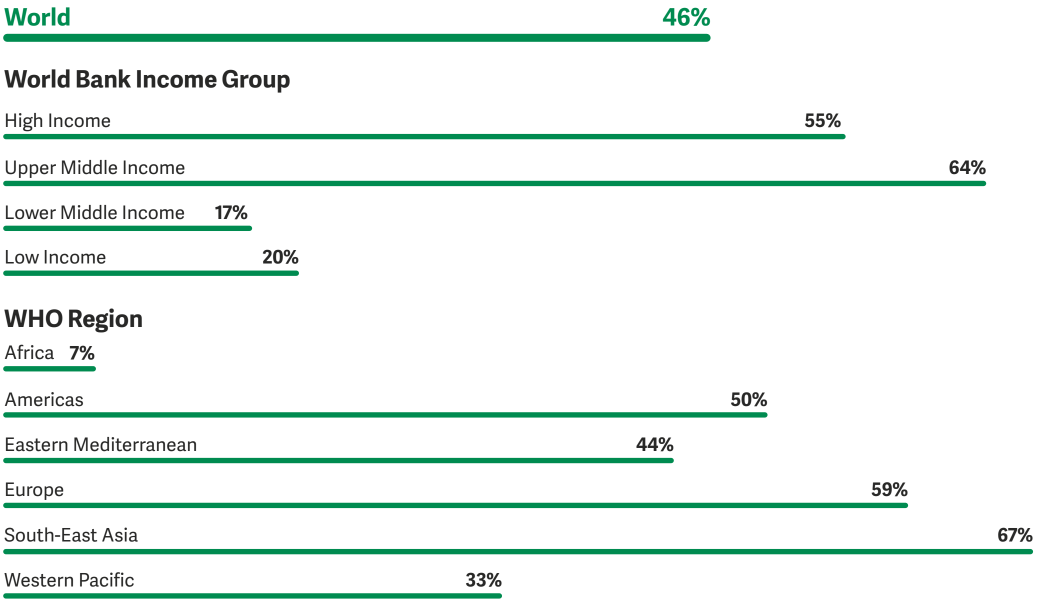
What are guidelines and standards for MS care?

Guidelines are tools to provide guidance for clinicians regarding best practice for the diagnosis and treatment of specific diseases and conditions. They are designed to ensure consistency in healthcare practice, resulting in improved outcomes for people with MS. Guidelines may be globally relevant, or tailored to the national/local healthcare context.

Standards are targets that are set in relation to diagnosis or care. They often focus on the time it takes to progress through different stages of the patient journey, for example how quickly treatment is initiated following a diagnosis.

Overarching national plans or guidelines for MS and standards for the care expected can help improve MS healthcare overall and reduce inequalities of access within countries.

Experts in 48 (46%) countries worldwide report having a national plan or guidelines that cover both the diagnosis and treatment of MS.



Proportion of countries with national guidelines for diagnosis & treatment of MS

n = 105 countries, representing 82% of the global population

This finding is interesting as a global literature review by CADTH in January 2018[22] indicates that the UK's NICE guidelines[23] are the only national guidelines for MS that are evidence-based. When we investigated this further and reviewed the guidelines and anecdotal evidence provided by country coordinators to support the data, it is clear that not all guidelines are officially recognised by governments or fully adopted in the national healthcare system. On a practical level, however, guidelines produced by professional groups such as MS centres, the regional International Committees for the Treatment and Research in Multiple Sclerosis (TRIMS)[24] and neurological societies such as the AAN[25] serve as national guidelines and are used by the relevant healthcare professionals within these countries.

Experts from 43 countries (41%) report that there are national standards or targets in place relating to the diagnosis, treatment or monitoring of MS.

At least 1.8 million people, two-thirds of the world's population of people diagnosed with MS, are living in countries that do not have national guidelines for the diagnosis and treatment of MS and do not have national standards in place to guide MS care.

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[22] *CADTH rapid response report: Diagnosis and Treatment of Multiple Sclerosis : Guidelines, January 3, 2018* https://n.neurology.org/content/95/9/e1257 https://www.cadth.ca/sites/default/files/pdf/htis/2018/RA0941%20Multiple%20Sclerosis%20Guidelines%20Final.pdf *(NB this review is only based on English language documents available between 2012-2017)*

[23] *Multiple sclerosis in adults: management. (NICE guideline; no. 186).* https://www.nice.org.uk/guidance/cg186

[24] *Montalban X, Gold R, Thompson AJ, Otero-Romero S, Amato MP, Chandraratna D, Clanet M, Comi G, Derfuss T, Fazekas F, Hartung HP, Havrdova E, Hemmer B, Kappos L, Liblau R, Lubetzki C, Marcus E, Miller DH, Olsson T, Pilling S, Selmaj K, Siva A, Sorensen PS, Sormani MP, Thalheim C, Wiendl H, Zipp F. ECTRIMS/EAN Guideline on the pharmacological treatment of people with multiple sclerosis. Mult Scler. 2018 Feb;24(2):96-120. doi: 10.1177/1352458517751049,*
Yamout B, Sahraian M, Bohlega S, Al-Jumah M, Goueider R, Dahdaleh M, Inshasi J, Hashem S, Alsharoqi I, Khoury S, Alkhawajah M, Koussa S, Al Khaburi J, Almahdawi A, Alsaadi T, Slassi E, Daodi S, Zakaria M, Alroughani R. Consensus recommendations for the diagnosis and treatment of multiple sclerosis: 2019 revisions to the MENACTRIMS guidelines. Mult Scler Relat Disord. 2020 Jan;37:101459. doi: 10.1016/j.msard.2019.101459.

[25] *American Academy of Neurology – Guidelines for starting, stopping and switching DMTs* https://www.aan.com/Guidelines/Home/GetGuidelineContent/900

How the UK MS society helped shape the NICE clinical guideline for MS

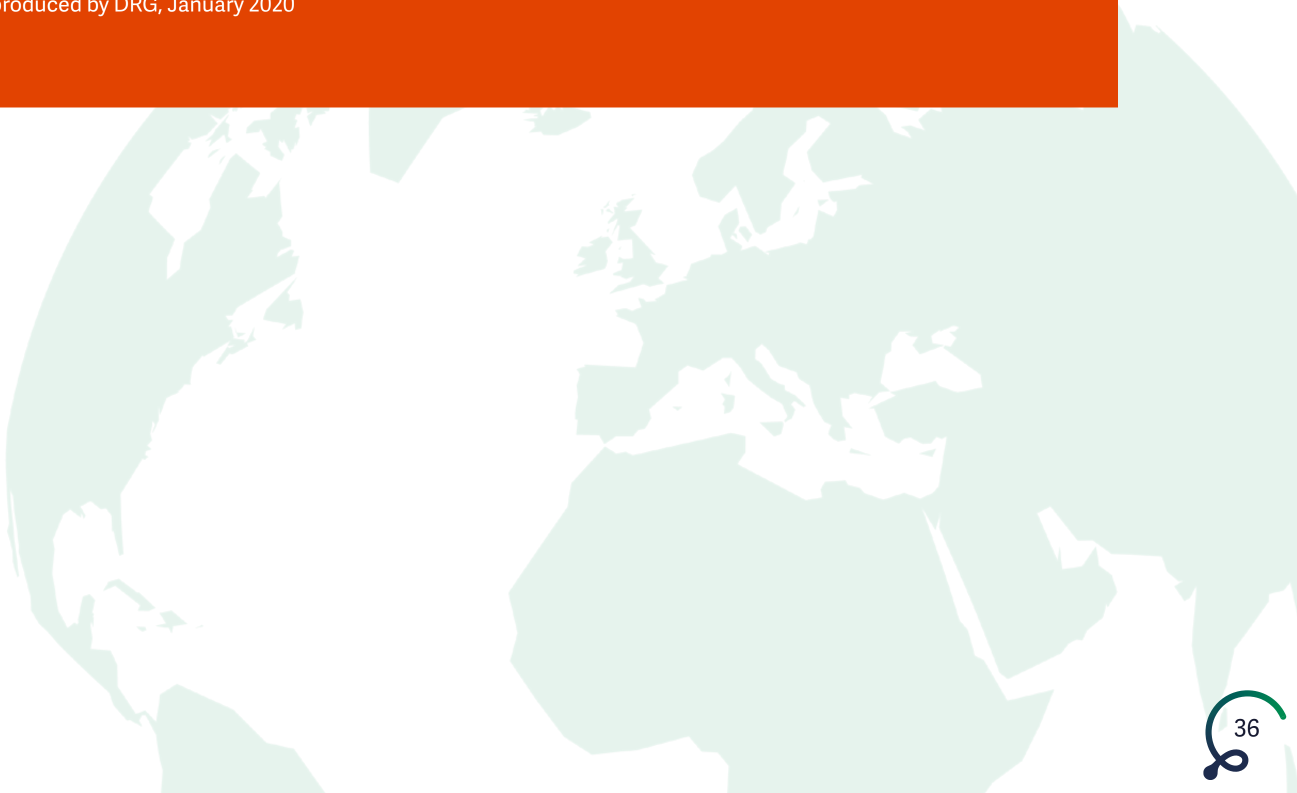
The UK has an evidence-based clinical guideline for MS as well as six quality standards set nationally via the National Institute for Health and Care Excellence (NICE). The UK MS Society has been instrumental in their development.

‘In 2014, we worked with people affected by MS and healthcare professionals to inform the draft MS clinical guideline as it was being written. We worked collaboratively to develop recommendations and promoted them through our *Treat Me Right* campaign and in the media. We proposed and secured the recommendation that every person with MS should have an annual review with an MS specialist as well as access to a named care coordinator and to a multi-disciplinary team of specialists. Research we commissioned in 2020* found that the majority of healthcare professionals who encounter people with MS use the NICE guideline as a first point of reference and find it very important to inform their practice.

Before the guidelines were published, our 2013 *My MS My Needs* survey found 36% of people with MS reported receiving enough information from healthcare professionals about disease-modifying therapies. This had risen to 46% of people with MS by 2016. Similarly, the 2013 survey found 60% of people with MS were able to access an MS nurse in the last 12 months and this had risen to 71% of people with MS in the 2019 survey.’

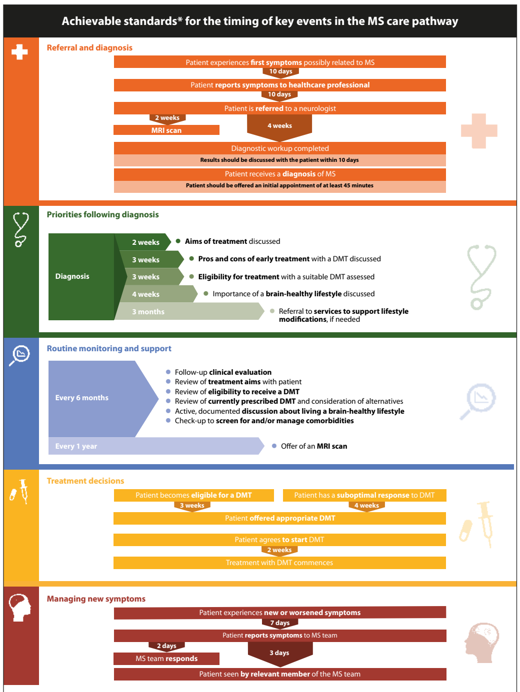
With thanks to Dr. Sarah Rawlings from the UK MS society for sharing this example.

* Awareness and Adherence of Clinical Standards for Multiple Sclerosis among Healthcare Practitioners, Report produced by DRG, January 2020



MS Brain Health quality standards

Achievable standards* for the timing of key events in the MS care pathway



Reproduced from Hobart *et al*. International consensus on quality standards for brain health-focused care in multiple sclerosis. *Mult Scler* 2018; doi:10.1177/1352458518809326.
*Achievable grading reflects good standards of MS care.
DMT, disease-modifying therapy; MRI, magnetic resonance imaging; MS, multiple sclerosis.

MS Brain Health
Time Matters

In early 2019, MS Brain Health international consensus standards for MS care were published. These standards include targets on timelines for diagnosis, treatment and review. The benchmarks build on the evidence-based report Brain health: time matters in multiple sclerosis[26], which recommends a strategy to maximize lifelong 'brain health'.

Experts from 67 countries (63%) reported that they were personally aware of these standards. The standards are endorsed and being followed to some degree in 20 countries (19% of countries worldwide). Furthermore experts from 16 countries (15%) report that there are future plans to develop national standards based on the MS Brain Health initiative.

It is clear that better data collection is needed to enable more countries to integrate the Brain Health standards into their national plans for MS. In 3 out of 10 countries experts report there is no data collected in relation to the diagnosis, treatment or monitoring of MS. Availability of data corresponds with country wealth – with no data collected in 50% of low income countries compared to only 16% of high income nations. Comparing the WHO regions, African, South-East Asian and Western Pacific countries are all data-poor (50-83% collect no MS data compared to 6% of the Americas, 11% of Eastern Mediterranean and 24% of European countries).

Information on the proportion of people treated with DMTs is the most commonly collected statistic (57% of countries worldwide), however fewer than a third of countries collect data on speed of diagnosis (31%) or time to DMT initiation (32%), both of which are essential aspects of the Brain Health standards.

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[26] *Brain health: time matters in multiple sclerosis - https://www.msbrainhealth.org/report*

Concluding remarks

The Atlas of MS estimates there are 2.8 million people living with MS today. However our data indicates that there may be many more people who are living with the disease who cannot access a diagnosis due to a lack of qualified health professionals or equipment within their country, or the cost associated with getting a diagnosis.

A diagnosis of MS is vital so that relevant disease modifying therapies and/or lifestyle modifications can be initiated in order to save brain cells and prevent accumulation of disability. Diagnosis is also important to help national healthcare systems better plan and provide relevant care and support for people affected by MS in their countries. Improving diagnosis – and collecting data on these diagnoses – is crucial to be able to understand the true global burden of MS.

It is important that people with MS are at the heart of decision making about their treatments and that they have access to a wide range of affordable disease modifying therapies, so that guided by their healthcare team they can make informed decisions about the treatment options that suit their circumstances and disease progression. Unfortunately this is simply not the case and access to treatment and rehabilitation is a huge challenge across the world. Tackling drug affordability, improved access to experienced healthcare professionals and removing bureaucracy as well as administrative barriers are key to ensuring equitable access, with the goal of improving outcomes for all people with MS worldwide.

Despite the challenges brought by the COVID-19 pandemic in 2020, there are many reasons to be hopeful for the future. MS research has not stopped pushing the boundaries in the search for cures. During the pandemic, we have been able to capitalise on our strength as a global movement and quickly provide much needed advice to our global MS community about COVID-19 and the vaccines against it. It demonstrates the power of the movement and that together there is much we can achieve.

We hope that MS organisations, healthcare professionals, researchers, industry and people affected by MS will work together to use the Atlas of MS data to uncover new insights and to provide the evidence for advocacy activity. We hope our recommendations will be a roadmap to encourage change so that people with MS, wherever they live in the world, can achieve an early diagnosis, early initiation of treatment, access to rehabilitation and symptomatic treatments to ensure a good quality of life.

Collaborators and acknowledgements

The Atlas of MS relies on extensive collaboration and support from MS organisations, clinicians, researchers, people affected by MS and other experts from around the world.

We are thankful to the Atlas of MS working group and expert advisors, who have been instrumental in guiding the development of the project, including the questionnaire, analysis and reporting:

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- Nora Kriauzaitè (Belgium)
- Benjamin Davis (Canada)
- Lasse Skovgaard (Denmark)
- Anna-Lena Roper (Germany)
- Renuka Malaker (India)
- Aoife Kirwan (Ireland)
- Prof. Mario Battaglia (Italy)
- Magdalena Fac-Skhirtladze & Marta Szantroch (Poland)
- Prof. Riadh Gouider (Tunisia)
- Arwenna Davis (UK)
- Dr. Tim Coetzee (USA)

Expert Advisors

- Prof. Ingrid van Der Mei (Australia)
- Prof. Ruth Ann Marrie (Canada)
- Qihui Yang (China)
- Roberto Rodriguez (Dominican Republic)
- Nardos Amdework Fenta (Ethiopia)
- Prof. Emmanuelle Leray (France)
- Dr. Joanna Laurson-Doube (Hong Kong)
- Renuka Malaker (India)
- Prof. Kazuo Fujihara (Japan)
- Prof. Bernard Uitdehaag (Netherlands)
- Najia Chafai (Morocco)
- Dominika Czarnota-Szalkowska (Poland)
- Dr. Mona Alkhawajah (Saudi Arabia)
- Prof. Neil Robertson (UK)
- Dr. Nick La Rocca (USA)
- Dr. Mitchell T Wallin (USA)

We would also like to thank our methodology experts: Dr. Wendy Kaye and Dr. Lindsay Rechtman of McKing Consulting Corporation, in helping us administer the survey, conduct the data preparation and in aiding our endeavours to improve the robustness and quality of the data.

The key MS International Federation staff who contributed to the Atlas project were: Ceri Angood Napier, Paulina Arce Casillas, Peer Baneke, Zoe Burr, Sarah Dobson, Victoria Gilbert, Anne Helme, Abdelfatah Ibrahim, Rachel King, Nick Rijke, Luke Thomas and Clare Walton.

We would also like to thank our other expert stakeholders who helped improve and refine our messaging, including members of MSIF's International Medical and Scientific Board (IMSB), and International Working Group on Access. We would especially like to thank the people affected by MS who shared their personal stories.

MSIF extends its thanks to the World Health Organization and the European MS Platform (EMSP) for their contribution to the initial edition of the Atlas of MS.

We are also grateful to Red Bullet for the website/analytical tool and Osomi for the design of the logo, report and social media materials.

We are most grateful to the following country coordinators and their colleagues for taking the time and effort to gather the information and data published in the Atlas:

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We would also like to thank those coordinators who provided data but who wished to remain anonymous.

Sponsors

MSIF would like to thank the following MS organisations and companies for making the 3rd edition of the Atlas of MS possible through their generous financial support: the National MS Society (NMSS - US), the MS society (UK), the Associazione Italiana Sclerosi Multipla (AISM/FISM - Italy), the Vanneau Trust, Biogen, Bristol Myers Squibb, Merck, Novartis, Roche and Sanofi Genzyme.

About the Multiple Sclerosis International Federation (MSIF)

- The world's only **global network** of MS organisations.
- **48 member** organisations from around the globe, with links to many other organisations.

- **Together we lead the fight against MS** and work to improve the quality of life of people affected by MS wherever they live.
- Together, we campaign for increased international awareness of MS, provide information and support to people affected by MS, and support international research to discover better treatments and ways to manage the disease.

- **Our vision** is a world without MS.
- **Our mission** is to lead the global MS movement to improve the quality of life of people affected by MS and to support better understanding of the treatment of MS by facilitating international cooperation between MS societies, the international research community and other stakeholders.

Some examples of our work include:

- **COVID-19 and MS global data sharing initiative:** Together with our members and the MS Data Alliance, we are spearheading a global data sharing initiative to meet the demand for data on the impact of the novel coronavirus on people with multiple sclerosis (MS). This information is crucial for people with MS and clinicians to make evidence-based decisions on how to manage their condition during the pandemic.
- **Patient Reported Outcomes initiative for people with MS (PROMS):** This initiative brings together the global MS community, people with and affected by MS, researchers, the healthcare industry and many more, to enable patient input in research, clinical trials of new therapies, and the design of healthcare systems. Through this exciting project, we will see an aligned global view on Patient Reported Outcomes (PROs) for MS for healthcare providers, regulatory agencies and healthcare technology assessment agencies (HTAs).
- **The International Progressive MS Alliance** is an unprecedented global collaboration of MS organisations (including MSIF), researchers, health professionals, the pharmaceutical industry, companies, trusts, foundations, donors and people affected by progressive MS - working together to address the unmet needs of people with progressive MS.

Find out more at **www.msif.org**