Global status report on neurology

World Health Organization

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ISBN 978-92-4-011613-9 (electronic version)
ISBN 978-92-4-011614-6 (print version)

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Suggested citation. Global status report on neurology. Geneva: World Health Organization; 2025. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at https://iris.who.int/.

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Graphic design and layout. Café Information Design.

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Foreword

The growing burden of neurological disorders represents a major global public health issue. Every year, disorders such as stroke, meningitis and epilepsy kill over eleven million people, making them the world's leading cause of ill health and disability combined. Over forty percent of the world's population are living with a neurological disorder, impairing the physical and mental health, quality of life and well-being, and ability for full participation in society of those affected.

The inequities in neurological care remain substantial. People in low- and middle-income countries are disproportionally affected by neurological disorders, while health systems in many parts of the world still lack the resources to adequately address the scope of the problem. This burden is complicated by stigma and discrimination which can hamper lives, increase the risk of poverty, and make accessing care even more difficult. Yet many neurological disorders are preventable or treatable through existing interventions, and research advances increasingly lead to more effective prevention, treatment and care.

The *Intersectoral global action plan on epilepsy and other neurological disorders 2022–2031* marks a historic milestone in public health policy. It presents an unprecedented opportunity to confront the growing global burden of neurological conditions and to promote brain health across the life course. WHO stands fully committed to working alongside Member States, people with lived experience and civil society to implement this transformative plan and achieve its ten ambitious targets by 2031.

We need a concerted and multipronged effort – across all sectors of society. Together, as a global community, we can transform the lives of millions affected by neurological conditions by advancing the action plan's vision: a world in which brain health is valued, promoted and protected across the life course; neurological disorders are prevented, diagnosed and treated; premature mortality and morbidity are avoided; and people affected by neurological disorders and their carers attain the highest possible level of health, with equal rights, opportunities, respect and autonomy.

Jeremy

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Preface

Neurological disorders concern the whole world. They affect more than one in three people directly, but the impact of lost life opportunities, lost social connections and lost economic gains spreads to everyone. In the changing landscape of health, neurological disorders are increasing their share. However, there is also hope – recognition of the importance of brain health and the need to promote and protect it across the life course is at an all-time high.

The *Intersectoral global action plan on epilepsy and other neurological disorders 2022–2031* provides a global mandate to reduce the stigma, impact, and burden of neurological disorders, including associated mortality, morbidity, and disability, and to improve the quality of life of people with neurological disorders, their carers and families. To achieve this overarching goal, we need clear reporting of the current situation to direct our efforts and mark our achievements. This is the purpose of the *Global status report on neurology* – to paint the picture of the gaps and needs, and give us a map towards our destination.

This report presents the findings from a comprehensive global survey of WHO Member States, establishing a baseline for the action plan's ten global targets. It provides essential evidence-based guidance to policymakers, health planners and the broader global neurology community on addressing key barriers, leveraging enablers and implementing priority actions for progress. By implementing the report's recommendations, countries can build an integrated, equitable and sustainable public health response to neurological disorders – one that strengthens governance, legislation and financing, raises public awareness, improves service delivery, supports the health workforce, invests in better access to medicines, technologies and health products and strengthens research and health information systems.

The report is anchored by the voices of people with lived experience who shared their unique perspectives, needs and recommendations at global consultations. They remind us of the true cost of inaction on the lives of people with neurological disorders. Together, we can change that by uniting our efforts to bring better brain health for everyone, everywhere.

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Acknowledgements

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WHO regional and country offices:

Andrea Bruni (Regional Office for South-East Asia), Claudina Cayetano (Regional Office for the Americas), Ledia Lazeri (Regional Office for Europe), Julius Muron (Regional Office for Africa), Joseph Mwangi (Country Office, South Africa), Renato Oliveira e Souza (Regional Office for the Americas), Chido Rwafa-Madzvamutse (Regional Office for Africa), Cassie Redlich (Regional Office for Europe), Khalid Saeed (Regional Office for the Eastern Mediterranean), Atsuro Tsutsumi (Regional Office for the Western Pacific), Martin Vandendyck (Regional Office for the Western Pacific), Jasmine Vergara (Regional Office for the Western Pacific), Alexandru Voloc (Country Office, Moldova).

WHO expresses its gratitude for the contributions to this report made by many international experts and persons with lived experience. These contributions were central to the development of the data analyses and discussions contained in the report. The report would not have been possible without the contributions of

the WHO Member States national counterparts and the country focal points nominated for participation in the IGAP Survey who provided country-level data and other relevant information on the public health response to neurological disorders. WHO extends its gratitude to all contributors and reviewers not otherwise stated.

The following experts and people with lived experience participated in the consultations, provided technical inputs (including the content of boxes and country case studies) and/or reviewed the draft of the report (in alphabetical order):

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Financial Support

Financial support for this publication was provided by the Government of France and the WHO Foundation.

Abbreviations

CRPD	Convention on the Rights of Persons with Disabilities
DALYs	Disability-adjusted life years
GBD	Global Burden of Disease study
GDP	Gross Domestic Product
ICD	International Classification of Diseases and related Health Problems
IGAP	Intersectoral global action plan on epilepsy and other neurological disorders 2022–2031
LMIC	Low- and middle-income country
mhGAP	Mental Health Gap Action Programme
NCD	Noncommunicable disease
OECD	Organisation for Economic Co-operation and Development
PHC	Primary health care
UHC	Universal health coverage
WFN	World Federation of Neurology
WHO	World Health Organization

Man receiving a health check-up from the Eltomale Site Mobile Health and Nutrition Team in Chifra, Afar. The background shows the impact of drought, floods and conflict on health in the region. Ethiopia, 2022. © WHO / Martha Tadesse

Executive summary

Chapter 1
Introduction

Neurological disorders represent the leading cause of ill health and disability globally, affecting over one third of the population in 2021, with a disproportionate burden on low- and middle-income countries (LMICs). These conditions carry substantial health, social and economic burdens which are exacerbated by global inequities in policy prioritization, awareness, resources and access to promotion, prevention, treatment and care. To address this growing crisis, WHO Member States unanimously adopted the *Intersectoral global action plan (IGAP) on epilepsy and other neurological disorders 2022–2031*. IGAP provides a comprehensive 10-year road map to reduce the stigma, impact and burden of neurological disorders, improve the quality of life of people with lived experience of these conditions, and promote brain health worldwide.

The *Global status report on neurology* presents the findings of WHO's IGAP monitoring mechanism which is designed to track progress and support Member States in implementing the action plan's strategic objectives and global targets by 2031. It establishes baseline values for IGAP's 10 global targets for 2022 and provides essential data on the epidemiological and economic burden of neurological disorders. The report covers key areas such as governance, financing, service delivery, workforce, access to medicines and technologies, promotion and prevention, and research and information systems. It maps the global public health response and identifies unmet needs, critical gaps and barriers which require urgent attention. It offers data-driven, actionable recommendations for policy-makers, IGAP implementation partners and the global neurology community – including people with neurological conditions, their carers and families who are at the heart of this effort.

This first IGAP reporting cycle was conducted in close collaboration with WHO's six regional offices and with WHO country offices worldwide. Data were collected via an IGAP global status monitoring questionnaire (IGAP survey) sent to health ministry focal points in all Member States. In addition to reporting on overall services and resources for neurological disorders, Member States could report on six tracer conditions – epilepsy, headache disorders, meningitis, neurodevelopmental conditions, Parkinson disease and stroke – and other relevant conditions (excluding dementia, which is monitored separately through the Global Dementia Observatory). The primary data source is the IGAP survey, which includes self-reported data from Member States across key domains. Additional sources include WHO's Global Health Observatory, other WHO monitoring frameworks, the Global Burden of Disease Study, desk research and country case studies. The report also incorporates input from over 70 external contributors and consultations with individuals with lived experience of neurological conditions, their carers and families.

A total of 102 of WHO's 194 Member States (53%) participated, representing 71% of the world's population. While this response rate provides a robust foundation, it also highlights that sustained efforts are needed to strengthen national health information systems and improve global data collection for neurological disorders in future reporting cycles. Despite strong participation across most regions and income groups, challenges such as limited capacity and fragmented data systems affected the reporting from many countries. WHO will continue to support Member States through targeted technical assistance, capacity-building and improved monitoring mechanisms to enhance future reporting cycles and accelerate IGAP implementation.

The baseline values for IGAP's 10 global targets for 2022 are summarized in Figure E1, with the report's key findings and recommendations presented in the chapter summaries that follow.

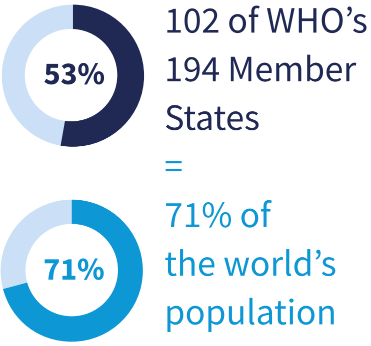


Figure E1

Baseline values for **IGAP’s 10 global targets, 2022**

		BASELINE VALUE FOR 2022 (% OF 194 WHO MEMBER STATES)
PRIORITIZATION AND GOVERNANCE	1.1 **75% of countries** will have adapted or updated existing national policies, strategies, plans or frameworks to include neurological disorders by 2031.	**32%** (62% of responding countries*)
	1.2 **100% of countries** will have at least one functioning awareness campaign or advocacy programme for neurological disorders by 2031.	**24%** (45% of responding countries*)
DIAGNOSIS, TREATMENT AND CARE	2.1 **75% of countries** will have included neurological disorders in the UHC benefits package by 2031.	**25%** (48% of responding countries*)
	2.2 **80% of countries** will provide the essential medicines and basic technologies required to manage neurological disorders in primary care by 2031.	**29%** (56% of responding countries*)
PROMOTION AND PREVENTION	3.1 **80% of countries** will have at least one functioning intersectoral programme for brain health promotion and the prevention of neurological disorders across the life course by 2031.	**20%** (38% of responding countries*)
	3.2 **The global targets** relevant to prevention of neurological disorders are achieved, as defined in: (1) The *NCD-GAP*; (2) *Defeating meningitis by 2030: a global road map*; and (3) *Every newborn: an action plan to end preventable deaths*.	Various baseline values (see Chapter 5)
RESEARCH AND INFORMATION SYSTEMS	4.1 **80% of countries** routinely collect and report on a core set of indicators for neurological disorders through their national health data and information systems at least every three years by 2031.	**37%** (70% of responding countries*)
	4.2 **The output** of global research on neurological disorders doubles by 2031.	**6.7%** Neurological disorders research share of overall health research output (2022 baseline)
PUBLIC HEALTH APPROACH TO EPILEPSY	5.1 **By 2031** countries will have increased service coverage for epilepsy by 50% from the current coverage in 2021.	**49%** Global median epilepsy service coverage (2022 baseline)
	5.2 **80% of countries** will have developed or updated their legislation with a view to promoting and protecting the human rights of people with epilepsy by 2031.	**25%** (48% of responding countries*)

*Baseline value for 2022 (percentage of 102 responding countries)

Chapter 2
Global burden of neurological disorders

Neurological disorders pose a major and growing global health challenge, with wide-ranging health, social and economic impacts. For this report, age-, sex- and condition-specific prevalence estimates for neurological disorders derived from 2021 Global Burden of Disease data were applied to United Nations population estimates for 2021. Further, overall health loss attributable to 37 neurological conditions was quantified and disaggregated by region, income level, age and sex.

It is estimated that in 2021 neurological disorders affected approximately 3.4 billion people (42% of the global population) across WHO Member States, causing over 435 million disability-adjusted life years (DALYs), making these conditions the leading cause of ill-health and disability worldwide. Together, the 37 neurological conditions caused 11.8 million deaths, 162 million years lived with disability, and 272 million years of life lost globally. It is likely that these figures underestimate the true burden due to diagnostic gaps, data limitations and unquantified conditions. The top 10 neurological disorders contributing to health loss globally in 2021 were stroke, neonatal encephalopathy, migraine, Alzheimer disease and other dementias, diabetic neuropathy, meningitis, idiopathic epilepsy, neurological complications associated with preterm birth, autism spectrum disorders and nervous system cancers.

Neurological conditions are marked by profound inequities. Over 80% of DALYs occur in LMICs, where access to diagnosis, treatment, care and rehabilitation remains limited. These conditions can arise at any age, with many being chronic and requiring lifelong care. Sex and gender differences also shape how neurological disorders manifest. Conditions such as migraine, multiple sclerosis and dementia are more common in females, while stroke and Parkinson disease are more prevalent in males. Rare neurological conditions, though often overlooked, affect millions and pose distinct diagnostic and management challenges. Addressing these disparities calls for an inclusive, integrated and person-centred public health strategy grounded in a life course approach that leaves no one behind.

Neurological disorders place an enormous economic burden on health-care systems because of, for example, direct medical expenses, social (nonmedical) costs, and indirect costs from informal caregiving and productivity losses. Although vital for health policy design, planning and financing, comprehensive cost estimates for these conditions are limited due to significant data gaps, especially in LMICs. Recent data suggest that, in 2019, direct costs for 24 brain disorders (including neurological and mental health conditions) exceeded US$ 1.7 trillion, growing by 3.5% annually since 2000, with stroke and dementia accounting for a large share. These figures exclude indirect costs, which are likely to be considerable. Research indicates that inaction on modifiable risk factors, such as physical inactivity and insufficient sleep, contributes to large avoidable costs. These findings highlight both humanitarian and economic imperatives for more equitable health promotion and prevention strategies that target major brain health determinants and neurological risk factors.

Over 80% of DALYs occur in LMICs, where access to diagnosis, treatment, care and rehabilitation remains limited.

Emerging investment cases suggest that cost-effective interventions exist and can yield meaningful returns. For instance, WHO estimates that an investment of US$ 440 million to implement fully the Defeating meningitis by 2030 global road map could result in economic benefits of up to US$ 71.3 billion over the working life of individuals whose lives are saved. To support countries in making informed decisions, WHO has developed guidance for building national investment cases. The Organization also continues to promote research on cost-effective, scalable interventions. Strengthening the evidence base through economic evaluations and implementation research will be essential if countries are to develop sustainable, context-appropriate policies and programmes.

Chapter 3
Policy, advocacy and health system financing

Effective public health responses to neurological disorders require strong policy frameworks, sustained advocacy and adequate health system financing. However, many countries face structural, financial and social barriers that hinder progress. Widespread stigma, misconceptions and low awareness of neurological conditions hinder health-seeking behaviour and policy prioritization. In many regions, fragmented and underfunded health systems compromise service quality and access. High out-of-pocket costs for neurological care, combined with weak financial and social protections, often lead to significant financial hardship, particularly in LMICs.

Strong governance and political commitment are indispensable for IGAP implementation. IGAP's global target 1.1 is for 75% of countries to adapt or update existing national policies, strategies, plans or frameworks in order to include neurological disorders by 2031 – either through stand-alone instruments or by integration into broader health strategies. At baseline, 63 countries (32% of WHO Member States) reported having at least one such policy. Most were integrated into broader frameworks (such as mental health, general health, noncommunicable diseases (NCDs), and disability policies), particularly in LMICs. Stand-alone policies – often focused on stroke and epilepsy – were more common in higher-income settings. Policy functionality – defined by the presence of dedicated resources, monitoring mechanisms, and involvement of people with lived experience – generally increased with country income level, though few countries reported fully functional policies.

Advocacy and awareness-raising are essential to reducing stigma, promoting human rights, and building political and public support. IGAP's global target 1.2 calls on all countries to implement at least one functional national awareness-raising campaign or advocacy programme for neurological disorders or brain health by 2031. Functionality requires dedicated resources, a defined implementation plan and evidence of progress or impact. At baseline, 61 countries reported implementing such initiatives in the past year; however, only 46 (24% of Member States) met one of the three benchmarks for functionality, and just 17 had fully functional campaigns meeting all three benchmarks. Implementation and functionality varied by region and were generally higher in high-income countries. Most campaigns focused on stroke and epilepsy, followed by broader initiatives on brain health or neurological conditions. While the general public and health professionals were commonly targeted, groups such as teachers and employers were less frequently engaged.

IGAP recommends sustainable and proportionate funding for brain health and neurological disorders, yet only one third (33%) of responding countries reported allocating dedicated funding. Funding levels varied by region and income, with higher-income countries more likely to report such allocations. Most funding was directed toward health care and treatment, while fewer countries prioritized promotion and/or prevention or the inclusion/participation of people with neurological disorders. There are major financial barriers to accessing care: over one in four countries reported that most people with neurological disorders pay more than 50% out-of-pocket for care, and nearly one in three reported the same for medicines. This situation is most pronounced in LMICs and in the African and South-East Asia regions.

Despite increasing recognition of the burden of neurological disorders, political leadership and dedicated national policies remain insufficient. The IGAP survey data highlight the urgent need for evidence-based, context-specific, well-resourced and closely monitored policies supported by national focal points and inclusive, multi-stakeholder task forces that include people with lived experience. Further priorities include investing in coordinated and scalable advocacy and awareness campaigns, establishing sustainable financing mechanisms and strengthening financial and social protections. Member States face persistent challenges such as limited resources, fragmented advocacy efforts, stigma at multiple levels, and difficulties in adapting IGAP to national contexts. WHO has developed resources to support implementation, and numerous global and national initiatives offer adaptable models. Strengthening political will, fostering inclusive governance and aligning investments with the true burden of neurological disorders are essential to advancing brain health for all.

Chapter 4
Effective, timely and responsive diagnosis, treatment and care

Access to neurological care is vital yet unevenly distributed; regions facing the greatest needs often have the fewest resources. IGAP global target 2.1 calls for 75% of countries to include neurological disorders in their universal health coverage benefits packages by 2031 – ensuring equitable access to care without financial hardship. At baseline, 49 countries (25% of Member States) reported this inclusion, with high-income countries more likely to do so. Disparities extended to social protection mechanisms for people with neurological conditions, which were reported ten times more often by high-income than low-income countries.

The IGAP survey data highlight gaps in the equitable availability and accessibility of neurological services, especially in LMICs. Of 102 countries, 92 reported having neurological services, although most were in specialized settings. Only half offered these services in both specialized and non-specialized settings, with the lowest availability in low-income countries. Services mainly targeted adults; just 17% of countries provided specialized care for children. Access was further limited by geography, with services far more available in urban areas than in rural ones. Inequities were most pronounced in low- and lower-middle-income countries, where essential services such as stroke units, neuro-intensive care, rehabilitation, and palliative care remain scarce. Upper-middle-income and high-income countries were also more likely to have national care guidelines and standards for neurological disorders.

People with neurological conditions often require ongoing care, frequently provided by unpaid family members, especially in LMICs. Informal carers, many of them women, face significant emotional, physical and financial strain. IGAP addresses this by including carers and families in its overarching goal and calling for inclusive services, supports and social and financial protection mechanisms. Global data reveal a major gap: at baseline, fewer than half of responding countries indicated having carer services (45%) or protections (43%), with such elements largely absent in low-income countries.

IGAP's global target 2.2 aims for 80% of countries to provide the essential medicines and basic technologies required to manage neurological disorders in primary care by 2031. At baseline, only 57 countries (29% of Member States) reported universal access to these resources in both urban and rural areas. Access was often limited by the concentration of these resources in urban areas and by high out-of-pocket costs. Analysis of 14 essential neurological medicines showed wide variation in availability: while paracetamol and ibuprofen were widely accessible in primary care facilities, key neurological medicines such as biperiden, sumatriptan, lamotrigine and levetiracetam were available in fewer than half of responding countries, with lowest availability in low-income settings.

A strong, multidisciplinary workforce at all levels of care is essential for quality neurological services, yet many countries face severe resource constraints. IGAP survey data reveal major shortages and stark disparities in the availability of neurologists, child neurologists and neurosurgeons. For instance, on average, low-income countries reported a median number of neurologists per 100 000 population over 80 times lower than that of high-income countries. Regional disparities are also evident, with the African and South-East Asia regions reporting the lowest median workforce densities. While 76% of responding countries offer primary care-level training to identify and manage neurological disorders – mainly targeting generalist doctors, nurses and specialists – community health workers and pharmacists are less often included. Nearly half of countries report using WHO's mhGAP modules, particularly in lower-resource settings, to support care for epilepsy, dementia, and child and adolescent mental and behavioural disorders.

These findings highlight persistent barriers to effective neurological care, including inequitable and geographically limited access to essential services and medicines, insufficient social and financial support for people with neurological conditions and their carers, and critical workforce shortages, especially in LMICs.

Addressing these challenges requires countries to: implement integrated, person-centred care pathways within universal health coverage; ensure equitable access to essential medicines and technologies; build a sustainable, interdisciplinary workforce across all levels of care; and strengthen carer support. WHO offers a comprehensive suite of technical resources to support these efforts. Immediate priorities include scaling-up of cost-effective interventions, integrating neurology into primary and community care services, and leveraging digital tools for neurology services, training and knowledge exchange. Long-term progress depends on political commitment, infrastructure investment and intersectoral collaboration in order to build integrated, resilient and equitable neurological care systems.

Chapter 5

Brain health promotion and prevention of neurological disorders

Optimizing brain health across the life course is essential for reducing the burden of neurological disorders, improving quality of life and enabling individuals to reach their full potential. This requires promoting protective factors and reducing modifiable risks from the perinatal period through to older age. WHO's framework for brain health optimization emphasizes intersectoral and integrated strategies that address physical, social, economic and environmental determinants.

IGAP's global target 3.1 aims for 80% of countries to implement at least one functioning intersectoral programme for brain health promotion and the prevention of neurological disorders across the life course by 2031. Full functionality requires dedicated resources, a defined implementation plan, and evidence of progress or impact. At baseline, only 39 countries (20% of Member States) had a national programme that met at least one functionality criterion. Programme functionality was generally strong: 27 countries met all three criteria, including 21 whose programmes were also intersectoral and adopted a life course approach. Most programmes either addressed brain health and/or neurological disorders broadly and/or targeted conditions like stroke, epilepsy and neurodevelopmental conditions.

IGAP also calls for global progress across five action areas: 1) promoting healthy behaviour across the life course; 2) controlling infectious diseases; 3) promoting optimal brain development in children and adolescents; 4) preventing head/spinal trauma and associated disabilities; and 5) reducing environmental risks. For the first three, IGAP global target 3.2 aligns with relevant prevention targets as defined in existing mandates, namely: the *Global action plan for the prevention and control of noncommunicable diseases (NCD-GAP) 2013–2030*; *Defeating meningitis by 2030: a global road map*; and *Every newborn: an action plan to end preventable deaths*. Progress in the latter two areas is tracked through other WHO reporting mechanisms.

Promoting healthy behaviours is key to addressing modifiable risk factors shared between neurological disorders and NCDs. Despite some improvements since 2010, 2022 data show that most NCD-GAP global targets remain off track. The prevalence of physical inactivity, diabetes and obesity has increased, raised blood pressure remained prevalent in 2019, and rates of tobacco and harmful alcohol use have declined but remain concerning. The strong links between NCDs and neurological conditions such as stroke and dementia offer opportunities for synergistic, integrated and scalable risk reduction interventions.

Infectious disease control is vital to curb the burden of neurotropic communicable diseases. LMICs are disproportionately affected by diseases such as meningitis, encephalitis, HIV, tuberculosis, malaria and neurocysticercosis, as well as sequelae that include epilepsy, cognitive and motor impairments, and sensory loss. Data from WHO's Defeating meningitis by 2030 monitoring framework indicate that, from 2015 to 2022, global vaccine coverage for key pathogens increased substantially, and global policies for meningitis prevention advanced. While age-standardized DALY rates for meningitis and encephalitis have declined by 54% and 36%, respectively, between 2000 and 2021, the burden remained high, especially in LMICs and among children. Broader efforts in sanitation, vaccination and pandemic preparedness are urgently needed.

Promoting optimal brain development is essential for lifelong health and well-being. Yet many children under five in LMICs are at risk of not reaching their full developmental potential due to poverty, malnutrition, and environmental and social adversities. It is critical to improve maternal and newborn health while ensuring healthy nutrition and creating supportive environments. Despite some progress, most countries trail the 2025 targets of the Every newborn action plan to end preventable deaths, with persistent gaps in antenatal and postnatal care, and care for small and sick newborns.

Preventing head/spinal trauma remains a global priority, with traumatic brain and spinal cord injuries affecting over 50 million people globally in 2021. These preventable injuries increase the risk of other neurological disorders and require complex neurosurgical, neurological and neurorehabilitative care which is often unavailable in LMICs. Effective prevention demands coordinated multisectoral strategies to address root causes such as road traffic accidents. The *Global status report on road safety 2023* highlights persistent inequities, with 90% of road deaths occurring in LMICs.

Reducing environmental risks – such as air, noise, and light pollution; contaminated food/water; radiation; and industrial chemicals and solvents – is essential to protecting brain health. WHO estimates that nearly all people breathe polluted air, contributing to 6.7 million deaths in 2019 and having a disproportionate impact in LMICs. Climate change compounds these risks through extreme temperatures and environmental instability. While regulation of neurotoxins such as lead and mercury shows progress, global action remains insufficient. The COP28 global stocktake confirmed that efforts to limit warming to 1.5°C are off track, underscoring the urgency for bold, coordinated, multisectoral action to safeguard both planetary and brain health.

Brain health promotion and prevention of neurological disorders remains a global challenge due to low awareness, limited resources, and weak intersectoral coordination. The data show that most countries have yet to develop dedicated national promotion/prevention programmes. Progress on relevant prevention targets for NCDs, meningitis and maternal/newborn health remains slow and must accelerate. The avertable burden from head/spinal trauma and environmental risks also remains high. Essential country actions include integration of brain health in all policies; developing and embedding promotion/prevention programmes in all care levels; and educating all stakeholders to support brain-healthy behaviours. Additionally, developing robust brain health metrics and surveillance, aligned with WHO frameworks and global mandates, can help countries track progress and support effective, sustainable policies and interventions.

Chapter 6

Research and health information system strengthening

Research

It is paramount that research and innovation should inform prevention, diagnosis, treatment and potential cures in order to address the rising neurological burden. However, research efforts remain underfunded and deprioritized in many parts of the world, including in LMICs. Contributing factors include limited awareness, resource and capacity constraints, and systemic barriers to equitable research participation and leadership.

IGAP's global target 4.2 calls for global research output on neurological disorders to double by 2031. A standardized, replicable methodology with indexed peer-reviewed publications was used to estimate global research output on neurological disorders. In 2022, this output accounted for 6.7% of all health research output, exceeding that on mental health and cardiovascular diseases but trailing cancer. Regional and income group disparities were substantial: output was highest in the European Region (7.7%) and high-income countries (7.6%), and lowest in the African Region (3.8%) and low-income countries (4.1%). Reported government funding for such research was limited and virtually absent in low-income countries. Similarly, WHO data on global health research grants show that, in 2023, research funding and collaboration remained concentrated in high-income countries, with little institutional involvement by LMICs.

Coordinated global action is needed to advance research into neurological disorders equitably and collaboratively, addressing key gaps in awareness, funding, infrastructure and inclusion. Research agendas at global, regional and national levels should be aligned, should be responsive to societal needs and should involve diverse stakeholders, including people with lived experience. Sustainable investment in LMIC-led basic, clinical and implementation research is critical and should be supported by inclusive funding, open-access platforms and international networks. It is equally important to integrate quality research data into national health information systems and use it to inform health policy-making, planning and financing. Promising global and regional initiatives demonstrate the value of inclusive, needs-driven and action-oriented research. WHO's dementia research blueprint offers a framework for countries to accelerate innovation by tackling regulatory, funding and equity challenges.

Health information systems

Effective and routine data collection through national health information systems is essential for evidence-informed policy-making, service planning and delivery, disease surveillance and forecasting, and for monitoring progress and ensuring accountability. However, major global disparities exist in data collection, analysis, reporting and translation. In many parts of the world, health information systems remain under-resourced, digitally fragmented and poorly integrated across sectors and levels of care, limiting the regular collection and use of quality data.

IGAP global target 4.1 aims for 80% of countries routinely to collect and report on a core set of indicators for neurological disorders through their national health information systems at least every three years by 2031. While 102 countries participated in this for the IGAP reporting round, only 71 (37% of Member States) met this target at baseline by being able to report on at least six of seven core indicators in the IGAP survey.

60% of responding countries reported integrating neurological disorder indicators into their health information systems across all care levels, with slightly higher rates reported by LMICs. Stroke and epilepsy were most commonly included, with few countries integrating all six IGAP survey tracer conditions. Data disaggregation by International Classification of Diseases code, sex and age was limited, with systems in high-income and upper-middle-income countries more likely to capture all three dimensions. Additionally, while two thirds of countries reported collecting and compiling data on neurological disorders, most use it for general health statistics but only a minority publish dedicated reports.

The data underscore the fact that health information systems around the world need to be strengthened for effective collection and use of data on neurological disorders. Common barriers – such as system fragmentation, poor indicator integration, limited data disaggregation and lack of routine reporting – require targeted investment, multistakeholder collaboration and workforce development. Countries should assess current capabilities, update core indicators and ensure integration of neurological disorders as relevant to the national context. In high-income and upper-middle-income countries, efforts may centre on improving system integration and interoperability, while in low- and lower-middle-income countries, priorities may include strengthening data disaggregation, compilation and reporting capacities. Publishing dedicated reports is recommended to enhance data utilization, transparency and decision-making. Scalable digital tools, including AI-assisted solutions, can enhance system capacity and should be implemented ethically, equitably and inclusively, with user-friendly, real-time decision support. People with neurological disorders and their carers should be central to these efforts. Strengthened health information systems will improve service delivery and clinical outcomes, elevate the profile of neurological disorders, and support more effective data-driven responses.

An 8-year-old child with cerebral palsy is supported by his young brothers to use his wheelchair.
United Republic of Tanzania, 2023. © WHO / Mwesuwa Ramsey

Chapter 7
Strengthening the public health approach to epilepsy

In 2021, epilepsy affected about 51.7 million people globally, 80% of whom lived in LMICs, imposing a major health and economic burden. Despite its prevalence, the treatment gap is substantial – particularly in low-income settings where access to care is hindered by workforce shortages, limited diagnostic tools, inaccessible medicines, geographical barriers and pervasive stigma. Social exclusion, discriminatory laws and misinformation further marginalize individuals with epilepsy, especially in rural, low-resource and humanitarian contexts. Addressing these challenges holistically can improve the lives of people with epilepsy and offer valuable entry points to strengthen the public health response to neurological disorders more broadly.

IGAP global target 5.1 calls for all countries to increase coverage of epilepsy services by 50% from baseline levels by 2031. The median global coverage of epilepsy services in 2022 was estimated at 49% on the basis of data from 18 countries, although data gaps and methodological constraints limit interpretation. Service coverage was calculated as the proportion of people receiving defined epilepsy services relative to the estimated population in need during the index year, using country-reported data (numerator) and age-standardized prevalence estimates from the Global Burden of Disease 2021 study (denominator). However, many countries faced challenges in reporting total epilepsy cases due to constraints in health information system infrastructure, decentralized data collection and reporting, and lack of national epilepsy registries. Statistical uncertainty in the Global Burden of Disease estimates of country-level prevalence is another limitation. These limitations show the need for stronger health information systems, standardized data collection and nationally representative prevalence studies to enhance accurate monitoring of service coverage indicators and reliably track progress toward this IGAP target.

To advance the protection of human rights for people with epilepsy, IGAP's global target 5.2 aims for 80% of countries to adopt or update relevant legislation by 2031. At baseline, 49 countries (25% of Member States) reported having epilepsy-specific or general legislation that promotes and protects the human rights of people with epilepsy. Fewer countries met a stricter definition requiring compliance with at least one of seven key legal provisions. Legal protections were more common in high-income and upper-middle-income countries and were typically embedded in general legislation rather than in epilepsy-specific laws. Most countries with existing legislation reported having legal provisions: 1) to prohibit discrimination, exploitation and other violations of human rights; 2) to ensure the right to legal capacity; 3) to protect from coercive practices and involuntary admission and treatment; and 4) to promote equal opportunities in areas such as education, employment and housing. However, fewer than half reported legal mechanisms for involving people with epilepsy in policy-making. These findings highlight both progress and persistent gaps, particularly in lower-income settings, thus emphasizing the need for legislative reform and enforcement to reduce stigma and protect the rights of people with epilepsy.

These findings are evidence of the urgent global need to scale up essential services and uphold human rights to improve the lives of people with epilepsy, their carers and families. In many LMICs, barriers include low awareness, weak care pathways, limited clinical guidance, workforce shortages, poor access to affordable antiseizure medicines, and limited involvement of people with epilepsy. Integrating epilepsy services into primary health care is essential to improve early detection, diagnosis and treatment, as well as equitable access. Countries should invest in training primary care workers (e.g. using WHO's *mhGAP Intervention Guide*), ensuring sustained access to essential medicines, and incorporating quality monitoring and specialist support. Intersectoral prevention strategies, research, innovation and implementation science are also critical to reducing the burden of epilepsy and improving outcomes. In many parts of the world, comprehensive legal reform is needed to align national laws with the United Nations Convention on the Rights of Persons with Disabilities. Reforms must be inclusive and needs-based, placing people with epilepsy, their families and carers at the centre. Public awareness campaigns are vital to counter stigma and promote understanding, especially in schools and workplaces. These efforts must accompany service expansion in order to increase uptake of treatment. Empowering people with epilepsy through inclusive governance and advocacy is key to achieving IGAP targets. WHO and partners can support national action, but sustained political leadership, investment and collaboration are essential.

Chapter 8
The way forward

Neurological disorders affect over one third of the world's population and represent a major public health challenge that is marked by profound global inequities and a disproportionate burden in LMICs. Despite the availability of effective and scalable solutions, systemic barriers – such as insufficient policy prioritization, limited awareness and resources, large treatment gaps and underdeveloped data systems – hinder progress. The 2022 IGAP survey showed that global baseline values for IGAP targets measurable in the reporting cycle ranged between 20% and 37% of WHO Member States, thus highlighting the urgent need for bold and coordinated action. To accelerate global progress, this report outlines four essential, timely and actionable recommendations for policy-makers and stakeholders involved in the public health response to neurological disorders:

- **Recommendation 1:** Make neurological disorders a policy priority through bold leadership and sustained investment.
- **Recommendation 2:** Expand access to neurological care by Universal Health Coverage and health system strengthening.
- **Recommendation 3:** Promote brain health across the life course with coordinated intersectoral action targeting key risk and protective factors.
- **Recommendation 4:** Strengthen data systems and monitoring for evidence-informed decision-making and accountability.

The 2022 IGAP survey data highlight an urgent need for bold and coordinated action.

As the first global baseline assessment under IGAP, this report outlines evidence-based priority actions to support countries with synergistic implementation of the plan's strategic objectives. Despite persistent challenges that demand renewed focus and commitment, emerging country experiences demonstrate that meaningful progress is achievable and can lead to tangible, lasting impact. Central to success is the meaningful involvement of people with lived experience in shaping person-centred policies, services and programmes. Addressing neurological disorders holistically requires intersectoral collaboration across both health and non-health domains, aligning with broader global health and development agendas. As the world enters the post-SDGs era, brain health must become firmly established as a global policy priority. Strong governance, international cooperation, and full implementation of IGAP are essential to realizing the vision of a world in which: 1) brain health is valued, promoted and protected across the life course; 2) neurological disorders are prevented, diagnosed and treated, and premature mortality and morbidity are avoided; and 3) people affected by neurological disorders and their carers attain the highest possible level of health, with equal rights, opportunities, respect and autonomy.

Girl standing between group of women. © Unsplash / Terry Boynton

Chapter 1

Introduction

A global public health imperative

Neurological disorders represent the leading cause of ill health and disability globally, as measured in disability-adjusted life years (DALYs), and years of life lost. In 2021, a group of 37 neurological conditions affected approximately 3.4 billion people (42% of the world's population) across WHO's Member States and caused 435 million DALYs and 11.8 million deaths globally, as derived from the 2021 Global Burden of Disease (GBD) study estimates *(1, 2)* (see Chapter 2).

The high burden associated with neurological disorders is compounded by profound health inequities. The majority of people with neurological disorders live in low- and middle-income countries (LMICs) where health systems are not yet adequately developed to address the enormous public health impacts associated with neurological ill-health *(3)*. Various challenges are encountered in LMICs – including: 1) lack of awareness and understanding of neurological conditions and brain health; 2) insufficient policy prioritization and resource allocation for neurological disorders; 3) critical neurological workforce shortages; and 4) limited access to prevention, diagnosis, treatment (including essential medicines), care and rehabilitation *(3)*. Consequently, treatment gaps in many countries are very high. For instance, nearly 80% of the almost 52 million people with epilepsy live in LMICs *(1, 4, 5)*. Treatment gaps exceed 75% in most low-income countries and exceed 50% in most middle-income countries *(6)*. Globally in 2019, 58.9 million children younger than 5 years had developmental disabilities and 95% of these children lived in LMICs *(7)*.

Limitations in functioning associated with neurological conditions disproportionately affect women, older people and those living in poverty and rural or remote areas. Other vulnerable populations include children from underprivileged households, indigenous populations, ethnic minorities, internally displaced or stateless persons, refugees and migrants *(8)*. Women are also often disproportionally affected by neurological disorders, such as dementia, migraine and multiple sclerosis *(1)*, and often bear most of the burden of informal caregiving *(9)*.

Neurological disorders are associated with substantial costs for governments, communities, families and individuals, as well as major productivity losses for economies. A recent global study estimated that, in 2019, the direct costs of 24 brain disorders (including mental and neurological conditions) alone exceeded US$ 1.7 trillion, with an annual growth of 3.5% since 2000 *(10)*. At the same time, emerging evidence on the cost of inaction and the cost-effectiveness of interventions highlights strong investment cases for brain health, as described in Chapter 2.

Neurological disorders represent the leading cause of ill health and disability globally

People living with neurological disorders and associated limitations in functioning and long-term disabilities continue to experience profound stigma, discrimination, and human rights violations. For example, institutional stigmatization – such as discriminatory legislation pertaining to education, employment, driving and marriage – may prevent people with epilepsy from fully participating in social and community life *(6)*. Beyond severe human rights infringements, stigmatization and discrimination also cause health loss by having a negative impact on peoples' abilities to seek, access, and receive quality health care. This diminishes their mental health and quality of life, and excludes them from equal societal participation (the "inclusion gap"). For example, insufficient knowledge of Parkinson disease and dementia can lead to delayed presentation to health facilities, misdiagnoses, or erroneous and stigmatizing assumptions – such as attribution to witchcraft, a contagious illness, "insanity" or a "normal" part of aging *(11, 12)*.

The intersectoral global action plan on epilepsy and other neurological disorders

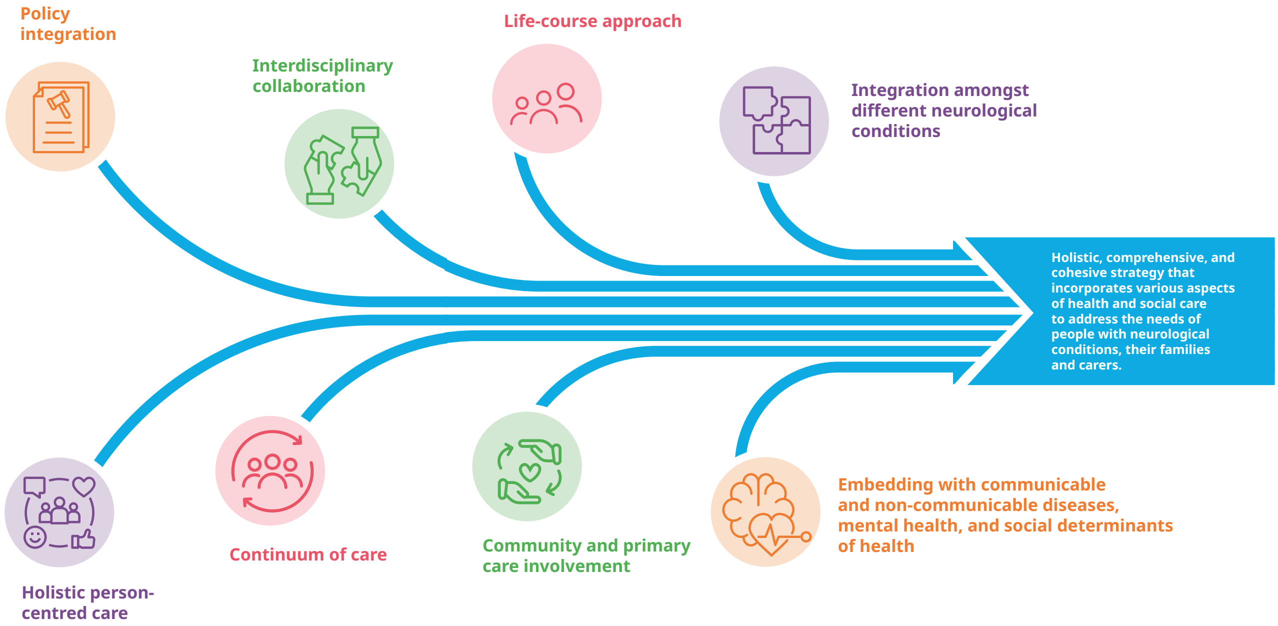
In response to the growing public health crisis associated with neurological disorders, the Seventy-fifth World Health Assembly adopted the World Health Organization (WHO)'s *Intersectoral global action plan on epilepsy and other neurological disorders 2022–2031* (herein referred to as IGAP) in May 2022 (Decision WHA75(11)) *(8, 13)*. IGAP represents a milestone for public health policy and marks an unprecedented opportunity to address the growing global neurological burden and to improve brain health across the life course. All WHO Member States have unanimously committed to "reduce the stigma, impact and burden of neurological disorders, including their associated mortality, morbidity and disability, and to improve the quality of life of people with neurological disorders, their carers and families" through a comprehensive, coordinated, and integrated public health response over a 10-year timeframe *(8)*.

Rather than adopting a disease-specific approach, IGAP uses an integrated, person-centred, human rights and life course approach for the promotion of brain health and the prevention, diagnosis, treatment and care of people with neurological disorders (Figure 1.1).

Figure 1.1

An integrated approach to neurological disorders

Adapted from *(14)*



The action plan has five strategic objectives, measured with 10 global targets, to be achieved by Member States by 2031 (Figure 1.2). While targets are defined globally, each Member State can be guided by these to set its own national targets, taking account of unique national circumstances, resources and challenges *(8)*.

Figure 1.2
IGAP at a glance

IGAP aims to improve access to diagnosis, treatment, care and rehabilitation for people living with neurological disorders, while promoting brain health and development across the life course and preventing new cases. It seeks to support the recovery, well-being and participation of people living with neurological conditions, while reducing associated mortality, morbidity and disability, promoting human rights, and addressing stigma and discrimination through interdisciplinary and intersectoral approaches.

THE VISION

The vision of IGAP is a world in which:

Brain health is valued, promoted and protected across the life course.

Neurological disorders are prevented, diagnosed and treated, and premature mortality and morbidity are avoided.

People affected by neurological disorders and their carers attain the highest possible level of health, with equal rights, opportunities, respect and autonomy.

THE GOAL

The goal of IGAP is to **reduce the stigma, impact, and burden** of neurological disorders, including their associated mortality, morbidity, and disability, and to **improve the quality of life** of people with neurological disorders, their carers and families.

THE SIX GUIDING PRINCIPLES

a People-centred primary health care (PHC) and universal health coverage (UHC)

b Integrated approach to care across the life course

c Evidence-informed policy and practice

d Intersectoral action

e Empowerment and involvement of persons with neurological disorders and their carers

f Gender, equity and human rights

FIVE STRATEGIC OBJECTIVES AND TEN GLOBAL TARGETS OF IGAP

1

Raise policy prioritization and strengthen governance

GLOBAL TARGET 1.1

75% of countries will have adapted or updated existing national policies, strategies, plans or frameworks to include neurological disorders by 2031.

GLOBAL TARGET 1.2

100% of countries will have at least one functioning awareness campaign or advocacy programme for neurological disorders by 2031.

2

Provide effective, timely and responsive diagnosis, treatment and care

GLOBAL TARGET 2.1

75% of countries will have included neurological disorders in the UHC benefits package by 2031.

GLOBAL TARGET 2.2

80% of countries will provide the essential medicines and basic technologies required to manage neurological disorders in primary care by 2031.

3

Implement strategies for promotion and prevention

GLOBAL TARGET 3.1

80% of countries will have at least one functioning intersectoral programme for brain health promotion and the prevention of neurological disorders across the life course by 2031.

GLOBAL TARGET 3.2

The global targets relevant for prevention of neurological disorders are achieved, as defined in:

1. the NCD-GAP;
2. Defeating meningitis by 2030: a global road map; and
3. Every newborn: an action plan to end preventable deaths.

4

Foster research and innovation and strengthen information systems

GLOBAL TARGET 4.1

80% of countries routinely collect and report on a core set of indicators for neurological disorders through their national health data and information systems at least every three years by 2031.

GLOBAL TARGET 4.2

The output of global research on neurological disorders doubles by 2031.

5

Strengthen the public health approach to epilepsy

GLOBAL TARGET 5.1

By 2031, countries will have increased service coverage for epilepsy by 50% from the current coverage in 2021.

GLOBAL TARGET 5.2

80% of countries will have developed or updated their legislation with a view to promoting and protecting the human rights of people with epilepsy by 2031.

Realizing the IGAP vision requires appropriate monitoring of the actions proposed to Member States, including mechanisms to track progress and ensure accountability towards achieving the action plan's 10 global targets. The *Global status report on neurology* seeks to capture the status quo of the global public health response to neurological disorders. Informed by aggregated country-level data on brain health and neurological disorders across the life course, this report aims to establish a global baseline for each IGAP target.

Rationale and aims of this report

WHO's Secretariat is expected to provide periodic updates to the World Health Assembly on the implementation status of IGAP. Accordingly, WHO has set up a monitoring mechanism to assess country progress towards achieving IGAP's strategic objectives and global targets by 2031. The IGAP survey, a global status monitoring questionnaire, was disseminated to WHO Member States. The aim was to collect baseline aggregated, national-level data pertaining to brain health and neurological disorders across the life course for the index year 2022. The IGAP survey covers critical areas relevant to neurological disorders, including governance and financing, service delivery, the health workforce, medicines, medical products and technologies, and research and information systems.

The *Global status report on neurology* presents and contextualizes the country-level findings of the IGAP survey to capture the status quo of the global public health response to neurological disorders. The report aims to:

- provide an aggregate baseline for IGAP's 10 global targets as a monitoring and accountability mechanism for Member States;
- identify gaps and derive evidence-informed, tailored and actionable priority recommendations supporting Member States with IGAP implementation; and
- prospectively, track Member States' progress towards achieving IGAP targets by 2031.

In establishing this global status monitoring mechanism, WHO also aims to support Member States and stimulate collaborative action towards the systematic integration of neurological disorders into national health information systems. This is in direct support of IGAP global target 4.1 (Routine collection and reporting on a core set of indicators for neurological disorders through national health data and information systems) *(8)*. Robust, standardized and easily accessible data are the basis for evidence-informed, effective planning and the establishment of targeted interventions. However, information systems for neurological disorders are often rudimentary or absent, especially in LMICs. The IGAP global status monitoring mechanism aims to support Member States to develop a strong data infrastructure that captures the epidemiological status quo and identifies critical gaps in service delivery. The purpose is to improve accessibility to and coordination of care for people with neurological disorders and to enable detection of population-level changes and trends. Additionally, this mechanism actively contributes to awareness-raising and policy prioritization of neurological disorders and brain health directives at the national level. The target audiences of the report are listed in Box 1.1.

Box 1.1

Target audiences of this report

The report is intended for use by policy-makers and stakeholders who are directly involved in the public health response to neurological disorders. The target audiences include:

- policy-makers and officials of national and subnational government sectors;
- programme managers and service planners in the health, social, education, economic, justice, environmental and other relevant sectors; and
- public health professionals and researchers working in national ministries, in subnational offices or at the district level.

The report is also aimed at partners who are critical in supporting IGAP implementation. These include:

- civil society organizations, including professional societies, advocacy groups, academic and research institutions, and other neurology community representatives;
- health and social care professionals involved in service delivery for neurological disorders;
- donors and funders of programmatic work;
- people with neurological conditions, their carers and families who are at the heart of IGAP because their meaningful engagement is essential to ensuring an inclusive and person-centred implementation process that is informed by lived experience.

Scope and contextualization with previous work

This report builds on previous work by WHO and partners to capture the global public health response to neurological disorders at country level – such as the gathering of comprehensive epidemiological data and essential information on the availability of neurological health policies, services and resources across the world. Relevant previous surveys, data collection efforts and associated technical products include: the periodic Global Burden of Disease (GBD) study *(1)*; WHO's Global Health Observatory; the 2017 *WHO Atlas: country resources for neurological disorders, second edition (3)*; the 2006 *Neurological Disorders: public health challenges (15)* report; and the 2020 pulse survey on *The impact of COVID-19 on mental, neurological and substance use services (16)*. Aimed at informing governments, public health institutions, nongovernmental organizations and other relevant stakeholders, these efforts have identified critical gaps, challenges and opportunities in global neurology. They have helped to formulate public health policy actions directed at improving the lives of people living with neurological disorders, their carers and families.

Following IGAP adoption, WHO launched complementary technical products – guidelines, disorder-specific technical series, and resources for an integrated approach to neurological disorders – to effectively support Member States in achieving the plan's global targets by 2031 (Box 1.2).

Box 1.2

WHO technical products supporting IGAP implementation

Relevant WHO guidelines:

- *Mental Health Gap Action Programme (mhGAP) guideline for mental, neurological and substance use disorders (17)* (updated in 2023).
- *Risk reduction of cognitive decline and dementia: WHO guidelines (18)* (update forthcoming).
- *WHO guidelines on meningitis diagnosis, treatment and care (19)*.

Relevant WHO technical and scientific briefs:

- *Improving the lives of people with epilepsy: a technical brief (6)*.
- *Parkinson disease: a public health approach: technical brief (11)*.
- *Encephalitis: global threats, trends and public health implications: a technical brief (20)*.
- *Neurology and COVID-19: scientific brief, 20 August 2024 (21)*.

Relevant WHO resources for an integrated approach to neurological disorders:

- *Optimizing brain health across the life course: WHO position paper (22)* provides a conceptual framework for what brain health is, its most important determinants and high-yield actions for brain health optimization.
- *WHO Guide for integration of perinatal mental health in maternal and child health services (23)* gives guidance for a step-by-step process of incorporating mental health services in maternal and child health services for better development of children and attention to caregivers' needs.
- *WHO UNAIDS: Integration of mental health and HIV interventions: key considerations (24)* advises on integrating mental health into HIV programming in order to improve medication adherence, treat comorbidities and diagnose neurological conditions.
- *WHO-UNICEF Global report on children with developmental disabilities (7)* provides principles and approaches for including the needs and aspirations of children and young people with developmental disabilities in policy, programming and public health monitoring.
- *IGAP Implementation toolkit (14)* is a practical resource to aid countries in planning their approach to neurological disorders aligned with IGAP in a concrete and practical way and to develop customized implementation plans.
- *Improving access to medicines for neurological disorders (25)* provides a systematic approach by which countries can identify and address key barriers that impede continuous access to high-quality medicines for people living with neurological disorders.

The *Global status report on neurology* complements and contextualizes these previous and ongoing IGAP implementation efforts and puts them into context. The report emphasizes an integrated approach to neurological disorders while aiming to capture the diverse presentation and broad range of neurological disorders across the life course. A pragmatic approach was taken when designing the monitoring mechanism in order to ensure that it can be implemented at country level and can generate appropriate response rates representing the majority of the world's population. In addition to reporting on the public health response to neurological conditions as a whole, Member States can report on six representative tracer conditions (i.e. epilepsy, headache disorders, meningitis, neurodevelopmental conditions, Parkinson disease, and stroke) with the option to provide data on other individual neurological conditions, as relevant. The report also includes relevant country spotlights and case studies aimed at covering a broad range of neurological conditions.

Notably, data related to dementia are collected through the Global Dementia Observatory (GDO) *(26)* which serves as the reporting mechanism for the *Global action plan on the public health response to dementia 2017–2025* *(27)*, which was recently extended to 2031 in line with the IGAP *(28)*. Progress towards this action plan is summarized in WHO's *Global status report on the public health response to dementia* *(29)*, and is therefore outside the scope of this report.

Methodology

This section summarizes the data sources and methods used in the development of this report. A Glossary of terms is provided in Annex 1, and the full methodology is detailed in Annex 2. The principal data sources for this report were:

a) WHO IGAP global status monitoring questionnaire (IGAP survey)

WHO collaborated closely across its three organizational levels – national, regional and global – to develop and disseminate the IGAP survey. This monitoring mechanism served to collect baseline aggregated, national-level data on core indicators from participating Member States for the index year 2022 for IGAP's 10 global targets. In addition, the IGAP survey contains a range of supplementary indicators to assess countries' wider policy, systems and research response to neurological disorders. The development and dissemination of the questionnaire – as well as associated data collection, analysis, clarification and reporting – are detailed in Annex 2.

b) Other centrally collected data

Data for IGAP global target 3.2 (Achieving the global targets relevant for prevention of neurological disorders, as defined in […]) were collected through central monitoring mechanisms for the indicators of selected global targets, as defined in these WHO mandates: *NCD-GAP* *(30)*, *Every newborn: an action plan to end preventable deaths* *(31)*, and *Defeating meningitis by 2030: a global road map* *(32)*. Data for IGAP global target 4.2 (The output of global research on neurological disorders doubles by 2031) were centrally collected via a comprehensive search strategy developed in collaboration with WHO's Library. The search strategy is provided in Annex 2.

c) Global Burden of Disease Study

Data from the Global Burden of Disease study of 2021 *(1)*, which quantified nervous system health loss for 37 unique conditions in 204 countries and territories, were used to inform sections of the report detailing the epidemiological situation for neurological disorders. These data were applied to UN World Population Prospects *(33)*.

d) Country spotlights/case studies

The country spotlights and case studies featured in this report were co-written with diverse external contributors and selected on the basis of: 1) their potential to illustrate good practice in one of the IGAP global targets; 2) their relevance to IGAP guiding principles and/or identified key messages; 3) representation across population (i.e. age, gender, neurological condition), income levels and geographical location; and 4) the existence of a formal impact evaluation of the good practice, whenever applicable.

e) Evidence synthesis from desk review

The narrative sections of this report were informed by relevant WHO technical products and previous reports, such as the 2017 *WHO Atlas: country resources for neurological disorders, second edition* *(3)* report. Additional sources of high relevance were identified through an iterative search of published systematic reviews, research studies and grey literature from electronic databases, snowballing (searching reference lists), and hand-searching in key journals and in WHO's publications library.

Additionally, the development of this report is underpinned by a multistakeholder approach that incorporates the following methodological elements:

WHO steering group

An internal steering group consisting of staff members from each of WHO's three organizational levels and relevant departments/units of the WHO secretariat was convened to inform the conceptualization, development and technical review of this report (see Annex 2).

Consultations with individuals with lived experience

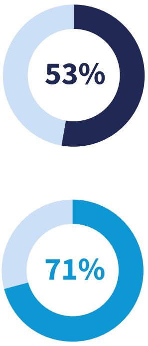
A number of written and online consultations were held during different stages of the report's development in order to capture the unique perspectives of people with neurological conditions, their carers, and families (see Annex 2). Participants highlighted key messages, priority actions, barriers, and opportunities for meaningful involvement of those with lived experience in pursuing each of IGAP's strategic objectives.

External contributors and peer reviewers

Over 70 external stakeholders from all WHO regions were involved in the data collection, analysis and reporting processes in order to provide, inter alia, feedback to the IGAP survey, country spotlights and case studies, and technical reviews and feedback on draft versions of this report.

Some limitations should be considered when interpreting this report (see Annex 2). Briefly, this initial wave of IGAP survey data collection carried out between 2023 and 2025 comprises self-reported data from a subset of Member States. Although the participating Member States represent a significant portion of the global population, the response rate is only 53% (102 of 194 Member States), with notable regional variations. To calculate baseline values for the IGAP global targets across all WHO Member States, non-responding countries were classified as giving negative responses, which may lead to an underestimation of the actual baseline values. Data in tables and graphs may not add up to the total number of participating countries because not all provided complete information for every indicator in the IGAP survey.

Participating Member States



102 of WHO’s 194 Member States = 71% of the world’s population

WHO and its Member States have made considerable efforts to gather information on indicators for the *Global status report on neurology* – including in relation to policy and law, financing, workforce and services, promotion and prevention, and research and information systems for neurological disorders and brain health. In total, the 102 of WHO’s 194 Member States (53%), comprising 71% of the world’s population, were able to at least partially complete the IGAP survey. Submission rates exceeded 50% in most WHO regions, except for the Western Pacific Region (30%) and South-East Asia Region (36%) (Table 1.1). Of note, the estimates for Indonesia were included in the WHO South-East Asia Region. In accordance with resolution WHA78.25 (2025), Indonesia was reassigned to the WHO Western Pacific Region as of 27 May 2025. The breakdown of submission rates by World Bank income groups illustrates participation rates greater than 44% for all income categories and 54% or more for upper-middle-income and high-income countries (Table 1.1). Participating Member States are shown in Figure 1.3, with a full country list available in Annex 3.

Factors affecting country submission rates include limited capacity within national ministries of health to support comprehensive data collection and reporting on neurological disorders, which are often not treated as a separate workstream but covered by other areas of competence such as mental health or noncommunicable diseases (NCDs). Additionally, a lack of dependable or readily available data for IGAP survey core indicators may lead to data gaps, delays, or non-submission. These challenges underscore the critical need to strengthen countries’ reporting capacity for neurological disorders, including by ensuring their integration into national health information systems, as further discussed in Chapter 6. Given the global scope of this first reporting cycle, which engaged all 194 WHO Member States, country sensitization to the IGAP survey is expected to improve readiness and submission rates in future cycles. WHO will continue to facilitate the reporting on this global mandate through targeted technical support, regional and national capacity-building workshops, and enhancements to survey design and dissemination.

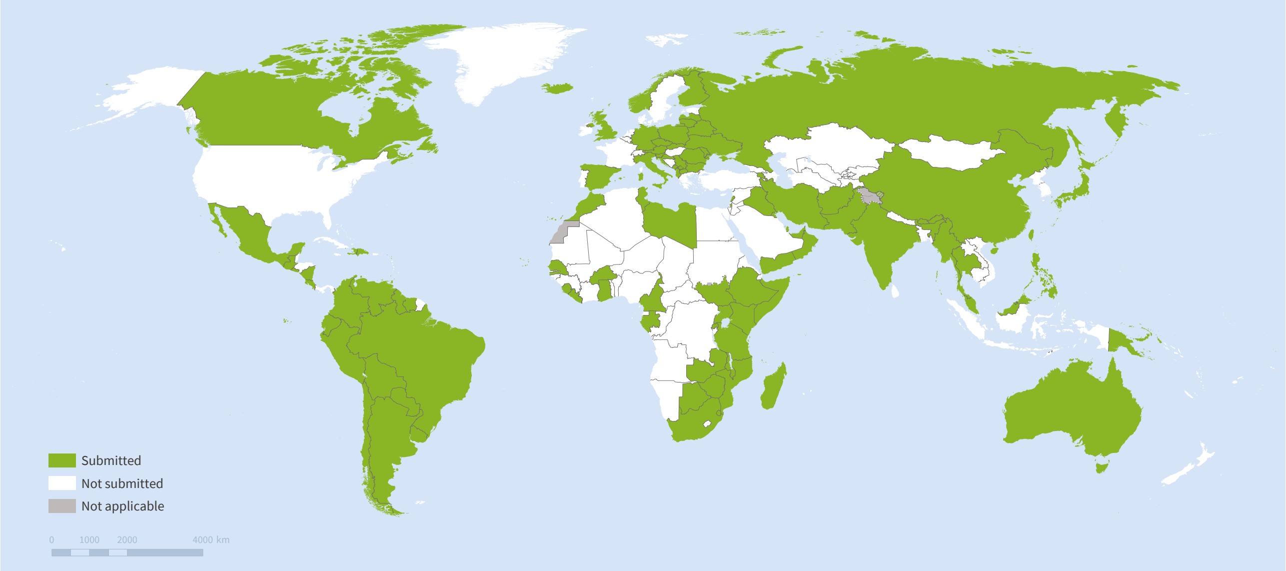
Table 1.1

Overview of participating Member States, by WHO region and World Bank income group

	n (participating countries)	n (missing countries)	N (WHO Member States)	% of WHO Member States represented	% of population represented (in 2022)
Global	**102**	**92**	**194**	**53%**	**71%**
WHO region					
African Region	24	23	47	51%	52%
Region of the Americas	23	12	35	66%	64%
South-East Asia Region	4	7	11	36%	75%
European Region	28	25	53	53%	63%
Eastern Mediterranean Region	15	6	21	71%	70%
Western Pacific Region	8	19	27	30%	90%
World Bank income group					
Low-income	13	13	26	50%	58%
Lower-middle-income	22	28	50	44%	72%
Upper-middle-income	30	22	52	58%	83%
High-income	35	28	63	55%	54%
No classification	2	1	3	67%	n/a

Figure 1.3

Geographical coverage of participating Member States (green, n=102)



A health care provider standing by the patient's bedside, studying the images of a brain scan. India, 2006. © WHO / Rajiv Kumar

Chapter 2

Global burden of neurological disorders

KEY MESSAGES

- In 2021, 3.4 billion people across WHO Member States (42% of global population) experienced health loss due to neurological disorders, making this group of conditions the leading cause of ill health and disability worldwide. Over 80% of health loss associated with neurological disorders occur in LMICs, where access to diagnosis, treatment, care and rehabilitation services remains limited.
- The top 10 neurological conditions contributing to loss of health in 2021 were: stroke, neonatal encephalopathy, migraine, Alzheimer disease and other dementias, diabetic neuropathy, meningitis, idiopathic epilepsy, neurological complications associated with preterm birth, autism spectrum disorders and nervous system cancers.
- Neurological disorders can develop at any time during the life course; many of them are chronic – with the need for treatment, support and care throughout life. While males are generally at a higher risk of developing neurological conditions than females, some conditions – such as migraine, multiple sclerosis and dementia – disproportionately affect females.
- The global economic burden of neurological disorders, including direct and indirect costs, is substantial. Collecting robust economic data is complex; however, such data are vital for countries to inform cost-effective policies, efficient resource allocation, and sustainable health planning and financing.
- Emerging investment case evidence highlights that pragmatic, scalable and cost-effective prevention strategies and interventions for neurological disorders are available and can generate substantial long-term economic and societal gains for countries.

Attributable and avertable epidemiological burden of neurological disorders

Neurological disorders represent a significant and growing burden on health globally. The chapter draws on 2021 data from the Global Burden of Disease, Injuries and Risk Factor Study and a recent collaboration with the Institute for Health Metrics and Evaluation to quantify nervous system health loss globally *(1, 2)*. The chapter outlines the morbidity and mortality associated with 37 conditions that affect the nervous system across WHO regions and World Bank income levels and that are stratified by age and sex, where relevant.

The figures presented in this chapter are derived from age-, sex- and cause-specific estimates of prevalence, years lived with disability, years of life lost, and disability-adjusted life years (DALYs) as published in 2021 *(1, 2)* that subsequently have been applied to the United Nations World Population Prospects for 2021 *(33)*. While the 37 conditions covered are not an exhaustive list of conditions that cause nervous system health loss, they represent the largest set of such conditions to date – reflecting the life course and both primary neurological disorders and neurological consequences of other congenital, neonatal, metabolic, or infectious diseases. Some conditions (e.g. poliomyelitis) that cause nervous system damage could not be reflected because they are not quantified in the GBD or because the neurological component of their overall health loss could not be isolated. The latter category includes genetic conditions such as adrenoleukodystrophy and infections such as HIV or tuberculosis, as well as secondary CNS cancers (i.e. metastases, which are coded under their primary cancers and thus could not be quantified separately). These conditions have large effects in many parts of the world and should be explicitly estimated in the future. A general limitation common to all GBD studies is the limited availability of reliable epidemiological data in many countries, particularly in LMICs, thus necessitating predictive approaches and data from neighbouring countries to inform country estimates *(1)*. For a full list of conditions included in the global estimates see Table 2.1.

Table 2.1

List of 37 conditions contributing to neurological health loss

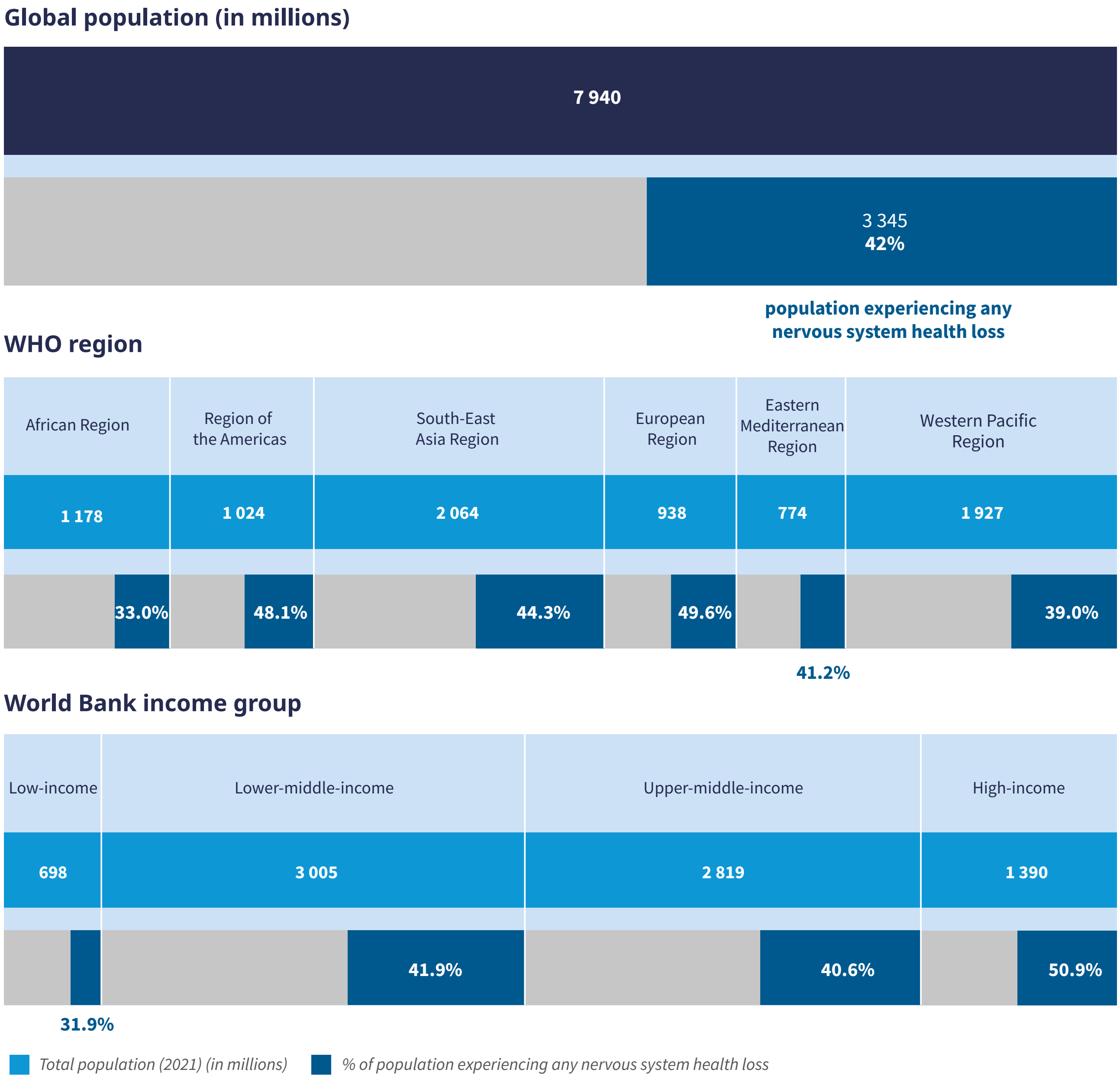
- **Alzheimer disease and other dementias**
- **Attention-deficit/hyperactivity disorder**
- **Autism spectrum disorders**
- **Cerebral malaria**
- **Cognitive impairment or Guillain-Barré syndrome due to COVID-19**
- **Congenital and adult neurosyphilis**
- **Diabetic neuropathy**
- **Encephalitis**
- **Epilepsy (idiopathic)**
- **Epilepsy due to echinococcosis**
- **Fetal alcohol syndrome**
- **Guillain-Barré syndrome (GBS)**
- **Idiopathic developmental intellectual disability**
- **Meningitis**
- **Migraine**
- **Motor neuron disease**
- **Multiple sclerosis**
- **Neonatal encephalopathy**
- **Nervous system cancers (CNS; neuroblastoma and other peripheral nervous cell tumours; the category includes paediatric and adult primary cases, and excluded metastases)**
- **Neural tube defects**
- **Neurocysticercosis**
- **Neurological complications due to:**
  - Congenital birth defects
  - Congenital Zika virus syndrome
  - Down syndrome
  - Klinefelter syndrome
  - Other chromosomal abnormalities
  - Neonatal jaundice
  - Neonatal sepsis
  - Preterm birth
- **Other neurological disorders (including degenerative diseases, disorders of the autonomic nervous system, movement disorders, spinocerebellar disease, nerve root and plexus disorders, peripheral nerve disorders, neuromuscular disorders and muscle diseases such as myopathies)**
- **Parkinson disease**
- **Rabies**
- **Spinal cord injury**
- **Stroke (ischaemic stroke, subarachnoid haemorrhage, intracerebral haemorrhage)**
- **Tension-type headache**
- **Tetanus**
- **Traumatic brain injury**

In 2021, approximately 3.4 billion people (42% of the global population) across WHO Member States experienced health loss due to neurological disorders, with over 80% of the people living in LMICs (Figure 2.1). Together, the 37 neurological conditions caused 11.8 million deaths, 162 million years lived with disability and 272 million years of life lost globally. These figures are conservative estimates, since not all types of neurological disorders could be included. Additionally, the diagnostic gaps for many neurological disorders, such as dementia, remain substantial – particularly in LMICs *(29)* – potentially resulting in an underestimation of the true disease burden.

> 3.4 billion people across WHO Member States experienced health loss due to neurological disorders in 2021 - over 80% of them living in LMICs

Figure 2.1

Total number of people experiencing any health loss due to neurological disorders in 2021



Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.
Source: Adapted from GBD2021 with adjustment using UN World Population Prospects.

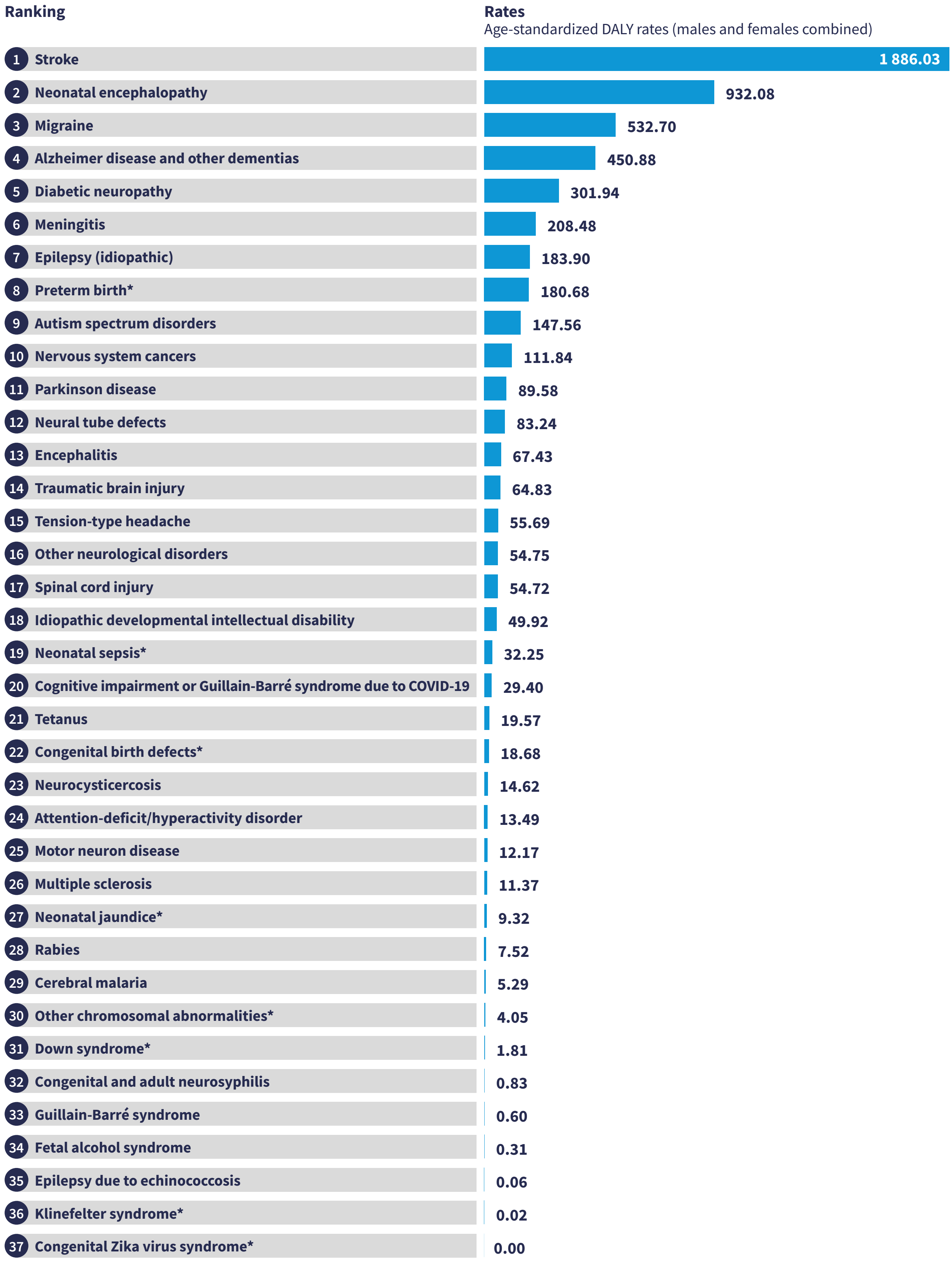
At over 435 million DALYs, the health loss associated with neurological disorders is spread unequally across the world.

The 10 neurological conditions that globally contributed most to age-standardized nervous system health loss among WHO Member States were: stroke, neonatal encephalopathy, migraine, Alzheimer disease and other dementias, diabetic neuropathy, meningitis, idiopathic epilepsy, neurological complications associated with preterm birth, autism spectrum disorders and nervous system cancers. Neurological disorders affect males and females differently (Figure 2.2, Figure 2.3, Box 2.1).

A patient receiving a diabetic neuropathy test at the medical camp at a health care provider's clinic in Mumbai. India, 2019. © WHO / Panos / Atul Loke

Figure 2.2

Rank of age-standardized DALY rates for 37 neurological conditions per 100 000 people (2021)

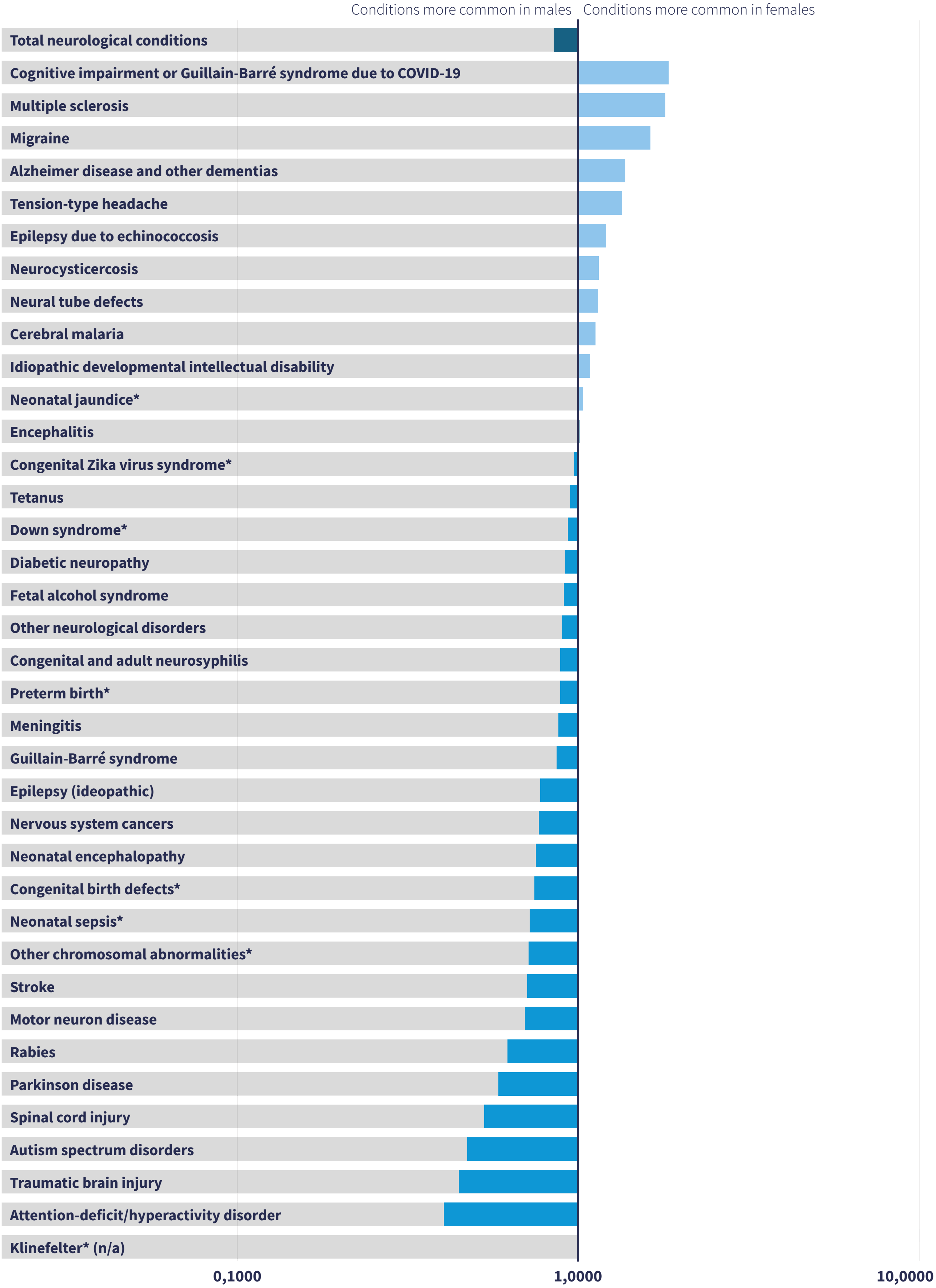


* Neurological complications associated with those conditions.

Source: Adapted from GBD2021 with adjustment using UN World Population Prospects.

Figure 2.3

Female:male ratio of age-standardized DALYs (log scale to the base of 10) (2021)



* Neurological complications associated with those conditions.

Source: Adapted from GBD2021 with adjustment using UN World Population Prospects.

Box 2.1

Neurological disorders: understanding sex and gender perspectives

Sex differences play a crucial role in the prevalence and impact of neurological disorders. The GBD 2021 analysis reveals that certain neurological disorders exhibit significant variations between men and women. For instance, migraine and multiple sclerosis are more prevalent in females, while Parkinson disease and stroke show higher prevalence in males. These differences may be variously attributed to biological factors, hormonal influences and different risk exposures. Understanding these sex-specific variations is essential for developing targeted prevention and treatment strategies that address the unique needs of both sexes.

Inequities exist in clinical research, where female participants are under-represented and limited information is available about the differential effect of interventions and therapies on women, particularly pregnant and breastfeeding women. Health-care workers also may lack awareness of the sex- and gender-specific risks and manifestations of neurological disorders. There is significant imbalance in the caregiver burden, too. Women disproportionately serve as informal caregivers, placing them more at risk of carer strain, loss of productivity, widening pension gaps and consequently at greater risk for old-age poverty.

To address these inequities, it is necessary to raise awareness of sex/gender-specific differences and inequities; to promote equity in research, training and service provision; to provide effective carer training and support; and to ensure social and financial protections.

Different conditions drive neurological health loss in different age groups (Table 2.2, Figure 2.4, Figure 2.5).

Table 2.2

Age-standardized DALY rates for 37 neurological conditions by age group per 100 000 people (2021)

Condition	Under 5 years	5 to 19 years	20 to 59 years	60 to 79 years	80+ years
Alzheimer disease and other dementias	0.0	0.0	44.2	1 504.2	13 047.1
Attention-deficit/hyperactivity disorder	2.4	28.3	10.7	1.0	0.0
Autism spectrum disorders	169.1	161.4	146.2	112.9	59.5
Cerebral malaria	2.8	8.8	5.0	0.8	0.0
Cognitive impairment or Guillain-Barré syndrome due to COVID-19	8.6	15.4	40.1	32.6	30.0
Congenital and adult neurosyphilis	0.7	1.1	0.8	0.6	0.4
Congenital birth defects*	27.2	20.5	17.4	13.1	10.0
Congenital Zika virus syndrome*	0.0	0.0	0.0	0.0	0.0
Diabetic neuropathy	0.0	1.5	260.5	1 397.3	1 493.5
Down syndrome*	3.2	3.0	1.3	0.1	0.0
Encephalitis	270.6	49.6	34.9	63.8	89.6
Epilepsy (idiopathic)	211.5	185.1	174.0	176.9	268.5
Epilepsy due to echinococcosis	0.0	0.0	0.1	0.1	0.0
Fetal alcohol syndrome	0.4	0.4	0.3	0.1	0.1
Guillain-Barré syndrome	0.4	0.5	0.6	1.2	1.4
Idiopathic developmental intellectual disability	68.3	70.4	43.1	17.1	9.8
Klinefelter syndrome*	0.1	0.0	0.0	0.0	0.0
Meningitis	1 234.9	130.4	72.4	69.8	84.1
Migraine	0.0	380.0	750.8	451.6	238.3
Motor neuron disease	6.2	1.3	8.7	57.3	48.2
Multiple sclerosis	0.0	0.5	15.1	31.8	24.4
Neonatal encephalopathy	8 316.7	64.9	55.4	25.8	2.1
Neonatal jaundice*	13.2	11.6	8.7	3.9	0.4
Neonatal sepsis*	42.3	39.5	31.3	13.5	0.6
Nervous system cancers	94.9	60.2	106.6	280.0	208.8
Neural tube defects	722.6	17.0	4.5	1.6	1.3
Neurocysticercosis	0.8	1.6	16.1	45.7	65.4
Other chromosomal abnormalities*	12.2	5.8	2.3	0.4	0.0
Other neurological disorders	44.6	60.2	41.8	94.7	157.8
Parkinson disease	0.0	0.0	16.2	430.7	1 773.2
Preterm birth*	264.9	234.3	165.7	56.0	14.1
Rabies	12.8	12.3	4.9	3.9	1.6
Spinal cord injury	3.2	17.6	74.7	103.2	83.0
Stroke	147.5	72.9	1 126.1	8 490.9	20 336.1
Tension-type headache	0.0	29.7	77.5	75.4	49.4
Tetanus	120.5	7.8	7.5	8.2	4.2
Traumatic brain injury	3.9	11.8	77.5	176.5	226.3
Total neurological conditions	11 806.6	1 705.4	3 443.1	13 742.8	38 329.3

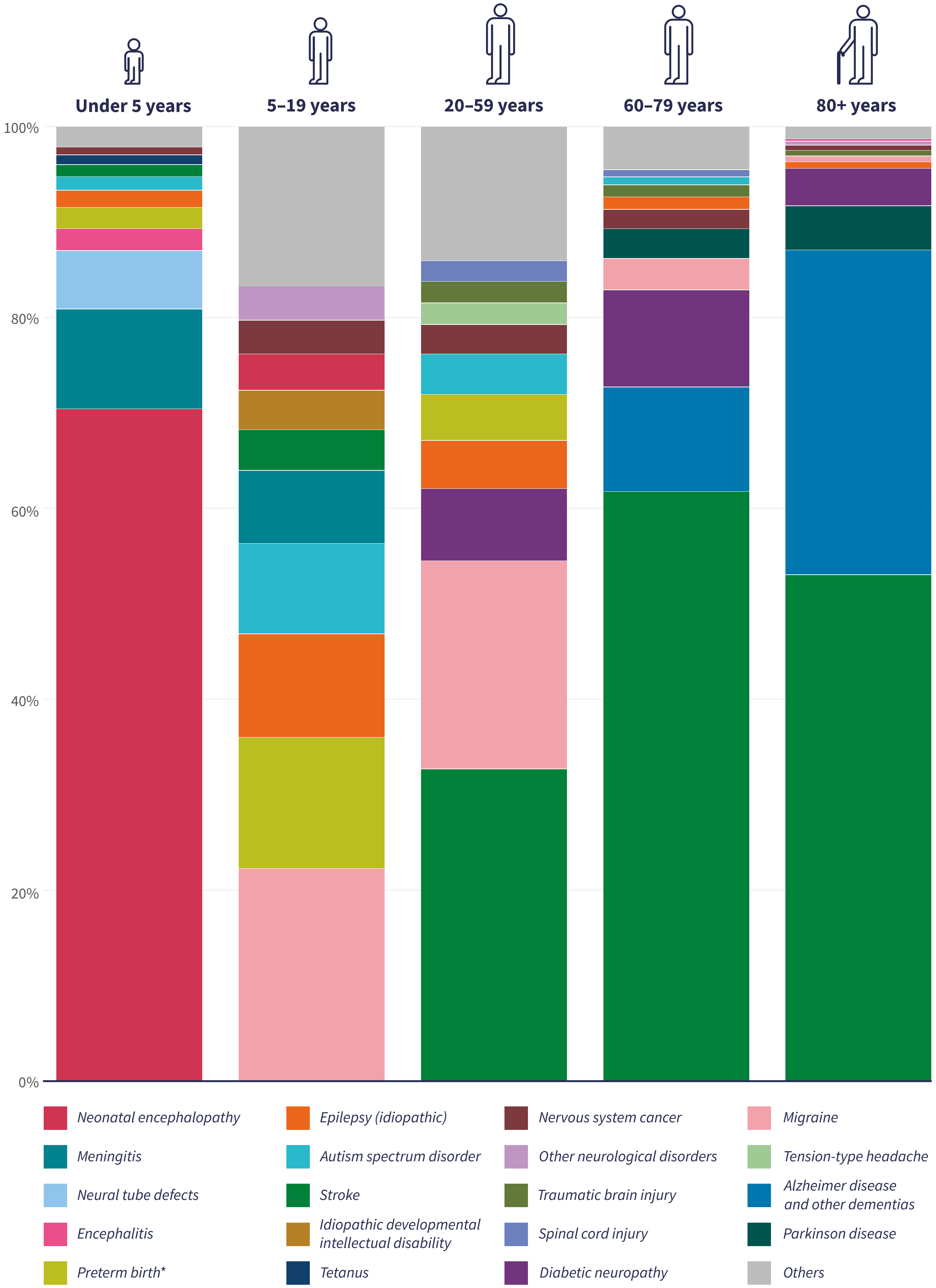
*Neurological complications associated with the conditions.

Values are rounded to 1 decimal. Due to rounding, values for some rare conditions are shown as 0.0, but the actual values are higher than 0.0.

Source: Adapted from GBD2021 with adjustment using UN World Population Prospects.

Figure 2.4

Accumulated age-standardized DALYs (2021)

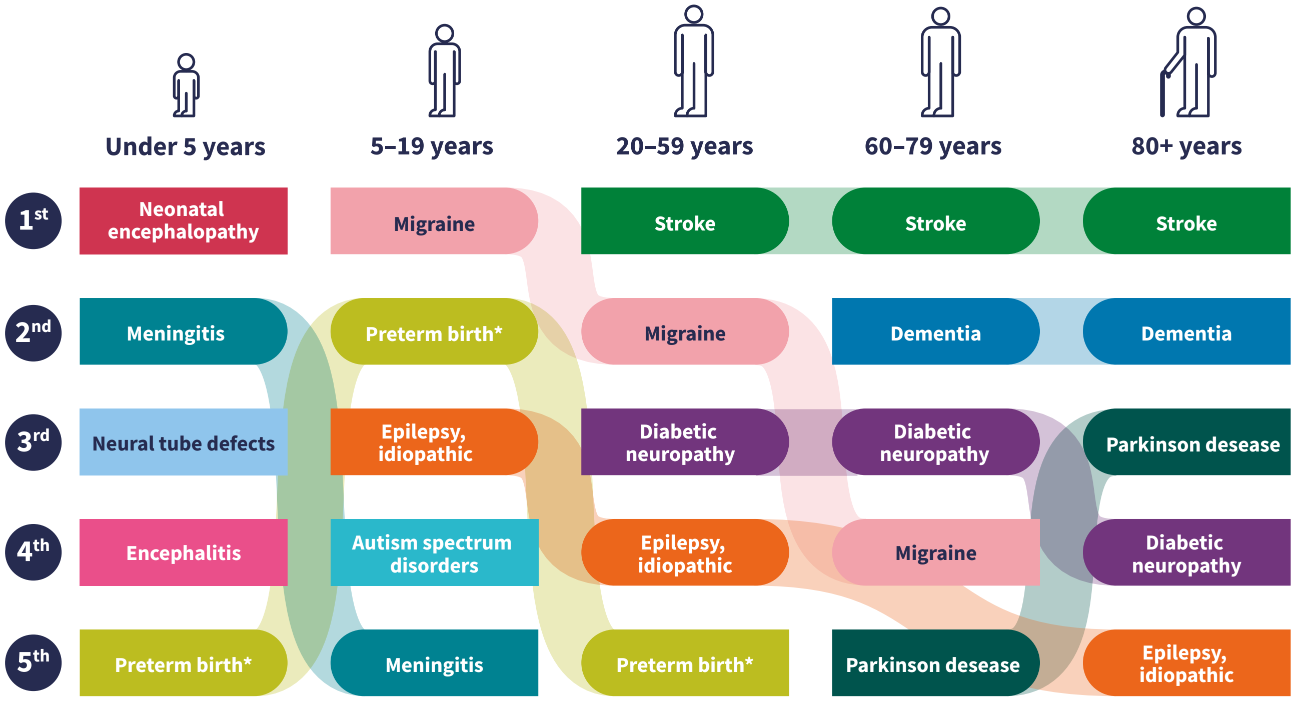


*Neurological complications associated with those conditions.

Source: Adapted from GBD2021 with adjustment using UN World Population Prospects.

Figure 2.5

Top 5 neurological conditions by age group (2021)



	Under 5 years	5–19 years	20–59 years	60–79 years	80+ years
1st	Neonatal encephalopathy	Migraine	Stroke	Stroke	Stroke
2nd	Meningitis	Preterm birth*	Migraine	Dementia	Dementia
3rd	Neural tube defects	Epilepsy, idiopathic	Diabetic neuropathy	Diabetic neuropathy	Parkinson desease
4th	Encephalitis	Autism spectrum disorders	Epilepsy, idiopathic	Migraine	Diabetic neuropathy
5th	Preterm birth*	Meningitis	Preterm birth*	Parkinson desease	Epilepsy, idiopathic

*Rankings are isolated to disease DALYs due to neurological complications, as opposed to DALYs attributed to the entire condition.
Source: Adapted from GBD2021 with adjustment using UN World Population Prospects.

While some neurological disorders are rare, they are usually chronic, progressive and can be associated with substantial morbidity and mortality (Box 2.2). To account for rare neurological conditions in national public health response mechanisms is paramount in order to ensure an integrated, equitable, human rights and life course approach to neurology and brain health, aligned with the IGAP guiding principles.

Box 2.2

Rare neurological conditions: leaving no one behind

Rare and orphan diseases refer to conditions affecting small numbers of people. They include diseases of genetic origin, infrequent forms of cancer, autoimmune diseases, toxic and/or infectious diseases, and congenital deformities *(34)* Although no universally agreed prevalence threshold defines a rare disease, recent estimates suggest that these conditions affect between 3.5–5.9% (or 263–446 million people) globally at any point in time *(35).*

Almost half of rare diseases are neurological or have neurological consequences *(36)*, and many start in childhood. Rare neurological conditions are mainly genetic but can also be post-infectious, iatrogenic or of unknown etiology. They can affect the brain, spinal cord or peripheral nervous system with symptoms ranging from mild tremors to significant motor and cognitive impairments. Although these conditions are rare, they are usually chronic, progressive can be associated with substantial morbidity and mortality.

The management of rare diseases, including rare neurological conditions, poses unique challenges. These include complex and specialized care needs, limited research, scattered patient support groups, and insufficient clinical expertise for timely and effective diagnosis and treatment. Another significant concern is the high cost of care and medicines/health products for many rare diseases, which may be deprioritized in UHC benefits packages and thus excluded from public procurement and reimbursement *(34).* For example, gene therapy for spinal muscular atrophy is priced in the millions of US dollars, limiting access to a few high-income countries *(34).* These geographical inequities are exacerbated by large treatment gaps, neurological workforce shortages, under-representation in clinical research, and catastrophic out-of-pocket expenditures encountered in most low- and middle-income countries.

At the Seventy-eighth World Health Assembly in May 2025, WHO Member States adopted a landmark resolution declaring rare diseases a global health priority and providing a mandate for WHO to develop a comprehensive 10-year global action plan on rare diseases *(37, 38).* This commitment also reaffirms WHO's ongoing work in the area, which includes advocating for policies that prioritize research, diagnosis, and treatment of rare diseases as well as supporting dissemination of best practices, research findings, data and resources for the management of such diseases. For example, WHO is collaborating with Rare Diseases International to shape international policy and strengthen the capacity of health systems. Activities focus on harmonizing the way in which rare diseases are defined internationally and on laying the groundwork for a global network of centres of excellence for rare diseases *(34).* WHO also works with Member States to integrate rare diseases into national health strategies in order to ensure that individuals with these conditions receive appropriate attention and resources, including improved access to the necessary medicines, therapies and rehabilitation services. WHO recognizes the importance of a participatory and patient-centred approach in health care, promoting ways to ensure that individuals with rare diseases, and their carers and families, are involved in decision-making processes.

Attributable and avertable economic burden of neurological disorders

Neurological disorders are associated with enormous global societal costs. This economic burden includes direct medical costs incurred by the healthcare system, social (nonmedical) costs such as long-term care services, and indirect costs from informal caregiving and productivity losses. Collecting robust data on the economic implications, resource use and epidemiological trends for neurological disorders is vital to public policy design, health planning and financing *(29)*. This enables decision-makers and budget holders to conduct a cost–benefit analysis and assess the expected return on investment of policies and interventions. This analysis can inform national strategies on brain health promotion and the prevention, treatment, care and rehabilitation of neurological disorders.

> "Neurological disorders are associated with enormous global societal costs."

The global cost of neurological disorders

Estimating the global cost of neurological disorders across society is complex. There is a paucity of population-level epidemiological data and accurate cost information on national health expenditures in many world regions, particularly in LMICs. Baseline costs may be significantly underestimated in countries that lack clinical registries or data collection infrastructure for neurological disorders, and where limited workforce capacity results in large diagnostic gaps. The costs of these mostly chronic and long-term conditions may occur consistently across the life course and extend beyond the tightly defined realm of the health-care system. Adopting a longitudinal and societal perspective of costs is therefore paramount to capture accurately the economic burden associated with these conditions. People with neurological disorders have elevated demands for informal caregiving (e.g. from carers and families) and experience productivity losses (e.g. absenteeism, early retirement, premature mortality) but such economic consequences are inherently more challenging to measure accurately *(29)*.

Despite these constraints, several analyses on the cost of neurological disorders have been conducted. A recent worldwide study by the Institute for Health Metrics and Evaluation estimated that global direct costs in 2019 for 24 brain disorders (including mental and neurological conditions) exceeded US$ 1.7 trillion, growing 3.5% annually since 2000 *(10)*. Spending on care for neurological disorders accounted for 52% of this cost, with stroke and dementia accounting for over 30% of total global costs. This amount is equivalent to 1.6% of global GDP and does not account for the indirect costs of brain disorders such as reduced productivity, lost income and the provision of informal care. Other studies have conducted economic analyses in specific regions and countries, primarily in high-income contexts, as well as estimates of the global cost of specific neurological conditions. While further research is needed for a more comprehensive and accurate understanding, the existing literature points to substantial and increasing economic losses from neurological ill-health. For instance, the combined cost of brain (including mental and neurological) disorders in 30 European countries neared €800 billion in 2010, 40% of which was attributed to indirect costs from productivity losses *(39)*. In the United States of America, the annual cost of nine common neurological disorders alone was estimated at nearly US$ 800 billion (adjusted to 2014 US$ values) *(40)*. Global analyses on the economic cost of specific neurological conditions suggest comparably high figures. For instance, the global costs of dementia exceeded US$ 1.3 trillion in 2019, with over half of these costs were attributable to informal caregiving *(29)*. The global economic burden of stroke neared US$ 900 billion in 2017, with a projected increase to US$ 2.3 trillion by 2050 *(41)*. For traumatic brain injury, the global cost was estimated at US$ 400 billion in 2017 *(42)*.

While cost-of-illness studies can provide useful estimates of the economic burden attributable to neurological disorders, research that quantifies the avertable economic burden is equally crucial for guiding policy and financial planning. As such, studies that model the cost of inaction on modifiable risk factors and/or assess the cost-effectiveness of interventions are essential for building strong investment cases for neurological disorders.

The cost of inaction

Some studies have estimated the cost of inaction on modifiable risk factors for major NCDs, including preventable neurological disorders. For instance, the cost of inaction on physical inactivity could result in 500 million new cases of major NCDs (including dementia and stroke) globally by 2030, with estimated direct medical costs of INT$ 520 billion *(43)*. Another study modelling the impact of insufficient sleep as a risk factor for negative health and social outcomes, on the economies of five Organisation for Economic Co-operation and Development (OECD) countries estimated an annual productivity loss of up to US$ 680 billion *(44)*. Additionally, persistent sex and gender inequities contribute to the growing economic burden. Under-representation of female participants in neuroscience research and clinical trials may diminish effective prevention and service delivery for neurological disorders, resulting in additional economic losses *(45)*. As most informal caregivers are women, they often face greater risks of economic hardship, pension gaps and old-age poverty *(46, 47)*. These findings indicate both humanitarian and economic rationales for the strengthening of equitable national health promotion and prevention strategies, including through interventions targeting major social determinants of brain health and cardinal risk factors for neurological disorders.

The value of action

Data from relevant investment cases suggest robust economic productivity gains from scaling-up the global response to neurological disorders *(48, 49)*. For example, every US$ 1 invested in the prevention of stroke and cardiovascular disease could translate to a more than US$ 10 return on investment *(41, 48)*. A 2022 multi-country study analysing the return on investment of scaling up the prevention of 10 neurological disorders across 11 countries to adequate levels by 2030 could save up to US$ 2.4 trillion *(41)*. Another 2023 multi-country study on the return on investment of scaling up the delivery of an evidence-based package of mental health interventions for common mental, neurological and substance use conditions in seven LMICs showed that investment costs are low and economic returns substantial. For instance, for epilepsy the benefit–cost ratios were in the range of 1.3–9.7 to 1 for productivity gains alone, and between 3.3–24.3 to 1 when the intrinsic social value of restored health was also considered *(50)*. For meningitis prevention and control, recent WHO estimates suggest that ensuring full implementation of the Defeating meningitis by 2030 global road map would require an estimated US$ 440 million investment (between 2024 and 2030) but translate to US$ 66.8–71.3 billion in economic benefits over the working life course of people whose life will be saved (i.e. based on 920 000 deaths gradually averted by 2030) (see Box 2.3 for further details) *(49)*.

> "Data from relevant investment cases suggest robust economic productivity gains from scaling-up the global response to neurological disorders."

WHO has developed a guidance note to support countries with taking a structured approach to building national investment cases for mental health, including mental, neurological and substance use conditions *(51)*, and has published findings from relevant investment cases conducted in several LMICs across WHO regions (Box 2.4). Additionally, a 2018 policy brief by WHO's European Regional Office outlines a set of cost-saving and cost-effective actions to promote health and prevent disease. These actions include interventions targeting shared modifiable risk factors (e.g. smoking, alcohol use, physical inactivity, unhealthy diets) and the broader determinants of brain health (e.g. road safety, fall prevention, early childhood development) *(52)*. Prioritizing such research, including economic evaluations of cost-effectiveness and local implementation feasibility of interventions, is essential for countries. Its results are key to developing evidence-informed, scalable, and sustainable policies and programmes for brain health and neurological disorders.

Box 2.3

Investing to defeat meningitis and beyond

Meningitis remains a major global public-health challenge, causing epidemics across the world, particularly in sub-Saharan Africa *(49)*. As per WHO Global Health Estimates, it ranks among the top 10 neurological conditions in terms of DALYs, accounting for 15.3 million DALYs in 2021. A deadly and debilitating disease, meningitis can affect people of any age, with serious health, economic and social consequences. Bacterial meningitis in particular has a high case fatality rate and leaves 1 in 5 survivors with lifelong disability *(53)*.

While much of this global burden is vaccine-preventable, progress in defeating meningitis is lagging behind. In 2020, 194 WHO Member States unanimously endorsed WHO's global road map Defeating meningitis by 2030 *(32)*, committing to three visionary goals: to: 1) eliminate bacterial meningitis epidemics; 2) reduce vaccine-preventable bacterial meningitis cases by 50% and deaths by 70%; and 3) reduce disability and improve quality of life after meningitis of any cause.

The technical document *Investing to defeat meningitis and beyond* *(49)* outlines the financing needs for fully implementing the road map, categorized to maximize the effect of every dollar invested. A catalytic investment of US$ 130 million over three years is needed to jumpstart priority research activities, national strategy and policy development, and implementation across all six WHO regions. A further US$ 310 million of scaling-up investment is required to achieve full road map implementation *(49)*.

Gradual implementation of the road map will generate enormous health, social and economic benefits. By 2030, 2.75 million cases of meningitis, 780 000 cases of long-lasting sequelae and 920 000 deaths could be prevented, with a predicted health-care saving of US$ 3.8–10.0 billion and economic benefits of US$ 86.0–100.4 billion through increased workforce participation and productivity *(49)*. Foreseeable impacts will extend beyond meningitis to reduce other conditions such as pneumonia and sepsis, strengthen primary health care systems and promote equity and global development, thus contributing to the achievement of several United Nations Sustainable Development Goals (SDGs) *(49)*.

Box 2.4

WHO resources to accelerate action for investment in mental, neurological and substance use conditions

WHO guidance:

- *Mental health investment case: a guidance note* (2021) *(51)*.

WHO policy brief:

- *Using economic evidence to help make the case for investing in health promotion and disease prevention* (2018) *(52)*.

WHO-supported national investment cases:

- *Prevention and management of mental health conditions in the Philippines: the case for investment* (2021) *(54)*.
- *Prevention and management of mental health conditions in Uzbekistan: the case for investment* (2021) *(55)*.
- *Prevention and management of mental health conditions in Zimbabwe. The case for investment* (2022) *(56)*.
- *Kenya mental health investment case* (2021) *(57)*.

An occupational therapist working to facilitate and improve motor control and hand function in the stroke-affected upper limb of an adult patient. Armenia, 2022.
© WHO / Nazik Armenakyan

A health worker using a megaphone as part of a national vaccination campaign in Namibe Province. Angola, 2024. © WHO / João Carlos Domingos

Chapter 3

Policy, advocacy and health system financing

> **"There is no health without brain health. How much a country invests in brain health will determine their future."**
>
> – Berrie Holtzhausen, Namibia

KEY MESSAGES

- At baseline, only one third of WHO Member States (n=63/194) report the inclusion of neurological disorders within their policies, strategies, plans or frameworks (IGAP global target 1.1), either as stand-alone instruments or integrated into other relevant health agendas.
- Among 63 countries with existing policies, around two thirds reported dedicated financial/human resources (65%) and monitoring mechanisms (65%) and just over half reported involving people with lived experience (52%). All of these are key components for operationalizing policies and sustaining priority interventions for neurological disorders.
- At baseline, less than one fourth of WHO Member States (n=46/194) report the existence of at least one minimally functional national awareness campaign or advocacy programme (IGAP global target 1.2). These instruments are essential for policy prioritization but often lack dedicated financial resources, implementation plans, and/or monitoring and evaluation frameworks, thus diminishing their functionality, effectiveness and sustainability.
- Health-financing gaps remain large: nearly two thirds of responding countries (63%) report no dedicated funding allocated to neurological disorders and brain health. Out-of-pocket health expenditures for access to care and essential medicines remain unacceptably high, particularly in lower-middle-income and low-income countries.
- The development and implementation of dedicated, context-specific and intersectoral policies on neurological disorders must be significantly stepped up from current levels to adequately address the escalating global neurological burden. These efforts should be supported by well-coordinated, adequately financed advocacy and awareness-raising strategies.
- Countries need to establish sustainable health-financing mechanisms to reduce out-of-pocket costs and ensure equitable access to essential neurological care and medicines for all.

Context

Attention to policies, advocacy and health system financing are integral to a comprehensive intersectoral public health response to neurological disorders. However, structural, financial and social barriers in many parts of the world, particularly in LMICs, impede policy prioritization and effective prevention, treatment and care of neurological disorders. This diminishes health outcomes and the quality of life of affected individuals, their carers and families *(8, 58, 59)*. Insufficient knowledge and awareness of brain health at all levels of society are major causes of delay in seeking health care, creating barriers to accessing neurological treatment and essential medicines, and increasing stigma, discrimination, and human rights violations *(6, 8)*. Health-care systems that are fragmented and take traditional siloed approaches to individual neurological conditions constitute additional challenges.

Strong governmental leadership and oversight are pivotal to addressing these challenges. Countries' principal roles involve: 1) coordination of national advocacy and awareness measures; 2) evidence-informed, context-specific policy development and implementation; 3) strengthening of legislation; and 4) appropriate resource allocation, including sustainable financing and provision of financial and social protection mechanisms for neurological disorders and brain health.

Policies for neurological disorders

Government inclusion of neurological disorders in national policies, plans, and updated legislation signals a clear political commitment, expedites resource allocation, elevates public awareness, and offers unique opportunities to accelerate IGAP's 10 global targets *(59)*. The process of developing or updating such policies enables countries to take stock of existing structures, services and resources, (including identification of unmet population needs, critical gaps and systemic inefficiencies), and to devise evidence-informed strategies to strengthen the public health response to neurological disorders. Policies can be developed either as stand-alone plans/strategies/frameworks and/or can be integrated into relevant existing health agendas, such as those related to NCDs, communicable diseases, mental health, maternal, child and adolescent health, disability and aging, or other public policy directives *(8)*. They should be evidence-informed, intersectoral, human rights-based, actionable and context-specific and should target the most pressing population needs.

Advocacy and awareness-raising

Effective public health awareness-raising campaigns and advocacy programmes can transform public attitudes towards neurological disorders, enabling better promotive, preventive and care services. Advocacy and awareness-raising are interdependent and mutually reinforcing concepts that are essential for mobilizing stakeholders. Advocacy seeks to change policy, practice and attitudes through evidence, arguments and accountability. It is a powerful tool for awareness-raising, securing political commitment, mobilizing resources, and catalysing policy and/or legislative changes that transform public health needs into political action. Awareness-raising seeks to enhance public and political understanding of brain health and neurological disorders, including by sensitizing society to the needs of people with lived experience. This entails: 1) providing essential and accurate information; 2) dispelling myths, falsehoods, and misinformation; 3) reducing multi-level stigma and discrimination; and 4) promoting and protecting the human rights of people with neurological disorders, including vulnerable groups. Effective awareness measures, including mass media campaigns, that meaningfully involve people with lived experience can have a positive impact on public attitudes and health-related behaviours across large populations *(60)*.

Effectively scaling and sustaining national awareness and advocacy measures requires comprehensive implementation plans with robust monitoring and evaluation frameworks in order to understand their long-term impacts and cost-effectiveness. This has been evidenced in public health campaigns on HIV-testing *(61)*, mental health-related stigma *(62, 63)*, cancer awareness *(64)*, and antimicrobial use behaviours *(65)*.

Health system financing

Health-system financing drives progress towards UHC and is integral to improved service coverage and financial protection for individuals with neurological disorders, their carers and families. Neurological ill-health results in enormous costs for governments, communities, families and individuals, compounded by US$ trillions of annual economic productivity losses *(41, 42, 66, 67)*, as noted in Chapter 2. Evidence suggests that appropriate investment by governments into effective surveillance, prevention, early detection, treatment, and rehabilitation of neurological disorders could largely avert these staggering costs and yield substantial long-term returns on investment *(41, 45, 49, 66, 68)*. Previous reports have identified that the financial and human resources allocated towards neurological programmes and services are grossly insufficient relative to the vast neurological burden, particularly in LMICs *(3)*. This budgetary mismatch causes substantial health loss and financial hardship for many households, especially in countries lacking UHC benefits packages for neurological disorders. Catastrophic out-of-pocket health expenditures remain a major concern, especially in lower-income countries, where out-of-pocket spending still accounts for 40% of total health expenditures *(69)*. Neurological conditions are often chronic, requiring recurrent long-term treatment and follow-up care. However, financial protection measures and policies in many LMICs are primarily designed to protect against high unexpected costs (such as those from hospitalization) rather than ongoing service costs from chronic conditions *(69)*. Thus, many households face recurrent out-of-pocket spending on outpatient care – and particularly medicines. Coupled with lost income due to disability and informal caregiving, this prolonged financial strain can perpetuate a “poverty-disability cycle” for affected individuals, their families and carers *(69)*.

Findings

This section reports on the key findings associated with the action areas included under IGAP's *Strategic objective 1: Raise policy prioritization and strengthen governance*, and its two global targets:

Global target 1.1

75% of countries will have adapted or updated existing national policies, strategies, plans or frameworks to include neurological disorders by 2031.

Global target 1.2

100% of countries will have at least one functioning awareness campaign or advocacy programme for neurological disorders by 2031.

Inclusion of neurological disorders in national policies

IGAP indicates (in its global target 1.1) the need for countries to adapt or update existing national policies, strategies, plans or frameworks in order to include neurological disorders, whether as stand-alone instruments or integrated into other policies such as those for NCDs, mental health, ageing, communicable diseases, or maternal and child health.

The umbrella term "dedicated policy" is used in this report to denote any existing operational national policy, strategy, plan or framework that has been adapted or updated to address or include neurological disorders. The IGAP survey captures a baseline to track progress towards this target, defined by countries reporting either a verifiable stand-alone national policy on neurological disorders or the integration of neurological disorders into another relevant policy.

At baseline, 63 countries (62% of responding countries, equivalent to 32% of WHO Member States) meet global target 1.1 by reporting that they have at least one stand-alone or integrated policy for neurological disorders that could be verified (Table 3.1). Reported rates of WHO Member States meeting this global target ranged from 22% in the Western Pacific Region to 43% in the African Region, with rates exceeding 30% across all World Bank income groups.

The functionality of national policies was determined on the basis of three criteria, namely: 1) dedicated financial and human resources to implement the policy; 2) a mechanism to monitor the policy; and 3) engagement and involvement of people with lived experience in the process. Over half of responding countries (54%) reported having a verifiable stand-alone or integrated policy meeting at least one functionality criterion while only 17% reported a policy meeting all three criteria (Annex 4, Table A3.1). Reported minimum policy functionality rates (at least one criterion met) across WHO regions ranged between 27% in the Eastern Mediterranean Region and 100% in the South-East Asia Region, exceeding 50% across all World Bank income groups. Full policy functionality (i.e. all criteria met) was more commonly reported in higher-resource settings (upper-middle-income and high-income countries) (Annex 4, Table A3.1).

Table 3.1

IGAP global target 1.1: Dedicated policies for neurological disorders (2022)

	Countries with at least one dedicated policy	Percentage of responding countries	Percentage of WHO Member States
Global (n=102)	**63**	**62%**	**32%**
WHO region			
African Region (n=24)	20	83%	43%
Region of the Americas (n=23)	8	35%	23%
South-East Asia Region (n=4)	4	100%	36%
European Region (n=28)	18	64%	34%
Eastern Mediterranean Region (n=15)	7	47%	33%
Western Pacific Region (n=8)	6	75%	22%
World Bank income group			
Low-income (n=13)	10	77%	38%
Lower-middle-income (n=22)	15	68%	30%
Upper-middle-income (n=30)	16	53%	31%
High-income (n=35)	21	60%	33%

Note: Numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

The majority of the 63 responding countries with verifiable dedicated policies on neurological disorders integrated these disorders into other existing policies (n=47; 46% of responding countries), while the remainder (n=16; 16% of responding countries) had stand-alone neurological and/or brain health policies (Figure 3.1). There were notable regional differences among responding countries: integrated policies were most common in the South-East Asia Region (100%) and African Region (83%), whereas stand-alone policies were more prevalent in the Western Pacific Region (38%), European Region (25%), and the Region of the Americas (22%) (Figure 3.1). Additionally, the share of stand-alone policies increased with income levels (0% in low-income versus 31% in high-income countries), while integrated policies decreased (77% in low-income versus 29% in high-income countries) (Figure 3.2).

Figure 3.1

Existence of dedicated policies for neurological disorders (% of responding countries), by WHO region (2022)

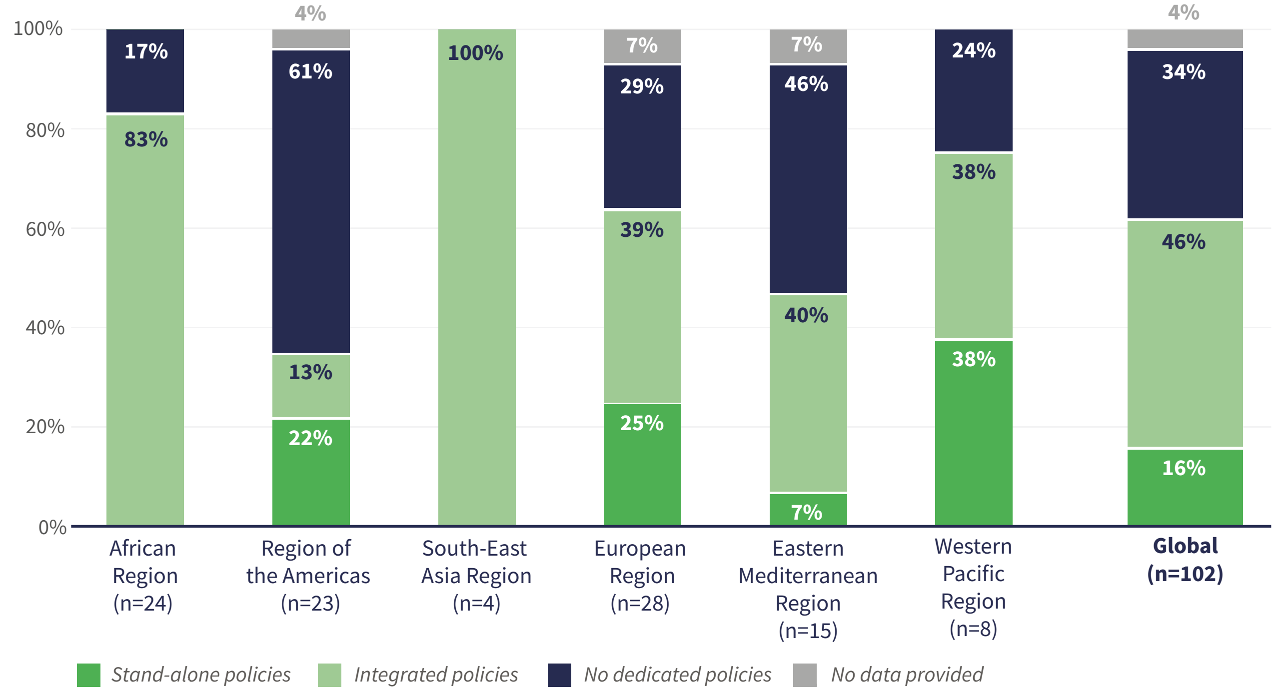
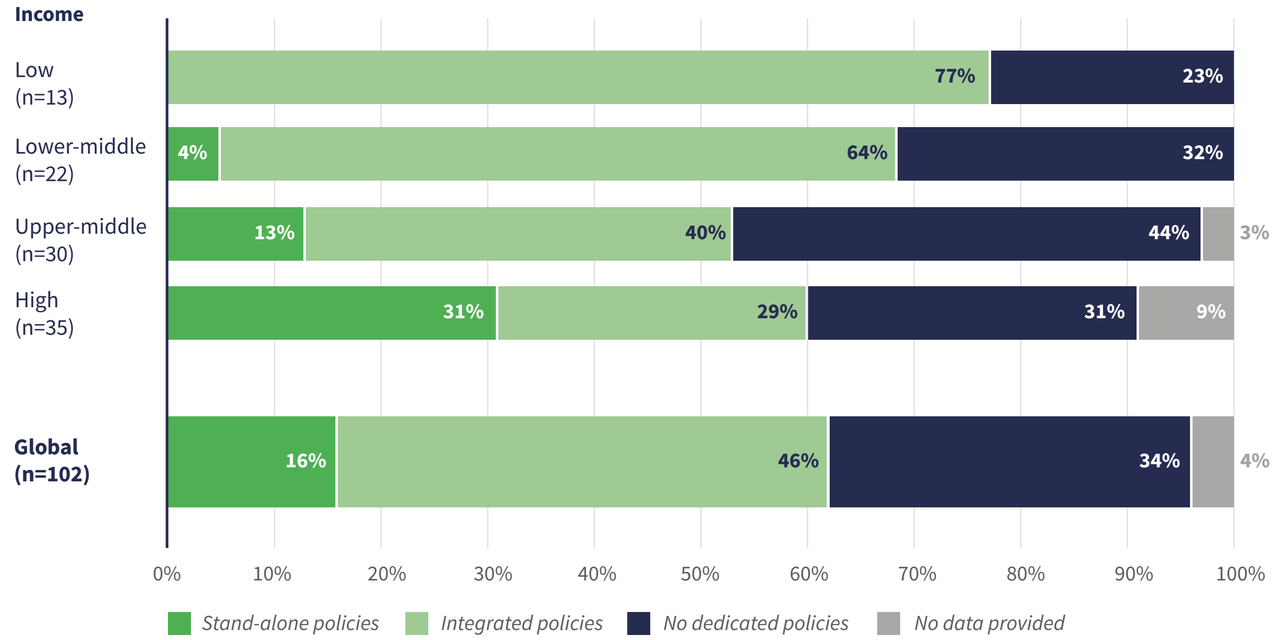


Figure 3.2

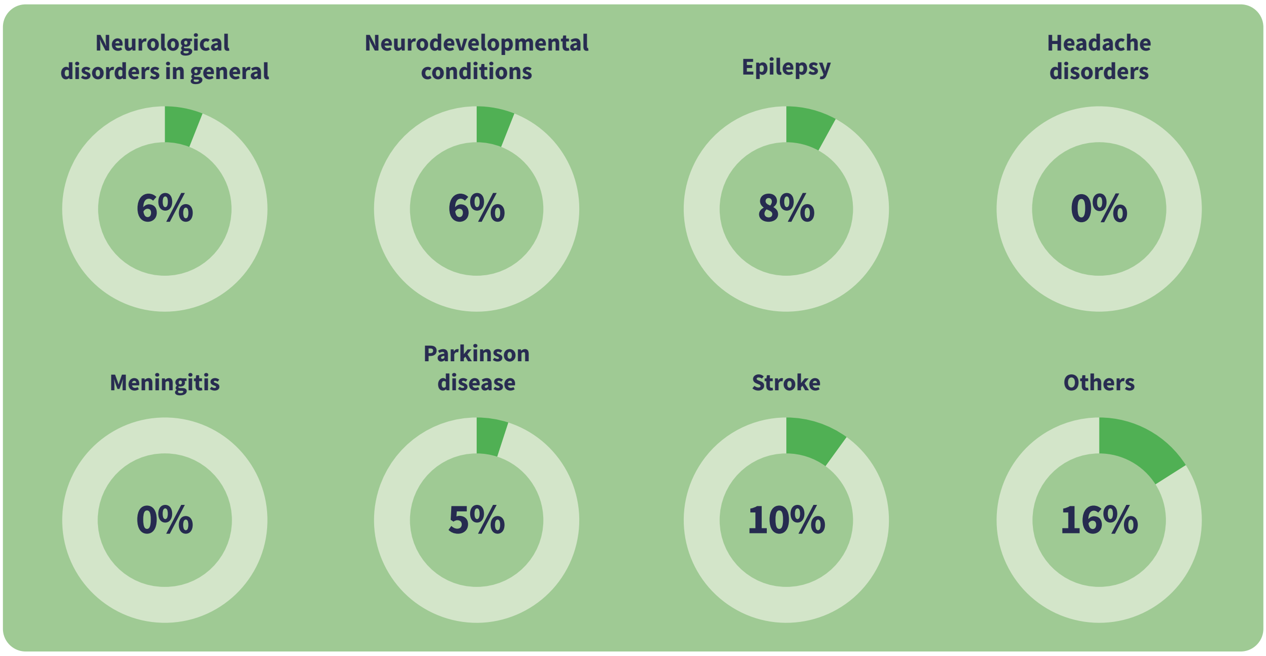
Existence of dedicated policies for neurological disorders (% of responding countries), by World Bank income group (2022)



Across the six IGAP tracer conditions, countries' stand-alone policies included stroke (n=6) and epilepsy (n=5), followed by neurodevelopmental conditions (n=4) and Parkinson disease (n=3). None were specifically related to headache disorders or meningitis (Figure 3.3). Additionally, four countries reported stand-alone policies related to neurological disorders in general (see Annex 4, Table A3.2 for a breakdown by WHO region and World Bank income group).

Figure 3.3

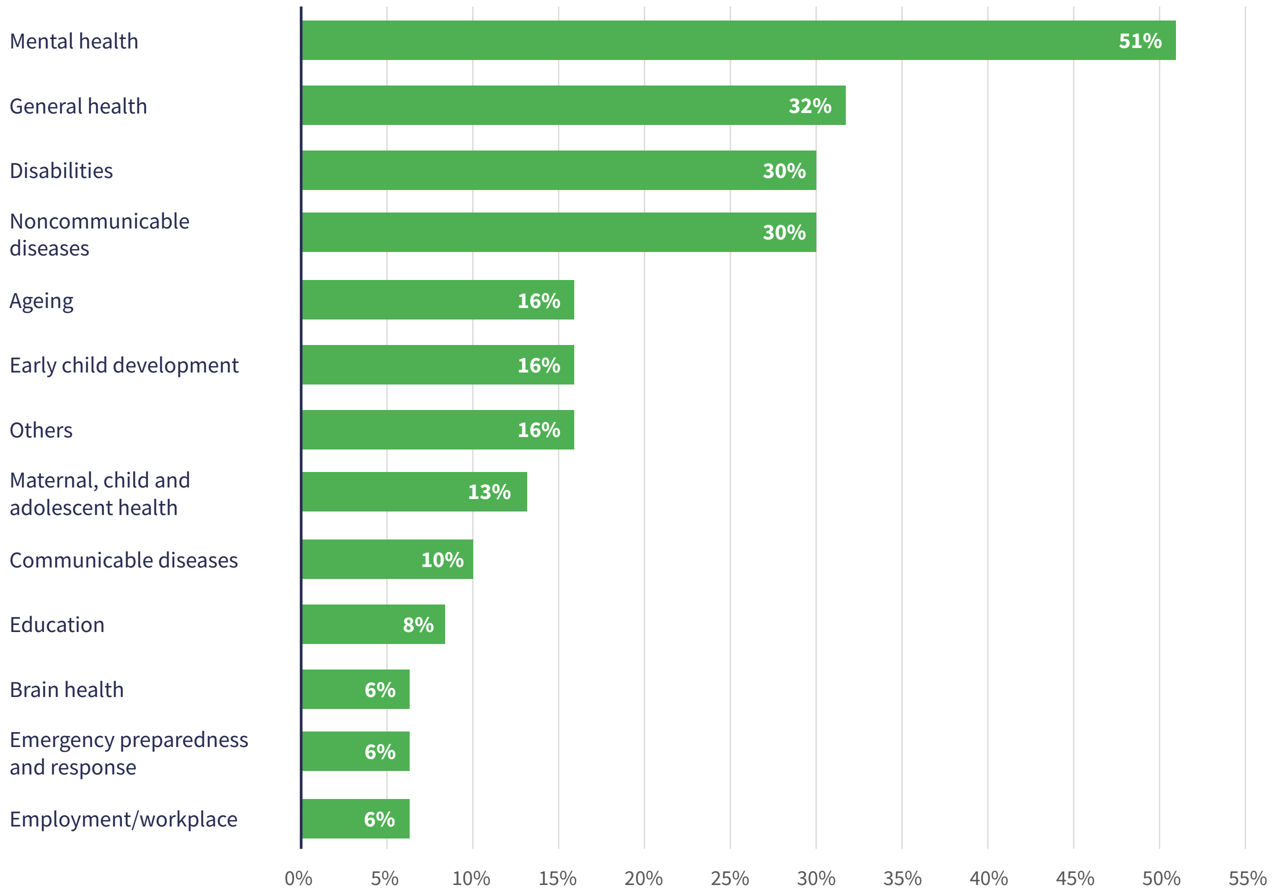
Distribution of stand-alone policies for selected neurological disorders (% of countries with dedicated policies, n=63) (2022)



Among countries that reported integration of neurological disorders into other existing policies, these disorders were most commonly integrated into policies on mental health (n=32 countries), general health (n=20), NCDs and disabilities (n=19 each) (Figure 3.4). Few countries reported such integration into existing policies on brain health, emergency preparedness/response or employment (n=4 each).

Figure 3.4

Integration of neurological disorders into other policies (% of countries with dedicated policies, n=63) (2022)



Of the 63 responding countries with dedicated policies on neurological disorders, approximately two thirds (65%; n=41) allocated dedicated financial and human resources for policy implementation, with a similar proportion stating that their polices were monitored (Figure 3.5). Just over half (52%; n=33) stated that people with neurological disorders and their informal carers were routinely involved in decision-making related to policy development and implementation. Globally, the mean functionality rating of policies – measured via a composite functionality score across the three criteria (financial/human resources, monitoring, involvement of people with lived experience) – was 1.9 out of 3. There was substantial geographical variation in policy functionality scores. The average score was above two thirds in all WHO regions except for the Eastern Mediterranean Region and African Region, where scores were substantially lower (1.2 and 1.5, respectively) (Annex 4, Table A3.3). Additionally, average functionality scores were higher among upper-middle-income and high-income countries compared to lower-middle-income and low-income countries (Figure 3.5).

Figure 3.5

Functionality of dedicated policies (% of countries with dedicated policies, n=63), by World Bank income group (2022)

Existence of functioning awareness campaigns

IGAP indicates (in its global target 1.2) the need for countries to have at least one functioning awareness campaign or advocacy programme for neurological disorders and/or brain health. IGAP recommends that countries engage all relevant stakeholders – including people with neurological disorders, their carers and families – to develop functioning national awareness-raising programmes and intersectoral advocacy strategies.

To establish a baseline for this global target, the IGAP survey captured whether countries have a functional national awareness campaign or advocacy programme. Campaign/programme functionality was determined based on three criteria: 1) dedicated financial/human resources; 2) a defined implementation plan; and 3) evidence of progress and/or impact (e.g. via a monitoring and evaluation plan). Meeting at least one criterion was considered minimally functional (functionality score 1 of 3), while meeting all three criteria was considered fully functional (functionality score 3 of 3).

In total, 61 countries (60% of responding countries) reported having implemented at least one national awareness campaign or advocacy programme for brain health and/or one or more neurological disorders during the past year. However, with regard to functionality assessment, only 46 countries (45% of responding countries, 24% of WHO Member States) met global target 1.2 by reporting that their awareness campaign or advocacy programme was at least minimally functional (Table 3.2). Reported rates of WHO Member States meeting this global target exceeded 20% in all WHO regions except the Eastern Mediterranean Region (14%) and Western Pacific Region (15%). Rates increased with income group levels, with high-income countries twice as likely to meet the target (30%) compared to low-income countries (15%). Notably, only 17 countries (17% of responding countries, 9% of WHO Member States) were found to have implemented at least one national campaign/programme over the past year that was fully functional (i.e. meeting all three criteria) (Annex 4, Table A3.4).

Table 3.2

IGAP global target 1.2: Functioning awareness campaigns / advocacy programmes for brain health and/or neurological disorders (2022)

	Countries with at least one minimally functioning campaign/ programme	Percentage of responding countries	Percentage of WHO Member States
Global (n=102)	**46**	**45%**	**24%**
WHO region			
African Region (n=24)	11	46%	23%
Region of the Americas (n=23)	9	39%	26%
South-East Asia Region (n=4)	3	75%	27%
European Region (n=28)	16	57%	30%
Eastern Mediterranean Region (n=15)	3	20%	14%
Western Pacific Region (n=8)	4	50%	15%
World Bank income group			
Low-income (n=13)	4	31%	15%
Lower-middle-income (n=22)	8	36%	16%
Upper-middle-income (n=30)	14	47%	27%
High-income (n=35)	19	54%	30%

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Rates of responding countries stating they had implemented any awareness campaign or advocacy programme (regardless of functionality) exceeded 50% in all regions except the Region of the Americas (44%), increasing with income group level (Figures 3.6 and 3.7). Of the 61 responding countries with existing campaigns/programmes, over half stated that these covered epilepsy (n=36) or stroke (n=35), followed by brain health (n=27) and/or neurological disorders in general (n=24). Fewer addressed neurodevelopmental conditions, Parkinson disease, headache disorders, or meningitis (Figure 3.8). Among responding countries, stroke campaigns/programmes were more commonly run by high-income countries (43%) while campaigns/ programmes on epilepsy were more frequently encountered in lower-middle-income and low-income countries (range 39% – 46%) (Annex 4, Table A3.5).

Figure 3.6

Existence of at least one awareness-raising campaign or advocacy programme (% of responding countries), by WHO region (2022)

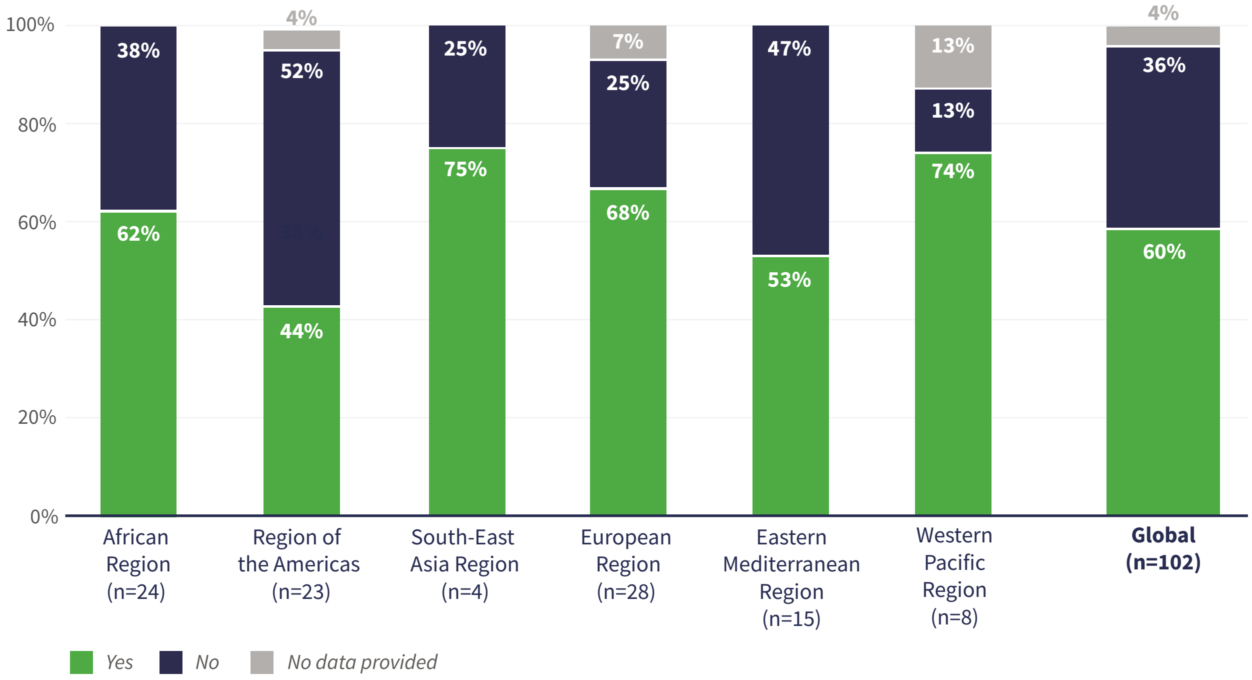


Figure 3.7

Existence of at least one awareness-raising campaign or advocacy programme (% of responding countries), by World Bank income group (2022)

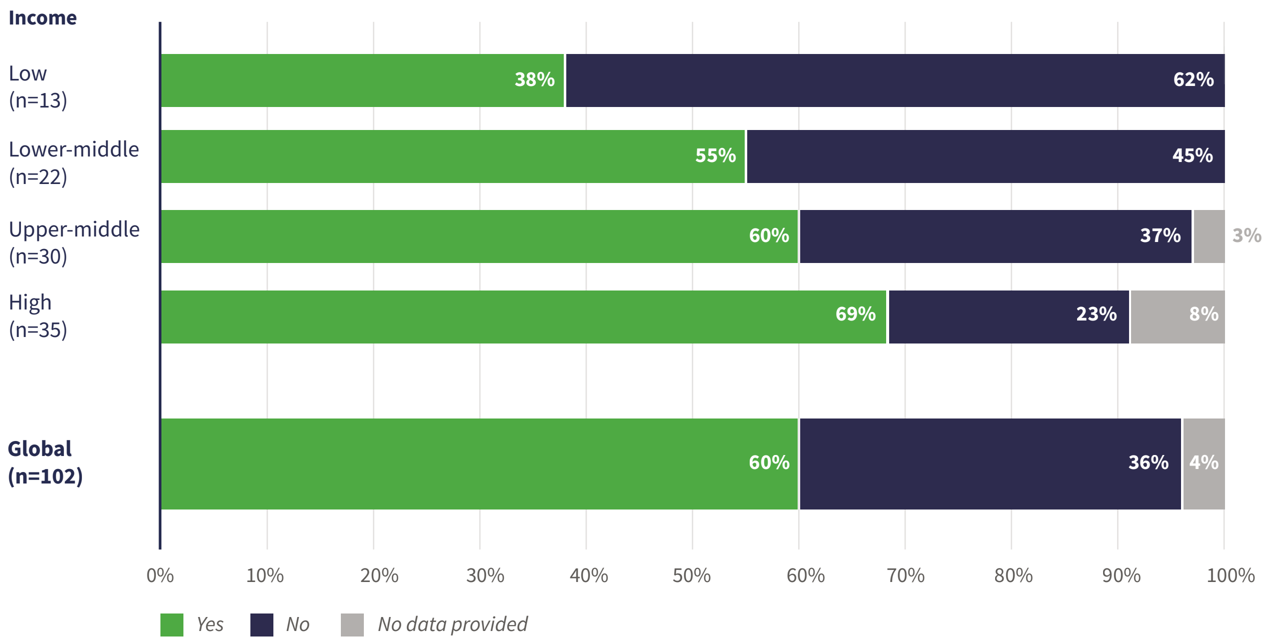
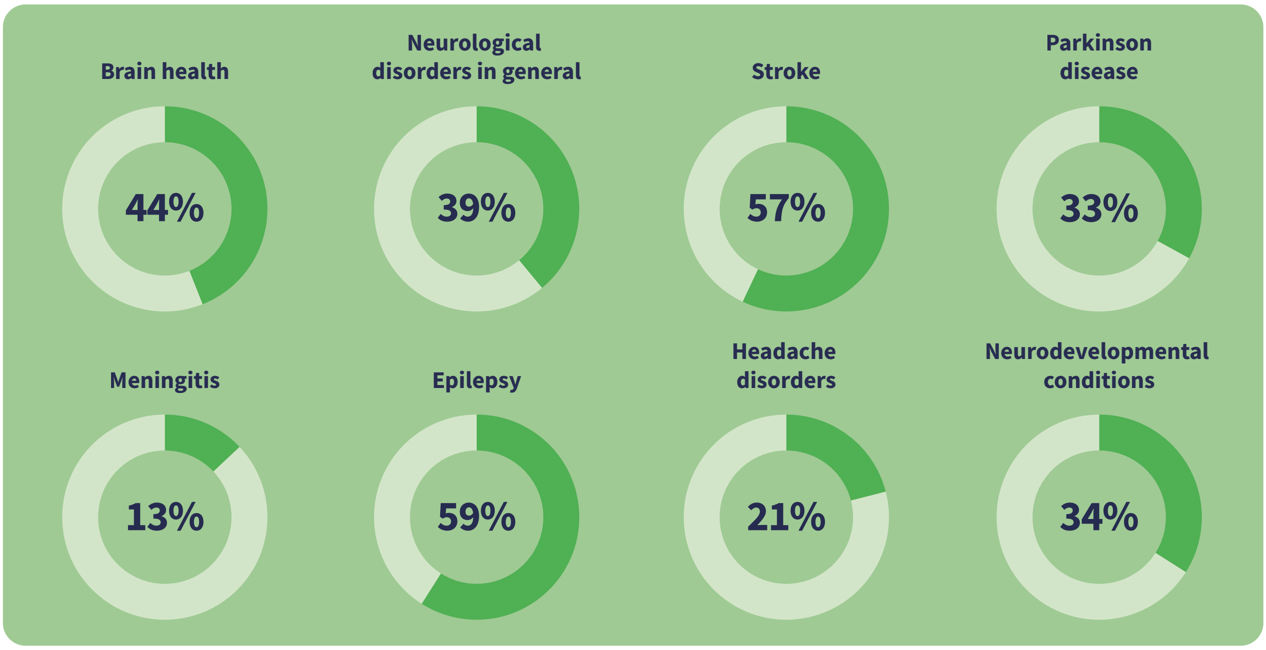


Figure 3.8

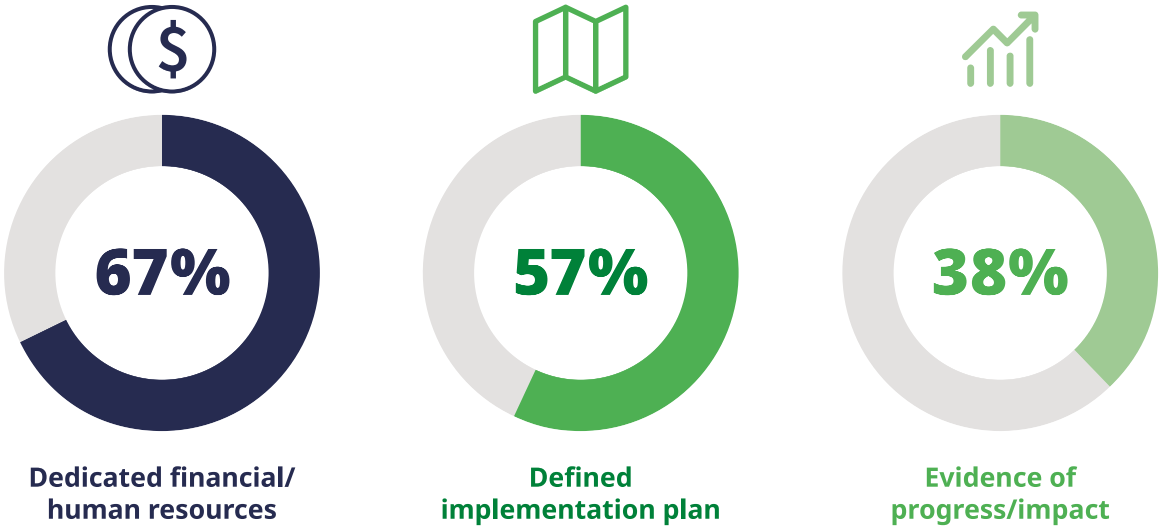
Neurological disorder(s) covered by awareness-raising campaigns or advocacy programmes (% of countries with campaigns/programmes, n=61) (2022)



Out of the 61 responding countries with existing campaigns/programmes, over two thirds (n=41) stated that they allocated dedicated financial and human resources to their campaigns/programmes. Over half (n=35) had a defined implementation plan, and more than one third (n=23) stated that their campaign/programme had evidence of progress or impact (such as through a monitoring and evaluation plan) (Figure 3.9). The mean functionality rating of existing campaigns/programmes, measured via a composite score across the three criteria (financial/human resources, implementation plan, evidence of progress/impact), was 1.7 out of 3. Generally, functionality rates across all three criteria increased with countries' World Bank income group level, with high-income countries reporting the highest mean functionality rating (1.9 out of 3) (Annex 4, Table A3.6).

Figure 3.9

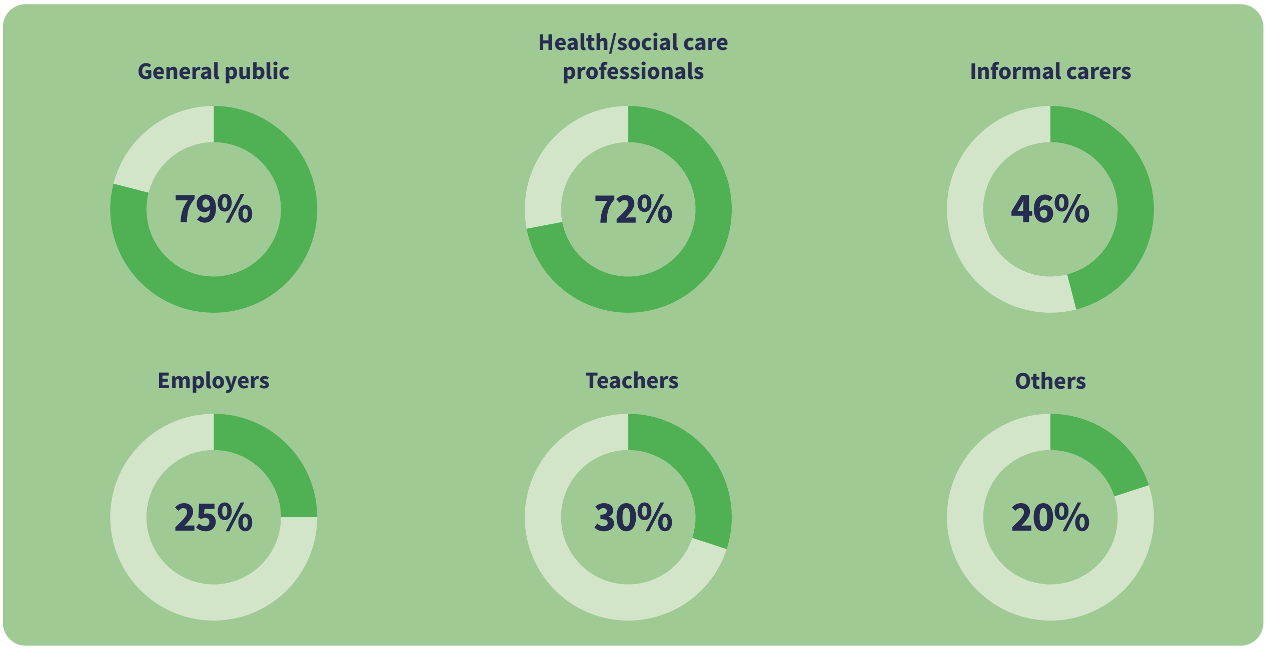
Functionality of awareness-raising campaigns or advocacy programmes (% of countries with campaigns/programmes, n=61) (2022)



Globally, the general public and health/social care professionals were the primary target audiences in existing campaigns/programmes, identified by 48 (79%) and 44 (72%) of the 61 countries, respectively. In contrast, teachers and employers were among the least targeted groups (Figure 3.10) (see Annex 4, Table A3.7 for a breakdown by WHO regions and World Bank income groups).

Figure 3.10

Stakeholders targeted by awareness-raising campaigns or advocacy programmes (% of countries with campaigns/programmes, n=61) (2022)



Dedicated funding for brain health and neurological disorders

IGAP recommends the allocation of sustainable funding for policies, plans and programmes that address neurological disorders, including through earmarked domestic budgets, efficient and rational resource utilization proportionate to the country's neurological burden, and innovative financing mechanisms *(8)*.

Globally, only one third (33%; n=34) of responding countries reported having dedicated funding allocated towards implementing their national neurological or brain health activities and/or functions (Figures 3.11 and 3.12). Across WHO regions, reported rates for this indicator are generally at or below the global average, except for the South-East Asia Region (75%) and Western Pacific Region (62%) (Figure 3.11). However, reported rates in these two regions may not be representative as a result of comparatively lower response rates (4 of 11 countries in the South-East Asia Region and 8 of 27 countries in the Western Pacific Region). Notably, reported rates of dedicated funding increased with countries' income levels, with 23% of low-income countries compared to 37% of both upper-middle-income and high-income countries reporting such funding (Figure 3.12).

1 in 3 responding countries report allocating dedicated funding for brain health activities and/or functions

Figure 3.11

Funding allocation for brain health/neurological disorders (% of responding countries), by WHO region (2022)

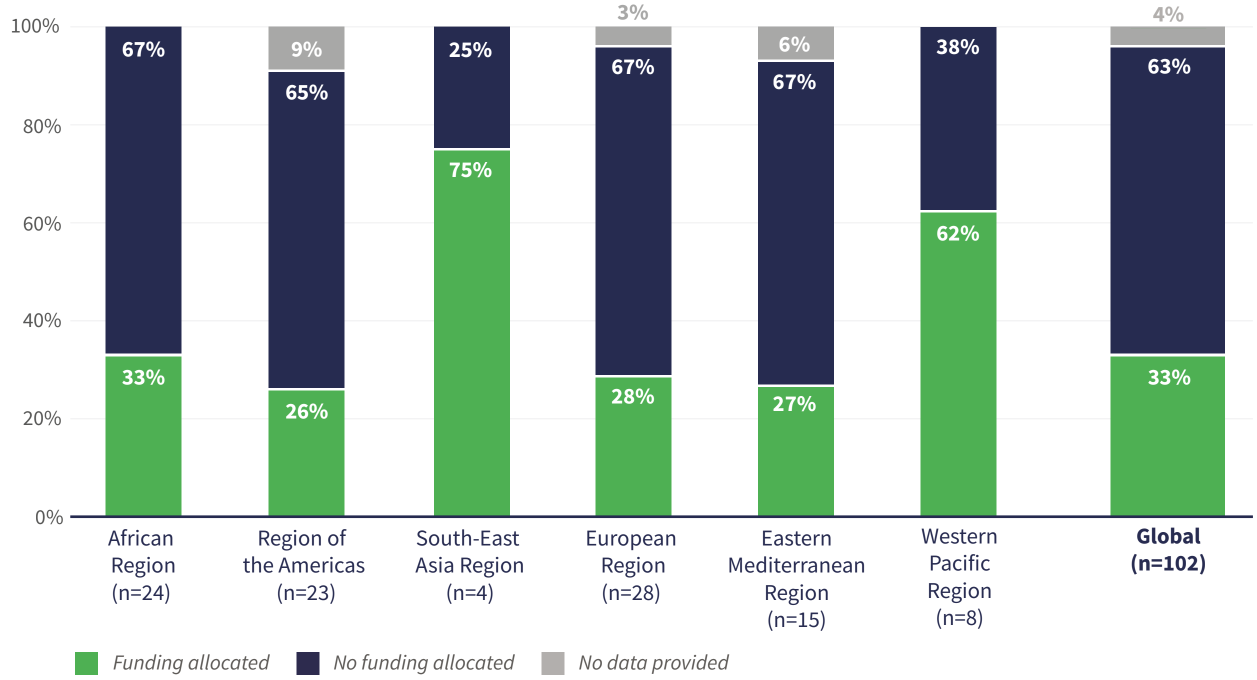
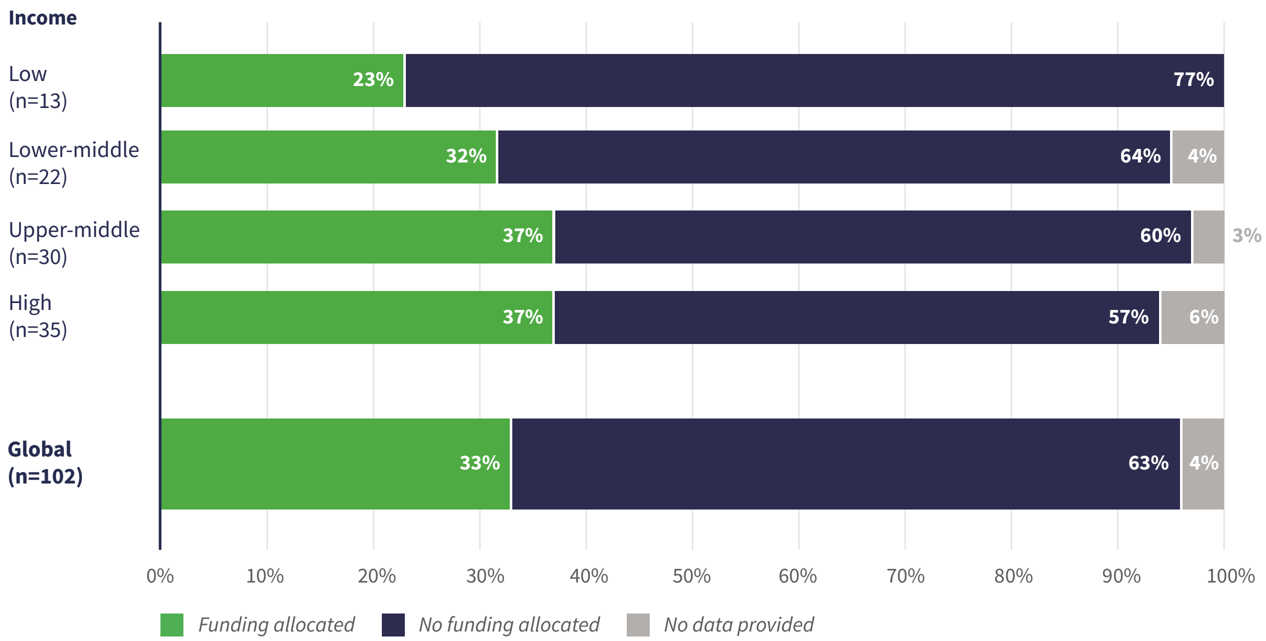


Figure 3.12

Funding allocation for brain health/neurological disorders (% of responding countries), by World Bank income group (2022)



Globally, most dedicated funding was allocated to health care and treatment of neurological disorders (28% of responding countries), while only 9% prioritized funding for the inclusion and participation of people with neurological disorders (Figure 3.13). In general, high-income and upper-middle-income countries reported higher rates of funding for health care and treatment, rehabilitation, and palliative care, while lower-middle-income and low-income countries reported higher rates of funding for workforce capacity-building and the inclusion/participation of people with neurological disorders (Annex 4, Table A3.8).

Figure 3.13

Areas to which dedicated funding for brain health/neurological disorders is allocated (% of responding countries, n=102) (2022)

Financial and social protection mechanisms, including national health insurance plans and social security benefits, are critical to ensuring affordable and accessible care for people with neurological disorders, their carers and families *(8)*. IGAP survey data reveal that a majority of people with neurological disorders incur substantial out-of-pocket costs in order to pay for neurological care and medicines.

Globally, over one in four responding countries (26%) reported that most people with neurological disorders pay over 50% out-of-pocket for care, while more than half (57%) indicated some out-of-pocket costs (Figures 3.14 and 3.15). Geographical variation in financing of access to care is significant: no responding countries in the European Region report major (i.e. >50%) out-of-pocket payments for care, whereas about half in the African Region and South-East Asia Region do report major payments (Figure 3.14). Amongst World Bank income groups, reported rates of major out-of-pocket payments for care were substantially higher in lower-middle-income and low-income countries (Figure 3.15).

Reported rates of major out-of-pocket payments for care were substantially higher in lower-middle-income and low-income countries.

Figure 3.14

Financing of access to care for neurological disorders (% of responding countries), by WHO region (2022)

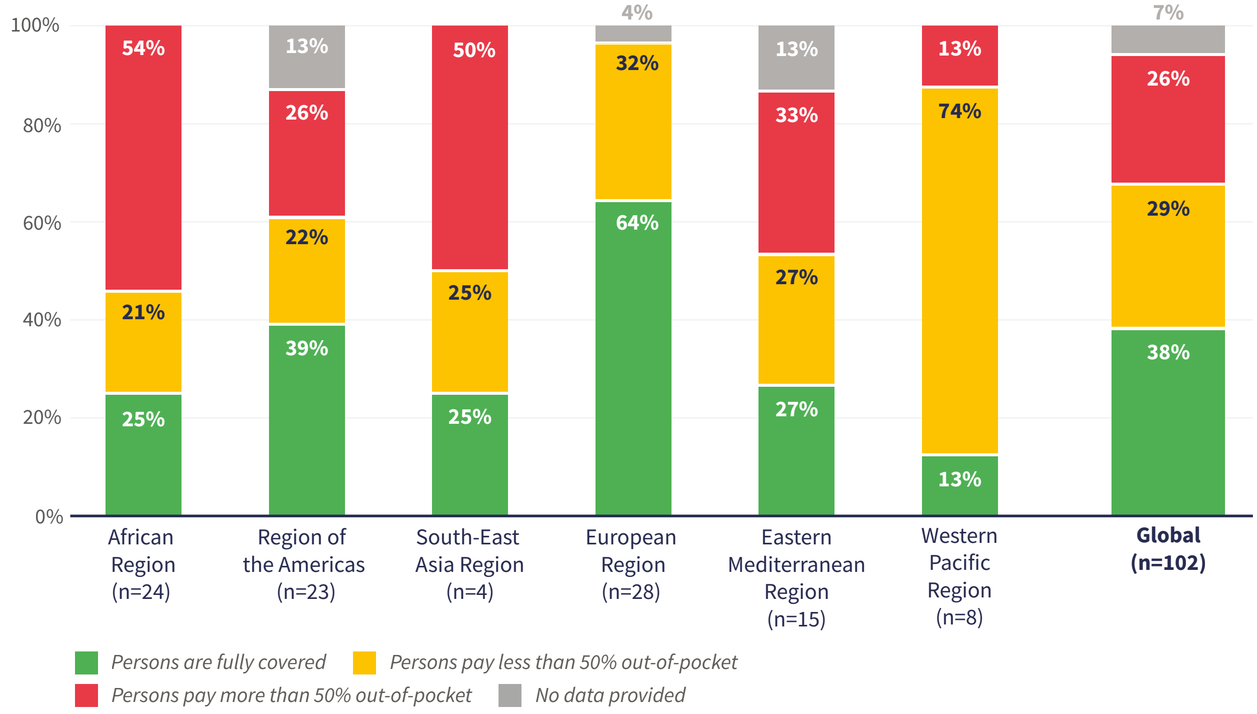
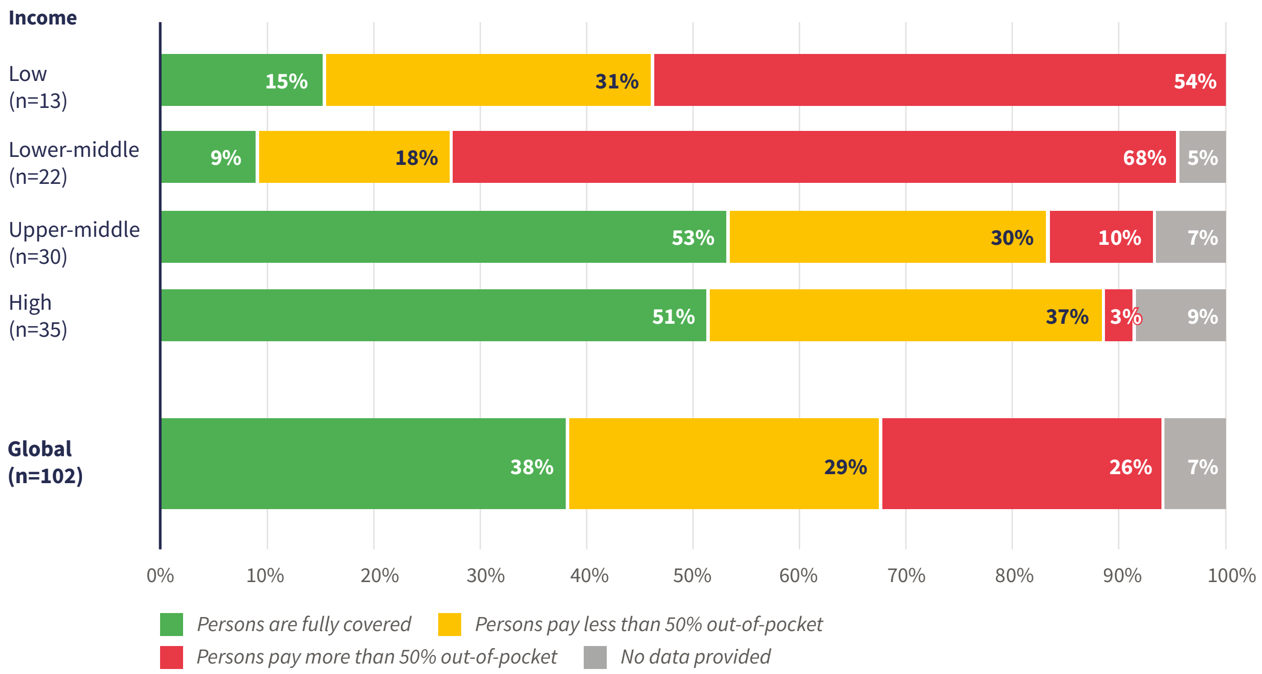


Figure 3.15

Financing of access to care for neurological disorders (% of responding countries), by World Bank income group (2022)



IGAP survey data show similar trends for financing access to medicines. Globally, nearly one in three responding countries (29%) reported that most people with neurological disorders pay more than 50% out-of-pocket for medicines, while more than half (56%) indicated some out-of-pocket costs (Figures 3.16 and 3.17). Reported rates of major (>50%) out-of-pocket spending on medicines ranged from 4% in the European Region to 58% in the African Region (Figure 3.16), disproportionately affecting lower-middle-income and low-income countries where about two thirds of countries reported major out-of-pocket spending (Figure 3.17).

Reported rates of major (>50%) out-of-pocket spending on medicines ranged from 4% in the European Region to 58% in the African Region.

Figure 3.16

Financing of access to medicines for neurological disorders (% of responding countries), by WHO region (2022)

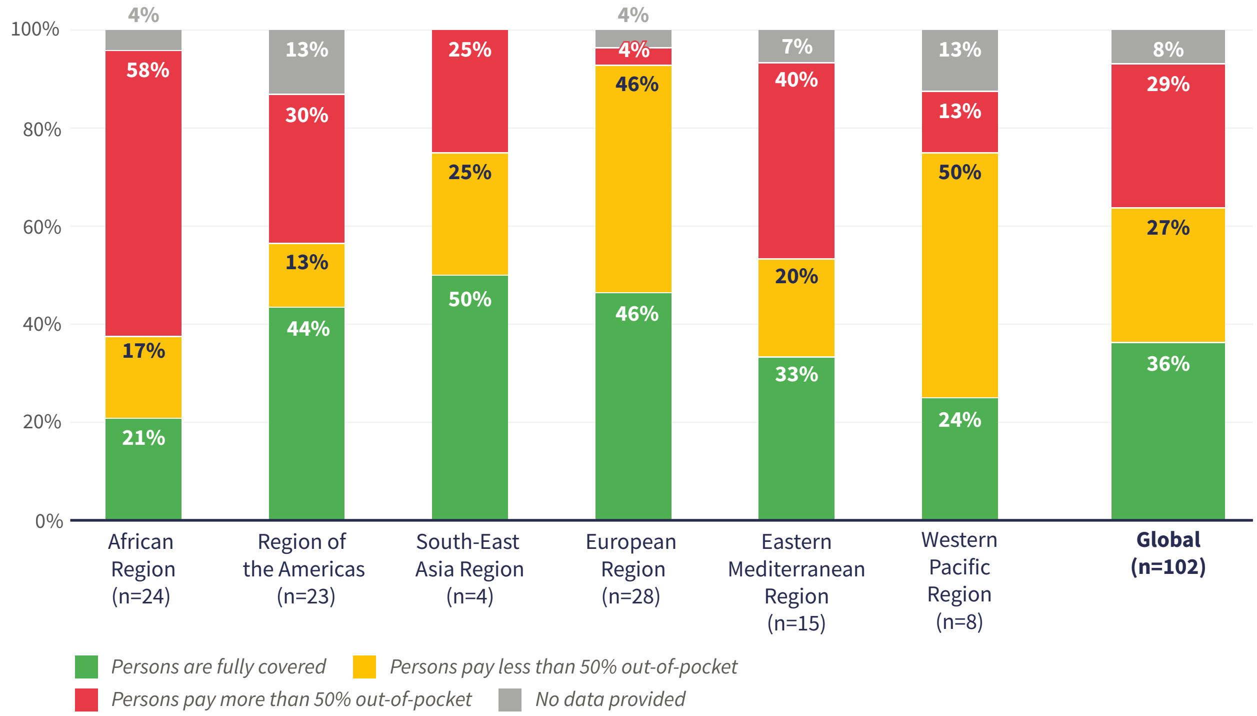
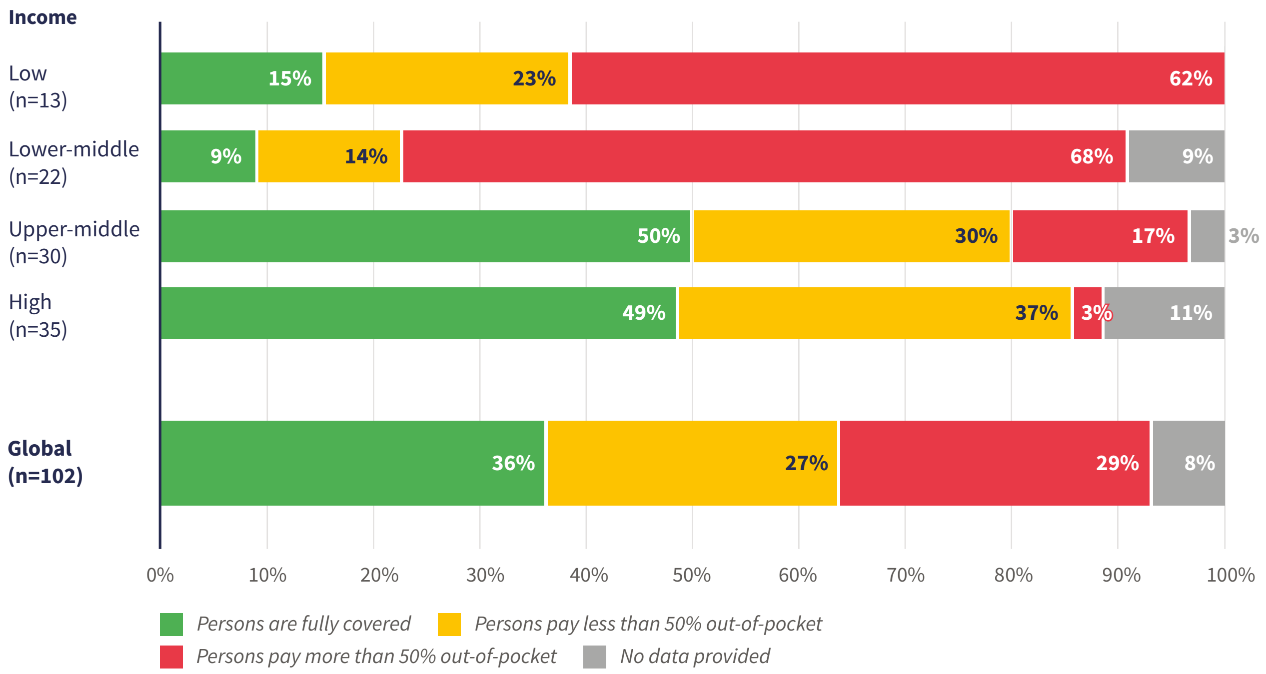


Figure 3.17

Financing of access to medicines for neurological disorders (% of responding countries), by World Bank income group (2022)



Next steps for impact

The IGAP survey data demonstrate an urgent global need to expedite the development, financing and implementation of national plans, policies, strategies or frameworks for neurological disorders (Figure 3.19). At the time of reporting, political leadership and action towards IGAP, as measured by dedicated national policies, remain insufficient. Similarly, robust national awareness/advocacy measures are still lacking in most countries – particularly in lower-middle-income and low-income countries. Efforts exist but are often disease-specific, underfunded, and/or insufficiently coordinated and monitored, thus compromising the functionality of these public health instruments. The lack of dedicated funding for brain health and neurological disorders remains a principal implementation barrier in many parts of the world, especially in lower-resource settings. This situation is further compounded by high out-of-pocket costs for neurological care and medicines in these settings, placing a significant burden on individuals and households.

A group of WHO delegates, partners, Lusaka residents and people with disabilities attending the "Walk the Talk" fitness walk of the 75th session of the WHO Regional Committee for Africa to promote health, inclusion and active living. Zambia, 2025. © WHO

IGAP 1

Figure 3.19
Priority actions, barriers and accelerators **to raise policy prioritization and strengthen governance**

Priority actions

Develop and implement dedicated neurological policies based on local needs.

This includes: 1) the identification of priority needs and critical gaps; 2) mapping key stakeholders; 3) developing context-specific intersectoral policies (stand-alone and/or integrated) for neurological disorders; 4) allocating resources; and 5) monitoring, evaluating and reporting on implementation. The appointment of national focal points and inclusive task forces are vital to support the process.

Invest in scalable awareness-raising and advocacy measures.

Measures should reflect priority needs, have clear coordination mechanisms and appropriately financed implementation plans, and should demonstrate reach and measurable impact. Robust investment cases for brain health and for engaging and highlighting interlinkages with other sectors can strengthen advocacy efforts.

Implement sustainable health-financing mechanisms.

To lessen countries' fiscal constraints, and bridge the health-financing gap, countries should complement existing health funding sources with sustainable financing mechanisms. These include "win-win" fiscal measures (i.e. benefitting health while generating resources), such as health taxes, solidarity levies, removal of harmful subsidies *(70)*, catalytic development assistance for health *(71)*, deferred repayment schemes, labelled bonds, voluntary contributions and public-private partnerships *(72, 73)*.

Improve financial and social protection mechanisms.

This includes directing resources to essential services, re-designing coverage policies (e.g. delinking entitlement from contributions; covering out-of-pocket cost drivers such as diagnostics and medicines), reducing prices of essential medicines and products (e.g. negotiating or regulating mark-up and supply prices, removing import tariffs and taxes) and limiting or capping co-payments for people with neurological conditions *(69)*.

Figure 3.19. Priority actions, barriers and accelerators

to raise policy prioritization and strengthen governance

Identified barriers

Resourcing the national adaptation of the IGAP framework.

Tailoring and operationalizing IGAP at the country level is often hindered by limited resources, fragmented stakeholder engagement, inadequate data systems and weak monitoring and evaluation capacity – making effective domestication a complex and under-supported process.

Fragmented, uncoordinated advocacy and awareness-raising efforts.

Many countries lack national neurological alliances and patient–caregiver associations. Existing initiatives often operate in silos and/or focus on specific disorders, limiting their overall reach, effectiveness and sustainability.

Multi-level stigma, discrimination and human rights violations against people with lived experience.

These adversities persist in many parts of the world, diminishing individuals' quality of life and well-being, impeding policy prioritization, limiting availability of, access to, and delivery of care, and hindering full participation in society.

Critical resource constraints and high out-of-pocket health expenditures, particularly in LMICs.

Resource scarcity and competing domestic demands limit funding for the policies, programmes and services needed to build and strengthen neurological infrastructure. At the same time, high out-of-pocket spending increases financial hardship, discourages health care-seeking and deepens health, social, and economic inequities.

WHO resources to accelerate action

- WHO *IGAP implementation toolkit (14)*
- WHO *OneHealth Tool (74)*
- WHO *Integrated operational framework for mental health, brain health and substance use (75)*
- *WHO advocacy strategy for mental health, brain health and substance use (76)*
- *Optimizing brain health across the life course: WHO position paper (22)*
- *WHO framework for meaningful engagement of people living with noncommunicable diseases, and mental health and neurological conditions (77)*

Figure 3.20

The voice of people with lived experience

KEY MESSAGES TO POLICY-MAKERS

"Policy-makers must first and foremost become aware that 'you are your brain' and that **'there is no health without brain health'.**"

On policies, strategies and plans:

"Accessibility should become a major policy priority to enable full societal participation of people with neurological conditions."

"A committee could be set up that includes people with lived experience and policy-makers. Indeed policy makers with lived experience themselves or experience of being a carer should be included in policy-making decisions."

On awareness and advocacy measures:

"Advocacy is not only about creating awareness but also about providing people with lived experience with actual tools that ensure a better quality of life."

"For those living with rare neurological diseases, awareness is even more crucial due to the invisibility and limited knowledge surrounding these rare conditions."

On health financing:

"People with neurological conditions are often among the first 'victims' of poor economic policy because they are not considered a priority."

On rights, laws and legislation:

"People need to have an awareness that not all neurological conditions are visible and laws should reflect this. Laws need to be explained in plain language to citizens, for instance when people are voting on whether a law should be passed or not, or when a law has been passed."

"Work, education and social settings can be places that are made inclusive to overcome stigma and discrimination and to protect the rights of people with lived experience – through openness, transparency, acceptance, and reasonable accommodations."

Figure 3.20

The voice of people with lived experience

OPPORTUNITIES AND GOOD PRACTICES

> "People with lived experience have a powerful tool – their own personal stories, the power to personalize and put a face to their condition with passion and emotion."

- ▶ **Amplify the voice of people with lived experiences** to create public awareness and stimulate dialogue, including through story-sharing platforms, public forums, and lived experience repositories.
- ▶ **Genuine co-creation of policies, services and programmes:** engage people with lived experience early and meaningfully, ensure their representation in decision-making bodies and advisory processes, and establish evaluation methods (e.g. participatory evaluations or regular feedback sessions) to assess the quality and impact of their involvement.
- ▶ **Capacity-building for advocacy** includes provision of peer support networks for improved social integration; educational opportunities to foster brain health literacy; advocacy training programmes (e.g. patient and public involvement in research, storytelling techniques) and train-the-trainer concepts in advocacy.
- ▶ **Integrated advocacy efforts**, coordinated by umbrella organizations, can unite neurology stakeholders and condition-specific advocacy groups around a common agenda.
- ▶ **Examples of policy advocacy actions** include engaging elected officials and public health stakeholders, submitting position papers to parliaments, speaking at public events and participating in consultations.

To expedite IGAP global target 1.1, governments should assign national focal points, units or divisions to develop dedicated policies on neurological disorders (see Box 3.1 for an example). This essential first step signals political commitment and helps define and operationalize context-specific priority actions. This includes conducting a situational analysis, engaging key stakeholders, identifying strategic public health entry points, and allocating available resources effectively. The *IGAP implementation toolkit (14)* (Box 3.2) contains pragmatic tools and practical guidance for countries to kickstart their national brain health strategies and align existing or planned policies with the five strategic objectives of IGAP.

Box 3.1

IGAP in action

Catalysing policy prioritization for brain health and neurological disorders in India

The Karnataka Brain Health Initiative (KaBHI) is a comprehensive and collaborative public health program aimed at reducing the burden of neurological disorders across Karnataka, a state in southern India. KaBHI was launched as a collaborative effort between the Department of Health and Family Welfare of the Government of Karnataka, and the National Institute of Mental Health and Neuro Sciences (NIMHANS), in consultation with NITI Aayog, the premier public policy think tank of the Government of India. The KaBHI initiative provides an evidence-based, integrated, and life course approach to strengthen neurological service delivery in low-resource settings.

The programme comprises eight foundational pillars:

- **Evidence-based, diagnosis and management protocols and strengthening of referral pathways**, including 32 new brain health clinics providing specialized multidisciplinary care, rehabilitation and post-diagnostic support.
- **Capacity-building**, using task shifting with structured training programmes for community health officers, accredited social health activist workers, and primary care physicians, a tele-neurology service, and a state-wide network of neurologists.
- **Digital health management,** including a secure systematic digital data monitoring and records system and planned state-wide registries for dementia, stroke and other neurological disorders.
- **Advocacy, awareness and risk reduction strategies,** including mass media campaigns, community engagement, sensitization programmes, and partnerships with celebrities as brand ambassadors for brain health.
- **Intersectoral coordination with national and state-level programmes,** including those on mental health, NCDs, reproductive, maternal, child and newborn health, ageing, and palliative care.
- **Research and evidence-based approach**, using an embedded monitoring and evaluation framework to evaluate KaBHI and its impact.
- **Sustainable financing**, with government-led funding of the 2022 pilot programme and state-wide expansion of KaBHI in 2023.
- **Towards national and international policy.** KaBHI was developed in consultation with the Indian Council of Medical Research and WHO's Brain Health Unit, aligning with the strategic objectives of IGAP and serving as an example for replication at national level.

By uniting key stakeholders and sectors around a needs-based, evidence-informed, and integrated approach to neurological disorders, KaBHI has paved the way for policy prioritization of brain health in India. Following the programme's state-wide implementation in 2023, a *National Task Force on Brain Health* was constituted by the Indian Health Ministry in 2024, with the goal of improving the accessibility and quality of brain health care at primary, secondary, and tertiary levels, inter alia by scaling KaBHI to the national level.

For more information, see:
Karnataka Brain Health Initiative (https://brainhealthnimhans.in/index.html).

Box 3.2

WHO resource – The IGAP implementation toolkit

The *IGAP implementation toolkit* complements the *Intersectoral global action plan on epilepsy and other neurological disorders 2022–2031* (IGAP) and supports the formulation of strong national responses to neurological disorders, whereby people with lived experience are placed at the heart of all actions. IGAP serves as a "go-to" guide with concrete actions and 90 unique suggested tools and resources that can be used to realize IGAP's vision and the 10 targets of the global action plan.

Case studies and best practice examples are used to illustrate the inner working of actions in particular contexts. Sections focus on each of the action areas of IGAP, as well as on six conditions with high burdens of disease which illustrate the diverse approaches and key actions in policy, clinical care, research, monitoring and prevention needed to tackle neurological disorders at the country level.

The toolkit is primarily intended for policy-makers, programme managers and service planners but is also relevant to civil society organizations, professional societies, advocacy groups, academic institutions, donors and funders of programmatic work.

There are numerous examples of government-led stand-alone or integrated policies for neurological disorders implemented at regional, national or subnational levels (Box 3.3). Additionally, civil society-led brain health plans or strategies are emerging in several European countries such as Finland, Germany, Italy, Poland, Sweden and Switzerland, among others.

Box 3.3

IGAP in action

Emerging government-led policies on neurological disorders and brain health (non-exhaustive list)

Examples of stand-alone policies:

At national level:

- Norway's National Brain Health Strategy 2018–2024 (to be updated for 2025–2035) (Norwegian Ministry of Health and Care Services, Oslo).
- Uruguay's brain health programme (Ministry of Public Health, Montevideo).
- Spain's Strategy on Neurodegenerative Diseases (Ministry of Health, Madrid).
- The National Policy Framework on the Prevention, Control and Management of Acute Stroke in the Philippines (Department of Health, Manila).
- National Strategic Action Plan for Heart Disease and Stroke in Australia (Department of Health, Canberra).
- Yaoundé Declaration for the Brain Economy, Brain Health, and Brain Capital (endorsed by members of the Government of Cameroon, Yaoundé).
- Qatar National Dementia Plan (summary, Ministry of Public Health, Doha).

At subnational level:

- Neurological Care and Support in Scotland: A Framework for Action 2020–2025 (The Scottish Government, Edinburgh).
- Neurological Conditions Delivery Plan (The Welsh Government, Cardiff).

Examples of integrated policies:

At regional level:

- Healthier together – EU non-communicable diseases initiative (European Commission, Brussels).
  → Covering 2022–2027, this initiative supports EU Member States in reaching SDG target 3.4 on "reducing premature mortality from NCDs by one third by 2030" and includes mental health and neurological disorders as one of five strands.

At national level:

General health

- 2022–2026 Strategic Plan National Health of Zambia (Ministry of Health, Lusaka).
  → Includes epilepsy.
- Healthy China 2030 (Government of China, Beijing).
  → Includes Alzheimer disease.

Box 3.3. IGAP in action

Emerging government-led policies on neurological disorders and brain health (non-exhaustive list)

NCDs

- South Africa's National Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2022–2027 (National Department of Health, South Africa).
  → Includes neurological disorders.
- Kenya's National Strategic Plan for the Prevention and Control of Non-Communicable Diseases 2021/22 – 2025/26 (Ministry of Health, Nairobi, Kenya).
  → Includes epilepsy and other neurological disorders.
- India's National Programme for Prevention and Control of Non-communicable Diseases 2023–2030 (Ministry of Health and Family Welfare, India).
  → Includes stroke.

Mental health

- Colombia's National Mental Health Policy (Government of Colombia).
  → Includes epilepsy and dementia.

Child development & education

- Thailand's Early Childhood Development Plan 2021–2027 (Ministry of Education, Bangkok).
  → Addresses issues related to neurological and developmental conditions.
- Ghana's Inclusive Education Policy (Ministry of Education, Accra).
  → Includes various neurodevelopmental conditions and epilepsy, among others.

Healthy ageing

- Slovenia's National Strategy for Healthy Ageing (Ministry of Labour, Family, Social Affairs and Equal Opportunities, Ljubljana).
  → Includes cognitive decline and dementia.

Disabilities

- Brazil's National Policy for Comprehensive Health Care for People with Disabilities (Ministry of Health, Brasilia).
  → Includes neurological conditions.

In pursuit of IGAP global target 1.2, priority actions by governments should focus on spearheading and/or supporting holistic awareness/advocacy measures. This means they: 1) are context-specific and address priority needs; 2) are fully accessible and place people with lived experiences at the centre; 3) provide information on the promotion and prevention of neurological disorders; 4) highlight the economic benefits of proposed policies ("investment cases"), and 5) emphasize links between brain health and broader policy commitments ("neurology mainstreaming"). The World Brain Day (Box 3.4) organized by the World Federation of Neurology (WFN) represents a global annual initiative to promote awareness and education on brain health and neurological disorders worldwide.

Box 3.4

IGAP in action

The WFN World Brain Day: Raising brain health awareness globally

The World Brain Day, which was initiated in 2014 and is held annually on 22 July is a global advocacy and awareness-raising campaign spearheaded by the World Federation of Neurology (WFN) in collaboration with WFN's six regional neurological societies. This global annual initiative seeks to catalyse brain health awareness across all regions of the world and to promote the importance of neurology worldwide.

WFN's 125 member societies and allied stakeholders across the global brain community are encouraged to organize awareness-raising activities involving medical professionals and students, patient associations, persons with lived experience, the media and health authorities. These multipronged activities are aimed at improving the prevention and treatment of neurological disorders, increasing public awareness, and promoting better access to neurological care, education and advocacy for brain health.

In alignment with the vision of IGAP, the themes of World Brain Day since 2022 have been dedicated to various aspects of global brain health, including "Brain Health for All", Brain Health and Disability", "Brain Health and Prevention", and, most recently, "Brain Health for All Ages".

For more information, see:

- https://wfneurology.org/world-brain-day-2025

Engagement of all relevant stakeholders from the outset is vital to secure buy-in, foster ownership and accountability, and propel synergistic action on IGAP's priorities *(58, 78)*. Neurological alliances can effectively coordinate integrated, intersectoral, and inclusive advocacy/awareness measures, uniting all concerned stakeholders around a common agenda *(59)*. These alliances can facilitate knowledge translation and exchange by stimulating dialogue and learning, knowledge brokering, exchange of good practices and coordination of synergistic actions. A global example of united advocacy is the OneNeurology partnership (Box 3.5). Similarly, at national level, the Neurological Alliance Australia forms a collective of nearly 30 national patient organizations that jointly advocate on behalf of children and adults with neurological disorders *(79)*.

Box 3.5

IGAP in action

Fostering integrated neurology advocacy: The OneNeurology Partnership

The OneNeurology Partnership is a consortium of global neurology organizations uniting patients, carers, clinicians and researchers worldwide to leverage IGAP and raise awareness of neurological conditions. It advocates for integrated, person-centred neurology and offers a one-stop shop for policy-makers, providing the evidence needed to support action. It demonstrates the strength of multidisciplinary and cross-disease efforts across various regions.

Impact and key activities

The OneNeurology Partnership:

- contributes to IGAP development through an extensive input to consultations;
- has published OneNeurology-led papers in academic journals, including *Lancet Neurology*, *Lancet Global Health*, and *Nature Reviews Neurology*;
- has advocated for the integration of neurological conditions across the life course into WHO policies, including NCDs, leading to increased recognition of neurology in WHO frameworks;
- has engaged with diplomatic missions in Geneva and WHO regions, issuing position papers and participating in WHO consultations, influencing global health policies directly;
- has enlisted regional ambassadors to rally support from national policy-makers;
- launched the One Voice for Neurology podcast;
- has collaborated strategically with the NCD Alliance, enhancing the partnership's capacity to strengthen neurology globally;
- participates in key global events such as the WHO Mental Health Forum.

Key lessons:

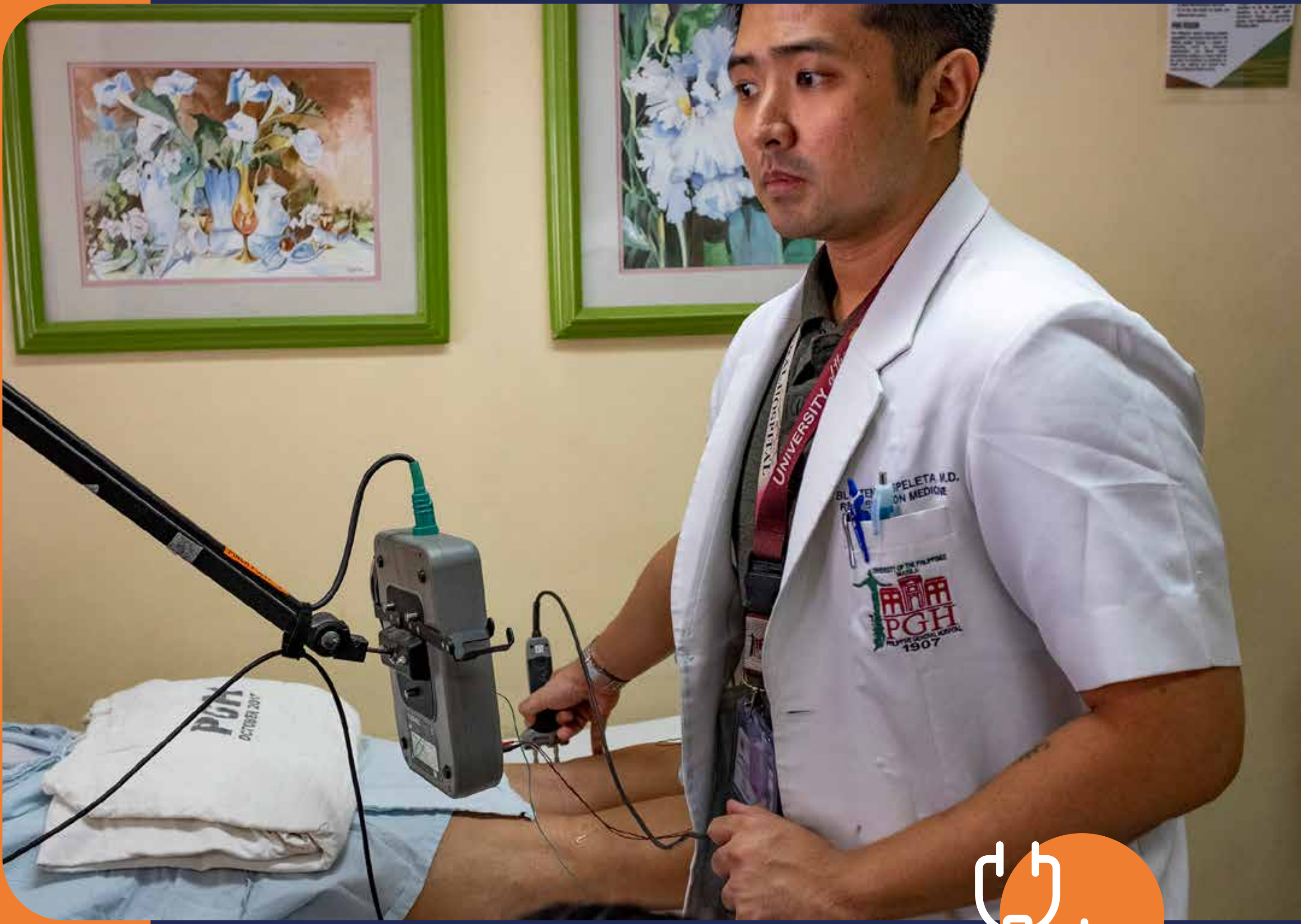
The partnership has demonstrated the importance of unified advocacy and the power of multidisciplinary collaboration in influencing global policies and optimizing brain health and through an integrated approach to neurological conditions.

For more information, see:

- https://oneneurology.net/partnership/

Governments should urgently re-align health budgets to match the epidemiological and economic burden on society caused by neurological disorders. In LMICs, integrated strategic health planning, using system-wide efficiency analyses embedding neurological programmes within the overall health system, can inform efficient budgeting and financing *(80)*. Such integrated, single framework approaches facilitate the identification and correction of inefficiencies such as duplications, overlaps and misalignments across health programmes *(80)*. The WHO OneHealth Tool can help planners with integrated scenario analysis, costing, health impact analysis, budgeting and financing of strategies aimed at neurological disorders and brain health interventions *(74)*.

Patient exercising with support from her instructor during a physiotherapy session at the Russian Federal Rehabilitation Center in Moscow. Russian Federation, 2020. © WHO / NOOR / Sebastian Liste



A health care provider conducting an electromyogram test and nerve conduction study in a patient diagnosed with lumbosacral radiculopathy at the Rehabilitation Department of the Philippine General Hospital in Manila. Philippines, 2019.
© WHO / NOOR / Sebastian Liste

Chapter 4

Effective, timely and responsive diagnosis, treatment and care

> **Access to treatment and care services and support structures must be provided in an equitable manner. It shouldn't matter where you live – rural or city; everyone should have equal access to the care they need, including carers and families."**
>
> – Lorraine Duffy, Ireland

KEY MESSAGES

▶ Access to neurological diagnosis, treatment and care is unequal: the settings with the highest burden of neurological disorders often have the least resources to care for the people affected.

▶ At baseline, only one fourth of WHO Member States (48% of responding countries) report explicitly including neurological disorders in their UHC benefits packages (IGAP global target 2.1), leaving millions of people worldwide unable to afford neurological care and causing economic hardship for many households.

▶ Neurological disorders require person-centred, integrated, multidisciplinary care across diagnosis, treatment, rehabilitation, and long-term and palliative services. While 84% of responding countries offer specialized care, access is often urban-centric. Profound inequities exist, as few low-income and lower-middle-income countries provide essential services such as stroke units, neuro-intensive care, rehabilitation and palliative care for adults and children.

▶ Many countries still lack social and financial protection mechanisms for people with neurological conditions and their carers, diminishing their quality of life and increasing financial risk, compounded by high out-of-pocket health expenditures. Fewer than half of responding countries, and even fewer low-income (15%) and lower-middle-income countries (27%), offer carer services, supports, or programmes, underscoring the need for investment in adequate carer support, training and upskilling.

▶ At baseline, only 29% of WHO Member States (56% of responding countries) report providing essential neurological medicines and technologies in primary care with accessibility in both urban and rural areas (IGAP global target 2.2). Nearly half of responding countries lack neurological services in non-specialized settings, highlighting the need to strengthen community and primary care capacity for neurology.

▶ The neurological workforce remains unevenly distributed globally (82:1 high-income/low-income country ratio for neurologists), with the lowest numbers of neurologists, child neurologists, and neurosurgeons in low-resource settings. Solutions include expanding neurological training programmes, upskilling primary health-care workers, expanding digital training and knowledge exchange programmes, and providing tele-neurology services and essential equipment and infrastructure.

Context

All people with neurological conditions deserve access to effective, timely and responsive assessment, diagnosis, treatment and care. Despite global efforts, access to neurological care remains significantly limited by: fragmented care pathways, workforce shortages, inadequate neurological infrastructure (including insufficient medical and surgical facilities), and restricted access to essential medicines, equipment, technologies and diagnostics. There are also financial, geographical and cultural barriers worldwide. LMICs are disproportionately affected. They carry over 80% of the global burden of neurological disorders but have the lowest capacity for care *(1)*. Components of effective neurological services include: 1) well-coordinated, evidence- and needs-based care pathways; 2) a robust service infrastructure; 3) equitable access to essential medicines, diagnostics and other health products; 4) a continuum of care spanning prevention, diagnosis, treatment, rehabilitation, long-term care and palliative care; 5) a competent interdisciplinary workforce at primary, secondary and tertiary care levels; and 6) appropriate social protection and carer support. Comprehensive strengthening of health and social care systems for equitable access to the full range of neurological services, in line with the guiding principle of UHC, is therefore crucial for optimizing brain health for all *(8)*.

> "All people with neurological conditions deserve access to effective, timely and responsive assessment, diagnosis, treatment and care."

Services and care pathways

Equitable access to health services and care pathways is essential for people with neurological conditions. These services must be accessible in both urban and rural settings, including remote areas, and should be firmly embedded within the community and at PHC levels, grounded in evidence-based policies and practices, and covering the whole spectrum of care. Services should provide coordinated and integrated health and social care, be responsive to the complex needs of individuals with neurological conditions and oriented to each stage of the life course *(8)*. In line with UHC, services should be available and affordable to all without discrimination or risk of financial hardship. Consistent with the United Nations Convention on the Rights of Persons with Disabilities (CRPD) *(81)*, interventions should adopt a human rights-based approach that is culturally sensitive, gender appropriate and accessible to vulnerable groups – including racial and ethnic minorities and indigenous peoples, refugees, internally displaced people and migrants, as well as people facing socioeconomic disadvantage, domestic and gender-based violence, or incarceration *(22)*.

Carer support

Many neurological conditions are chronic and/or progressive, affecting cognitive, behavioural, sensory and/or motor functioning, with profound impacts on activities of daily living, mobility and participation in meaningful life-roles. Comorbidities may compound these challenges. Consequently, affected individuals may require regular, prolonged and potentially life-long treatments and long-term care *(22, 82)*. This can create high levels of dependency and complex care needs, which are frequently borne by unpaid informal carers, most of whom are women *(83)*. Informal caregiving can result in significant carer strain, including challenges that may be emotional (e.g. chronic stress, social withdrawal, isolation, stigma, and mental health conditions), physical (health conditions) or economic (e.g. work absenteeism, productivity losses, early retirement). Consequently, equitable carer support and social and financial protection measures are essential for a comprehensive approach to neurological disorders. Strategies for self-care – defined by WHO as "the ability of individuals, families and communities to promote their own health, prevent disease, maintain health, and to cope with illness with or without the support of a health or care worker" *(84)* – should be actively supported.

Access to medicines, diagnostics and other health products

Access to medicines, diagnostics and other health products (e.g. assistive equipment and technology, biological products, and cell and gene therapy) is essential for prevention, timely diagnosis and treatment of neurological disorders but remains a critical global health challenge *(8)*.

Medicines

Widespread lack of availability and affordability of essential neurological medicines is a significant contributor to the treatment gap, which can exceed 75% in low-income countries *(25)*. In many countries, the situation is complicated by a myriad of barriers across various health system components, as depicted in Figure 4.1. Inaccessibility of medicines compromises the delivery of quality neurological care, increases the risk of disability and premature mortality, and diminishes individuals' quality of life, resulting in profound health, social and economic repercussions for many people *(25)*.

Diagnostics

Similar access issues exist for essential neurodiagnostics which include laboratory tests (e.g. microscopy, cerebrospinal fluid analysis), neuroimaging (e.g. head computed tomography, brain magnetic resonance imaging, ultrasound) and electrophysiology (e.g. electroencephalography, electromyography). These tools are crucial for timely diagnosis and effective monitoring of neurological disorders; however, their availability, accessibility, and affordability are largely uneven across countries and income settings, with lowest affordability encountered in low-income settings *(85, 86)*. Even when these tools are available, their appropriate use is frequently hindered by limited availability of laboratory infrastructure, equipment and trained personal *(8)*. Cultural beliefs and/or stigma related to medical procedures (e.g. lumbar puncture) may further limit their uptake.

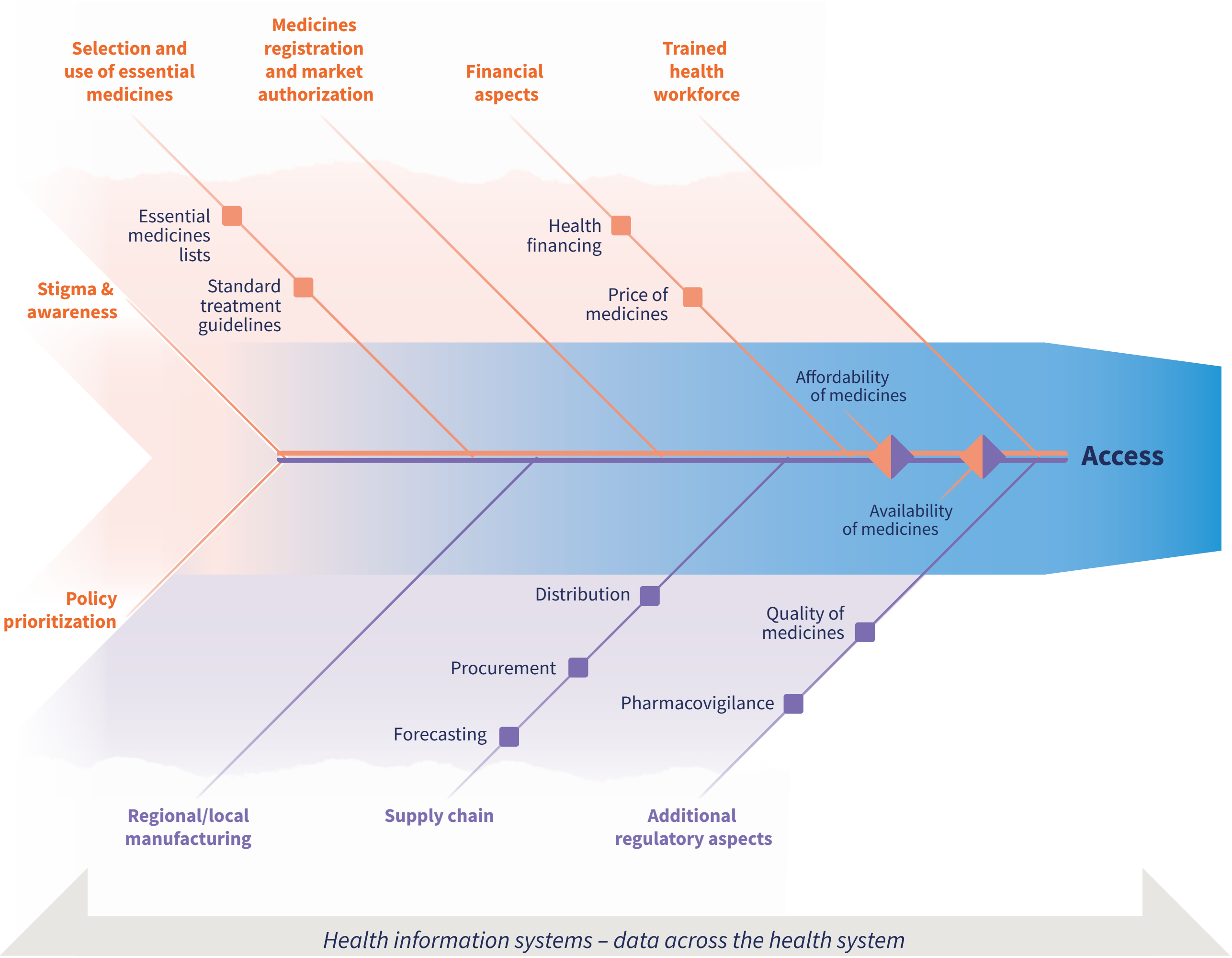
Health products

Assistive products and technology (e.g. wheelchairs, spectacles, hearing aids, speech recognition tools, prosthetic limbs) are essential for enabling people with impairments to lead healthy, productive, independent and dignified lives. More than 2.5 billion people worldwide need assistive products, yet profound global access inequities remain *(87)*. In some low-income countries, as few as 3% of people report access to the assistive products they need, compared to 90% in some high-income countries *(87)*. For example, only 5–35% of the 80 million people who need a wheelchair have access to one *(88)*, and current hearing aid production meets less than 10% of the global demand *(89)*.

Figure 4.1

Fishbone diagram of barriers and health systems components affecting access to medicines for neurological disorders

Adapted from *(25)*



Note: Orange components are those found to have an impact on access to medicines for neurological disorders directly, while purple components represent broader health-system elements that influence access to medicines in general.

Health workforce

People with neurological disorders often have complex care needs that require multidisciplinary care teams to conduct specialized investigations and treatments. Neurological workforce shortages remain a major barrier to ensuring timely diagnosis, treatment, care and rehabilitation for affected individuals *(3)*. LMICs face disproportionate shortages of both adult and paediatric neurologists relative to population needs *(3)*. For example, a majority of low-income countries entirely lack access to child neurologists, with countries in the WHO African and South-East Asian regions particularly affected *(90)*.

A strong workforce across all relevant health disciplines and levels of care – including primary, secondary and tertiary levels – is a fundamental cornerstone for achieving integrated, person-centred neurological care *(8)*. Relevant disciplines other than neurology are important for delivering quality and comprehensive neurological care. Such disciplines include general medicine, emergency medicine, paediatrics (including child development), geriatric care, radiology, neurosurgery, neuropathology, nursing, social care and community health, psychiatry, psychology, rehabilitation (including occupational therapy, physiotherapy, speech and language therapy, among others) and palliative care. However, as in the case of neurologists, these disciplines are often limited in terms of workforce numbers *(91, 92)*. Strengthening the neurological workforce requires overcoming numerous key barriers – such as inadequate planning and resourcing of workforce-related programmes and policies, limited education and training opportunities, insufficient compensation or incentives for workforce retention, and high levels of stress among neurological care providers *(8, 93, 94)*. Capacity-building through pre-service education and in-service training, continuing education, and adequate supervision, support and protection is needed for both specialists and non-specialists (including community health workers, nurses, local traditional healers, and formal and informal carers).

Findings

This section reports on the key findings associated with action areas included under IGAP's *Strategic objective 2: Provide effective, timely and responsive diagnosis, treatment and care*, and its two global targets:

Global target 2.1

75% of countries will have included neurological disorders in the UHC benefits package by 2031.

Global target 2.2

80% of countries will provide the essential medicines and basic technologies required to manage neurological disorders in primary care by 2031.

Access to neurological treatment, care services and support structures

At baseline, 49 countries (48% of responding countries, 25% of WHO Member States) reported that they have a national UHC priority benefits package that includes neurological disorders (Table 4.1). Among WHO regions, only the European Region (28%) and the Eastern Mediterranean Region (43%) had a higher proportion of Member States that exceeded the global average in this regard. The availability of UHC benefits packages that include neurological disorders was highest in high-income countries, reported at roughly twice the rate of low-income and lower-middle-income countries (37% vs. 19% and 18%, respectively).

Table 4.1

IGAP global target 2.1: Inclusion of neurological disorders in UHC (2022)

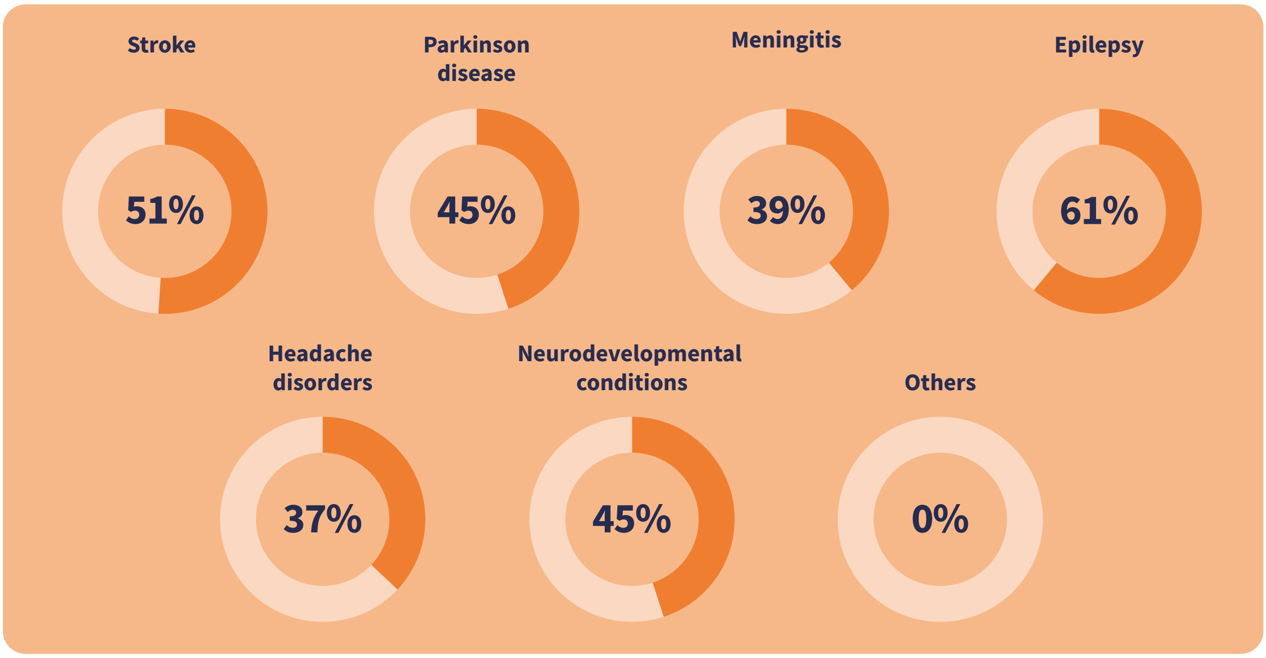
	Countries with neurological disorders included in UHC benefits package	Percentage of responding countries	Percentage of WHO Member States
Global (n=102)	**49**	**48%**	**25%**
WHO region			
African Region (n=24)	11	46%	23%
Region of the Americas (n=23)	8	35%	23%
South-East Asia Region (n=4)	2	50%	18%
European Region (n=28)	15	54%	28%
Eastern Mediterranean Region (n=15)	9	60%	43%
Western Pacific Region (n=8)	4	50%	15%
World Bank income group			
Low-income (n=13)	5	38%	19%
Lower-middle-income (n=22)	9	41%	18%
Upper-middle-income (n=30)	12	40%	23%
High-income (n=35)	23	66%	37%

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

The remainder of responding countries (n=46; 45%) stated either not having a UHC priority benefits package (n=33; 32%) or not including neurological disorders in existing UHC benefits packages (n=13; 13%) (Annex 4, Table A4.1). Among responding countries with UHC benefits packages that include neurological disorders, epilepsy and stroke were the most listed, followed by Parkinson disease and neurodevelopmental conditions (Figure 4.2) (see Annex 4, Table A4.2, for a breakdown by WHO regions and World Bank income groups).

Figure 4.2

Neurological disorders included in UHC benefits packages (% of countries meeting IGAP global target 2.1, n=49) (2022)



To map a global baseline holistically for access to neurological treatment, care services, and support structures, the IGAP survey captures four additional indicators, including social protection mechanisms, existence of guidelines and standards, neurological services, and services and supports for carers.

Social protection mechanisms

Globally, over two thirds of responding countries (68%) reported having social protection mechanisms (e.g. social security or disability benefits) for people with neurological disorders (Figures 4.3 and 4.4). Across WHO regions, proportionately fewer countries in the African and South-East Asia Regions stated that they provided these benefits compared to other regions (Figure 4.3). Disparities across countries' income levels are stark, with social protection mechanisms being 10 times more common in high-income and upper-middle-income countries than in low-income countries (Figure 4.4).

> Social protection for people with neurological disorders is **10x more common** in high- and upper-middle-income countries than in low-income countries.

Figure 4.3

Existence of social protection mechanisms for people with neurological disorders (% of responding countries), by WHO region (2022)

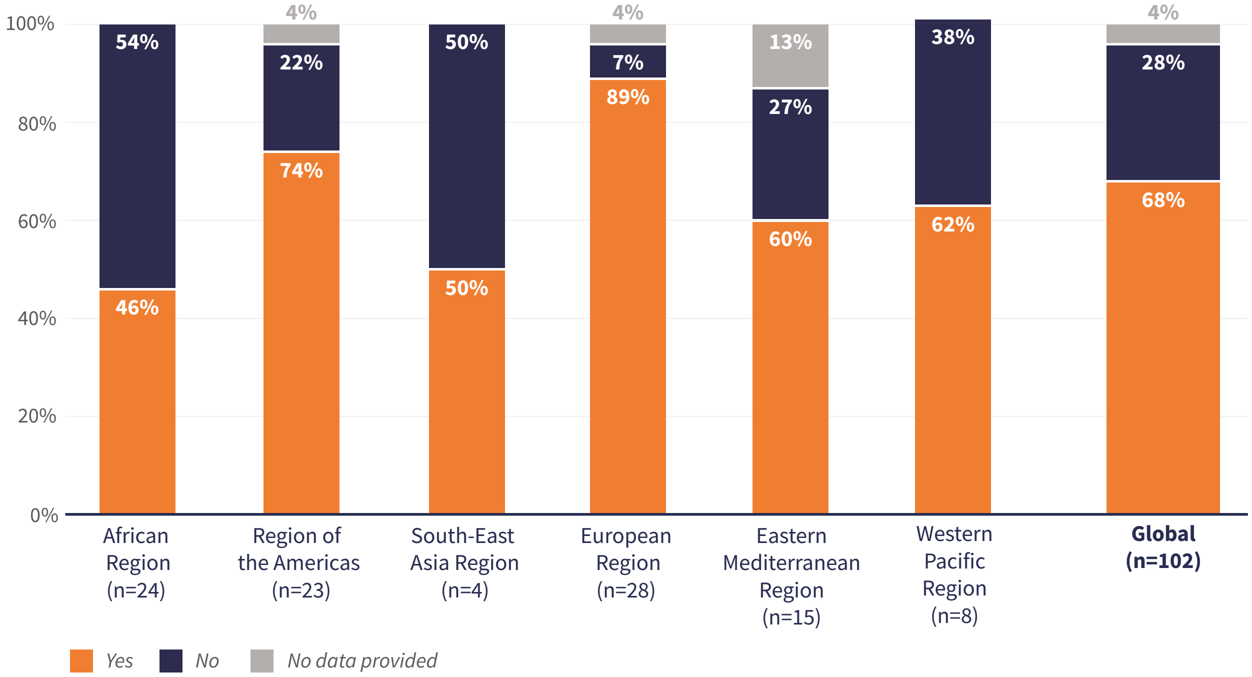
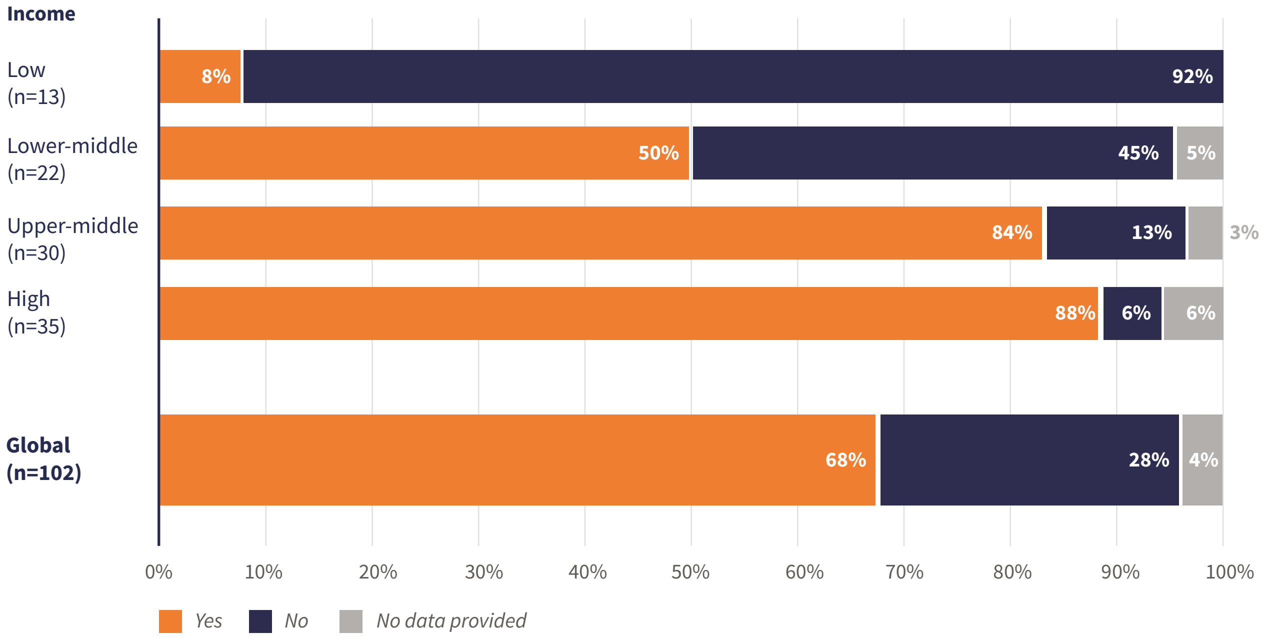


Figure 4.4

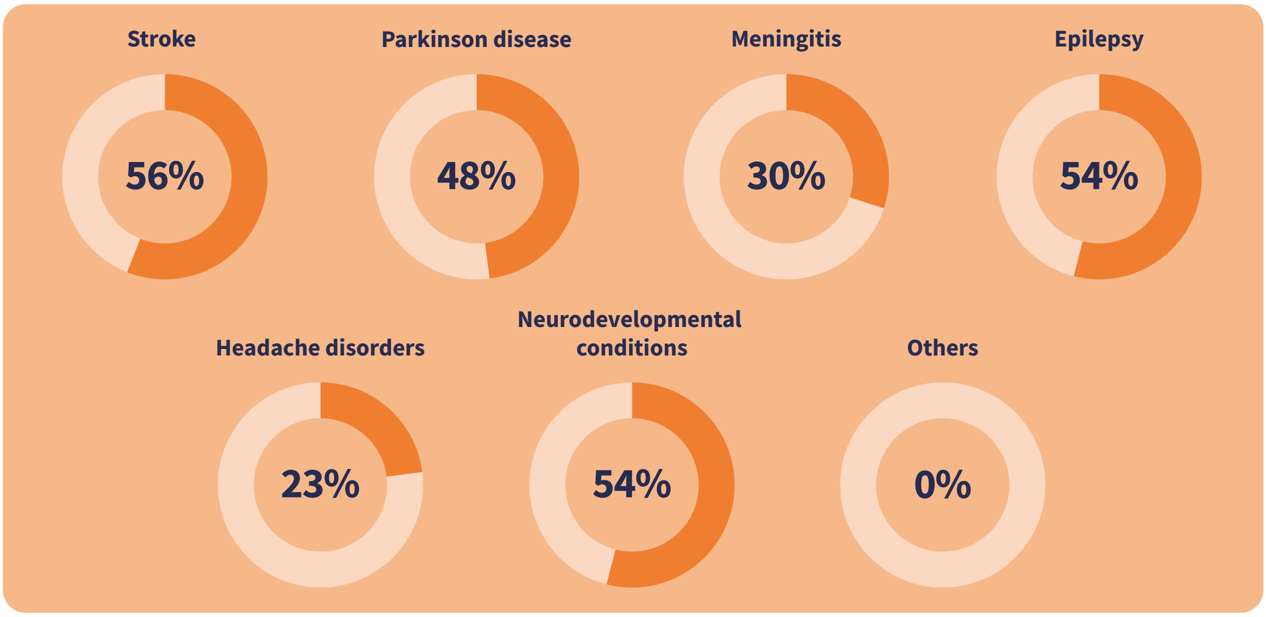
Existence of social protection mechanisms for people with neurological disorders (% of responding countries), by World Bank income group (2022)



Social protection mechanisms were reported to be most commonly available to people with stroke, epilepsy, neurodevelopmental conditions and Parkinson disease, with relatively fewer benefits provided to individuals with meningitis or headache disorders (Figure 4.5) (see Annex 4, Table A4.3, for a breakdown by WHO regions and World Bank income groups).

Figure 4.5

Neurological disorders for which social protection mechanisms are available (% of responding countries, n=102) (2022)



Existence of guidelines and standards

Among responding countries, nearly two thirds (63%) stated that they have national guidelines and standards for the management of neurological disorders, developed and published by the government (Figures 4.6 and 4.7). Reported rates ranged between 61% and 100% across all WHO regions, except for the Eastern Mediterranean Region (33%) (Figure 4.6). Low-income and lower-middle-income countries were less likely to report having guidelines than upper-middle-income and high-income countries (Figure 4.7).

Figure 4.6

Existence of national guidelines and standards for neurological disorders, developed and published by the government (% of responding countries), by WHO region (2022)

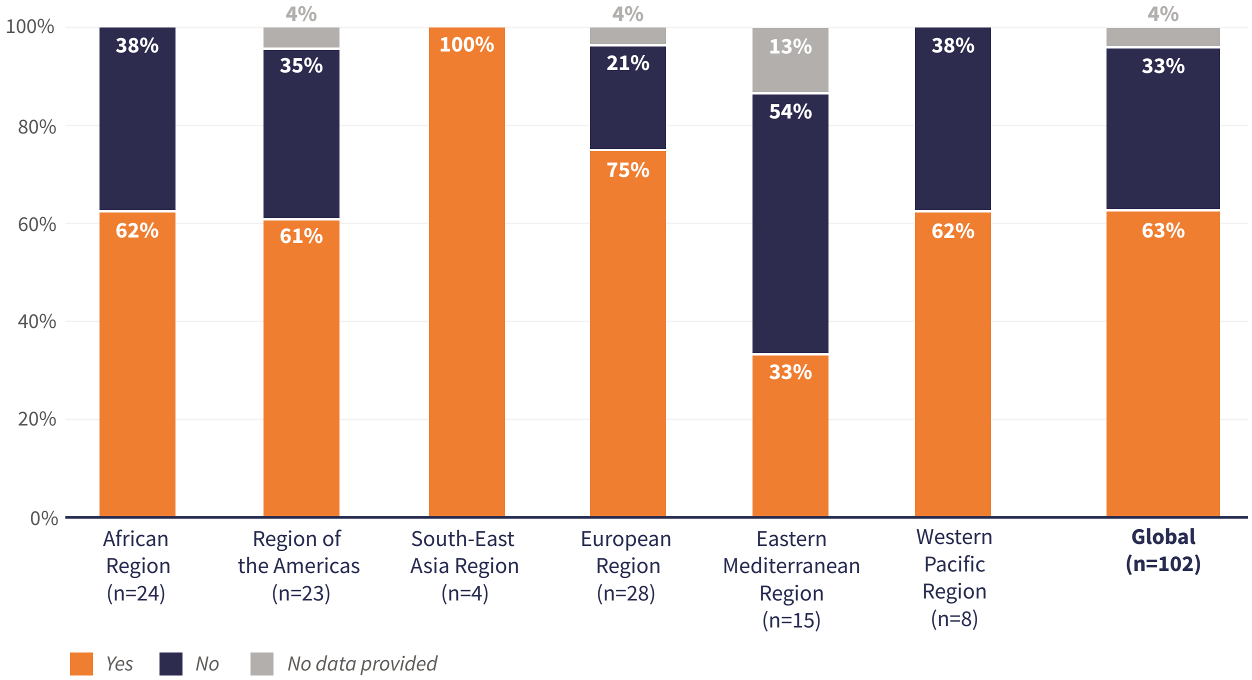
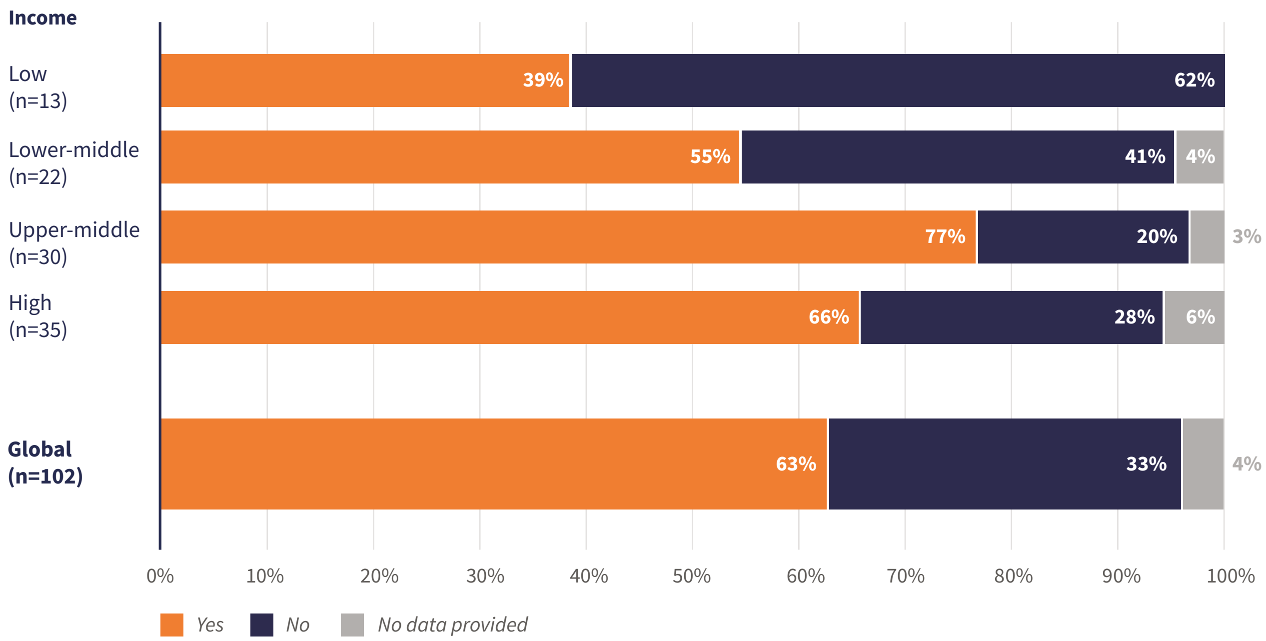


Figure 4.7

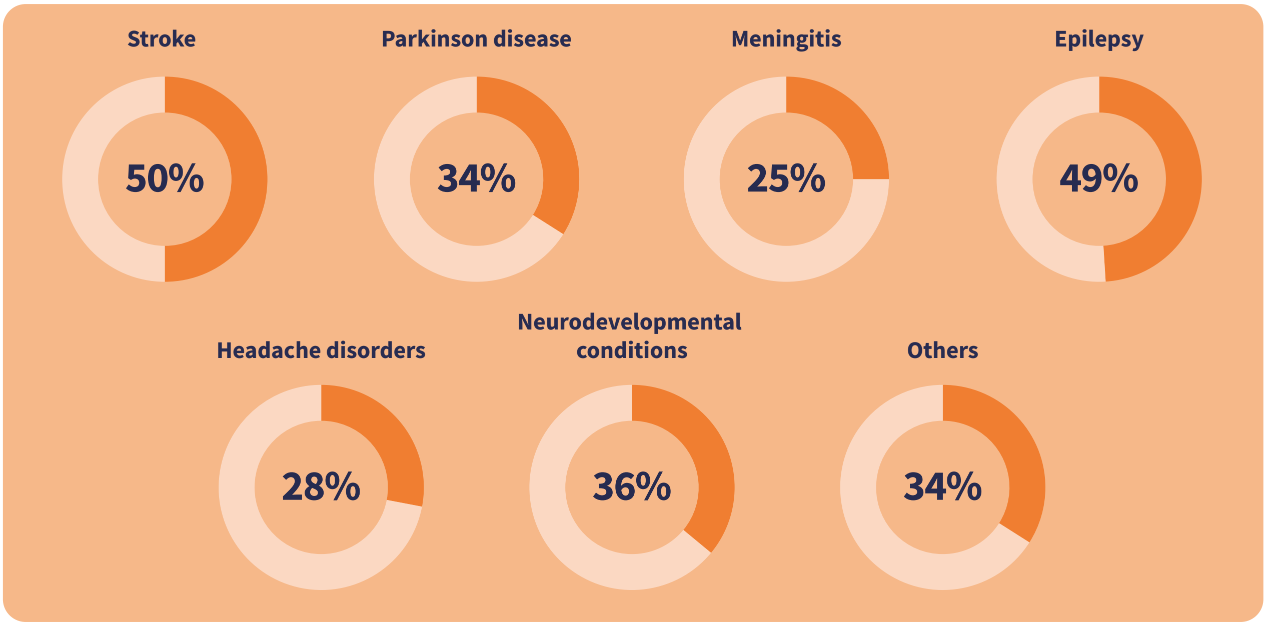
Existence of national guidelines and standards for neurological disorders, developed and published by the government (% of responding countries), by World Bank income group (2022)



Approximately half of responding countries reported having standards or guidelines for stroke and epilepsy (Figure 4.8). More than one third reported having them for neurodevelopmental conditions and Parkinson disease, while at least one in four stated having them for headache disorders and meningitis. In general, high-income and upper-middle-income countries reported having more neurological conditions covered by existing standards/guidelines than lower-middle-income and low-income countries (see Annex 4, Table A4.4, for a breakdown by WHO regions and World Bank income groups).

Figure 4.8

Neurological disorders included in existing guidelines or standards (% of responding countries, n=102) (2022)



Services for people with neurological disorders

Service availability

Services for people with neurological disorders encompass services focused on the prevention, diagnosis, treatment and/or rehabilitation of neurological disorders and that are provided as inpatient or outpatient services in public and/or private for-profit or non-profit general or specialist neurology or neurosurgery hospitals (including those for children and adolescents or other specific groups). These services are reported to be available in 92 of 102 responding countries. Most countries (84%; n=86) reported the availability of neurological services in specialized settings, while 57 countries (56%) reported having them also or only in non-specialized settings. Half (50%; n=51) reported offering these services in both specialized and non-specialized settings (Figures 4.9 and 4.10). A small subset (6%) of countries, from the African Region and the Region of the Americas, stated that services were exclusively available in non-specialized settings. In most regions, less than 10% of responding countries reported not providing any neurological services in any setting, except for the Western Pacific Region (potentially due to a low response rate).

Among responding countries reporting the availability of neurological services in both settings, substantial variations existed across regions and income groups (Figures 4.9 and 4.10). Reported rates were highest in the European Region (68%) and Western Pacific Region (63%), and lowest in the Eastern Mediterranean Region (33%) and African Region (38%). Additionally, rates for this indicator were twice as high in high-income countries (63%) compared to low-income countries (31%).

For data on availability of neurological services in specialized settings or in non-specialized settings, by WHO region and World Bank income group, see Annex 4, Table A4.5 (specialized settings) and Table A4.6 (non-specialized settings).

Figure 4.9

Service availability for people with neurological disorders (% of responding countries), by WHO region (2022)

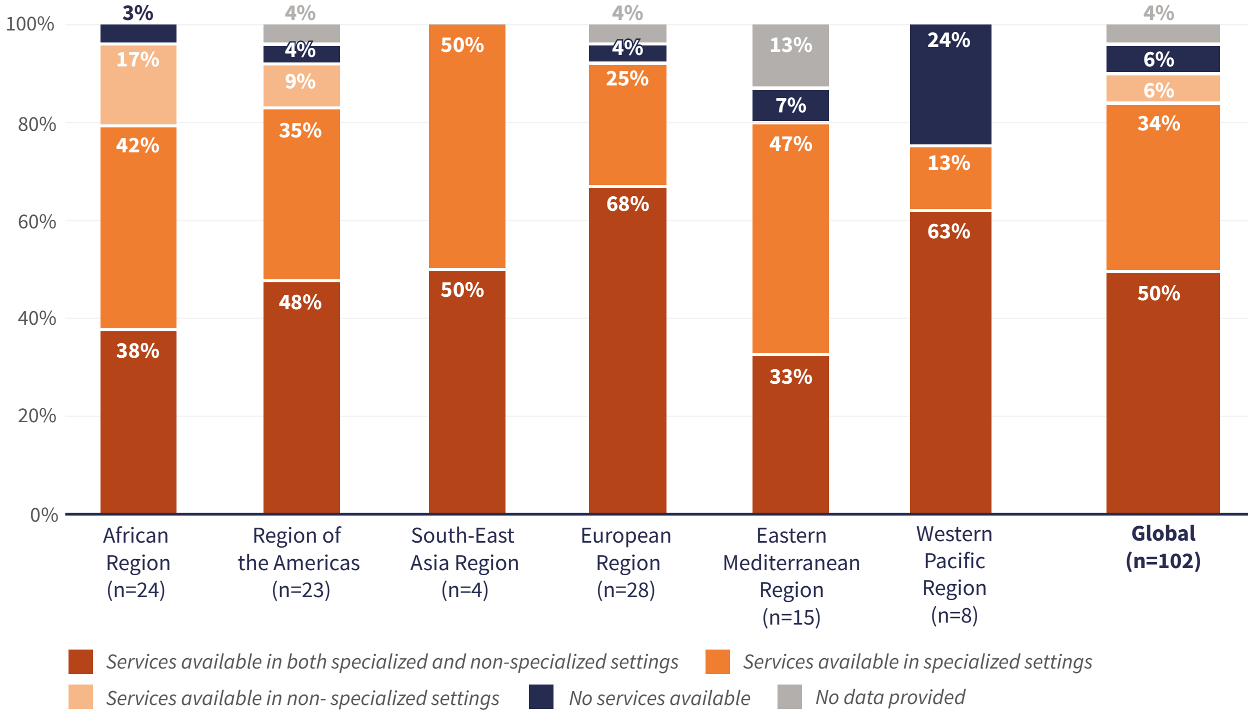
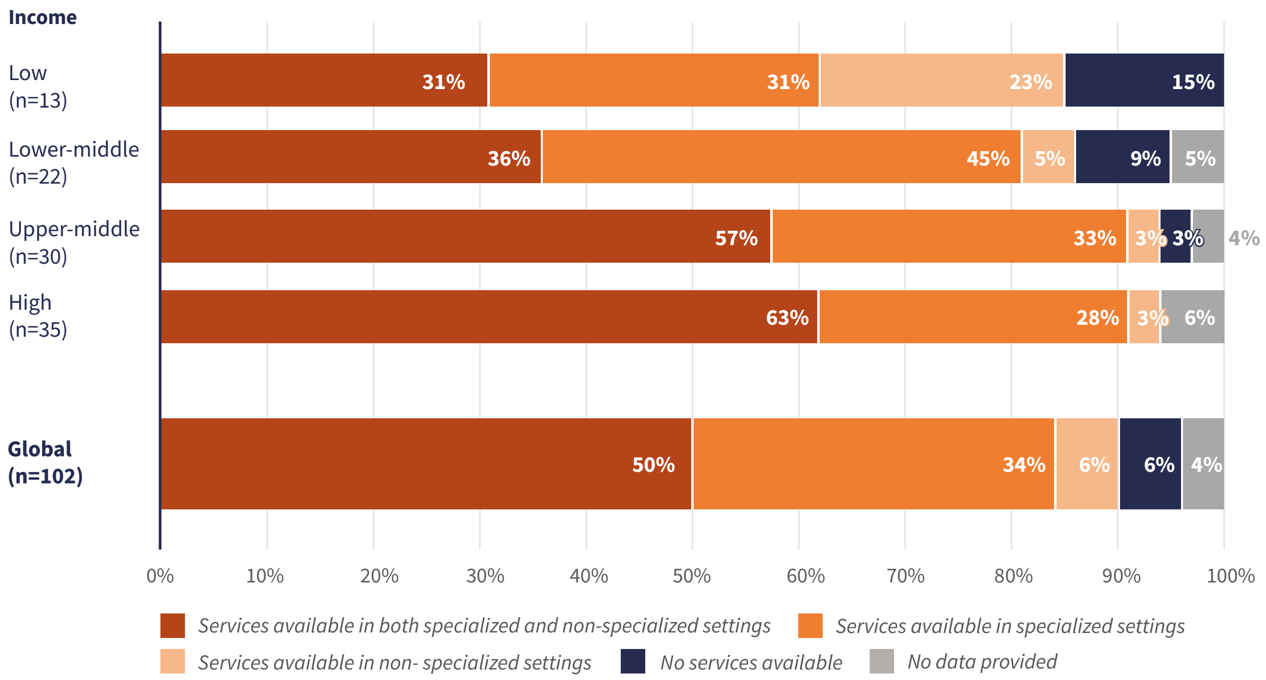
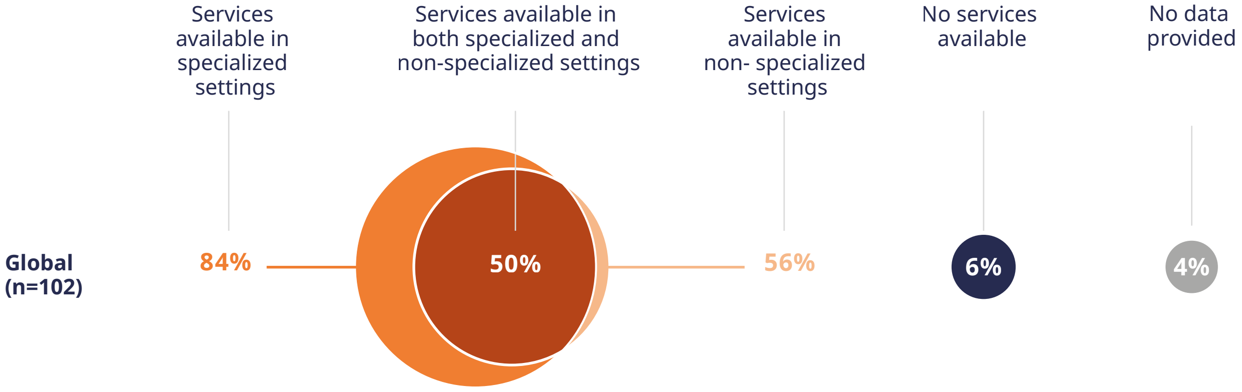


Figure 4.10

Service availability for people with neurological disorders (% of responding countries), by World Bank income group (2022)





Globally, specialist wards and clinics were the most reported settings for neurological care (both over 70%), followed by rehabilitation units and stroke units (both available in at least 60% of responding countries) (Table 4.2). Overall, fewer low-income countries reported providing neurological services in specialized settings compared to other income groups. While over 50% of responding countries across all income groups reported having specialist wards and clinics, other specialized settings were less commonly reported by low-income countries. For example, among responding countries, only 38% of low-income countries reported having rehabilitation units, and less than one fourth had stroke units (23%) or neuro-intensive care units (23%). Similarly, the reported availability of palliative care services was nearly twice as high in high-income and upper-middle-income countries (69% and 63%, respectively) compared to lower-middle-income and low-income countries (36% and 38%, respectively).

Table 4.2

Availability of neurological services in specialized settings (% of responding countries, n=102) (2022)

	Specialist wards	Specialist clinics	Stroke units	Neuro-intensive care units	Rehabilitation units	Palliative care	Other specialized settings	N (WHO Member States)
Global (n=102)	**78%**	**75%**	**61%**	**58%**	**69%**	**56%**	**11%**	**194**
WHO region								
African Region (n=24)	71%	71%	46%	29%	63%	46%	8%	47
Region of the Americas (n=23)	74%	83%	48%	52%	61%	52%	17%	35
South-East Asia Region (n=4)	100%	100%	100%	75%	75%	75%	25%	11
European Region (n=28)	93%	79%	79%	79%	89%	75%	11%	53
Eastern Mediterranean Region (n=15)	80%	67%	67%	73%	60%	47%	7%	21
Western Pacific Region (n=8)	50%	50%	50%	50%	50%	38%	0%	27
World Bank income group								
Low-income (n=13)	62%	54%	23%	23%	38%	38%	8%	26
Lower-middle-income (n=22)	82%	73%	64%	50%	59%	36%	9%	50
Upper-middle-income (n=30)	83%	87%	67%	70%	80%	63%	13%	52
High-income (n=35)	80%	74%	69%	66%	77%	69%	9%	63

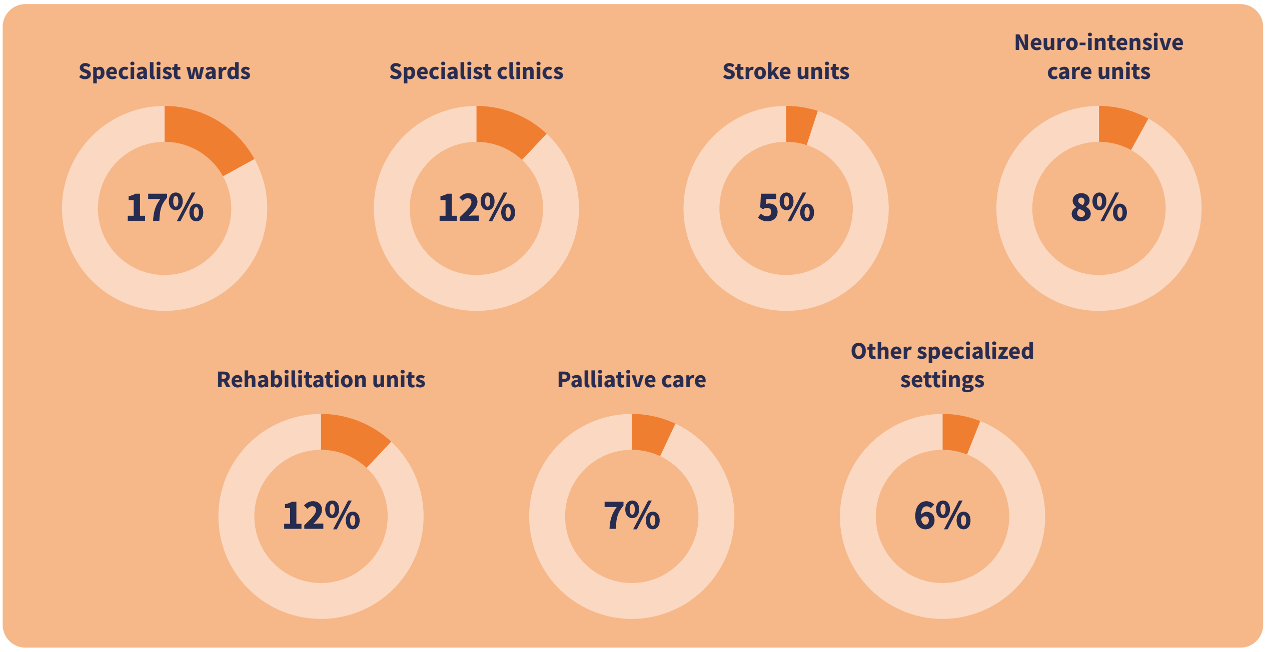
Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Overall, fewer responding countries reported providing neurological services for children in specialized settings (17% or less globally) (Figure 4.11). Notably, rates in low-income, lower-middle-income, and upper-middle-income countries were substantially lower than those reported by high-income countries, where neurological services for children were provided by at least 40% of countries or more in specialist wards (50%) and in rehabilitation units (43%) (see Annex 4, Table A4.7 for a breakdown by WHO regions and World Bank income groups).

Specialized neurological services for children are often lacking, particularly in LMICs.

Figure 4.11

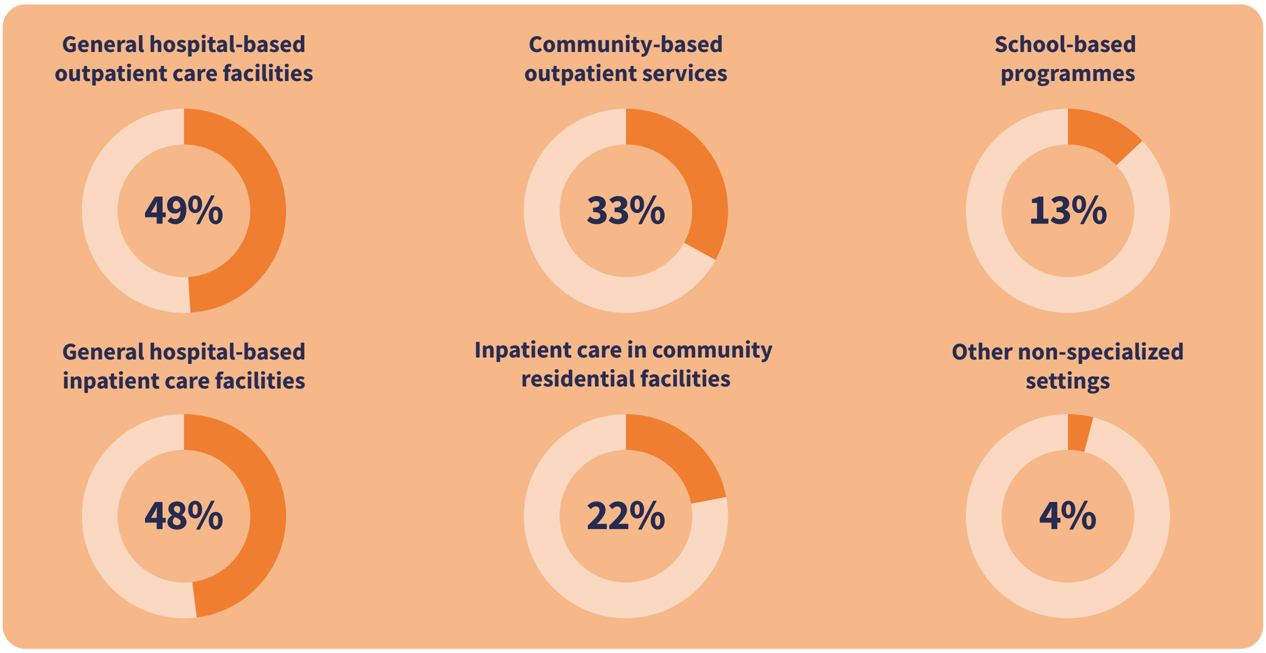
Availability of neurological services for children in specialized settings (% of responding countries, n=102) (2022)



Globally, almost half of responding countries (44%) stated that they did not provide neurological services in non-specialized settings. Among those that did, the most reported non-specialized settings were general hospital-based outpatient and inpatient care facilities (49% and 48% of responding countries, respectively), followed by community-based outpatient services (33%) (Figure 4.12). Fewer than one fourth of responding countries stated that they offered these services in community residential facilities (22%) or school-based programmes (13%). Availability varied by regions and income group. (Annex 4, Table A4.8).

Figure 4.12

Availability of neurological services in non-specialised settings (% of responding countries, n=102) (2022)



Service accessibility

Reported accessibility of neurological services varied between specialized and non-specialized settings. Globally, access to neurological services in specialized settings was geographically restricted, with only 16% of responding countries reporting accessibility in both rural and urban areas (Figures 4.13 and 4.14). In 22% of responding countries, these services were accessible only in the capital, and in 42%, only in urban areas. Across WHO regions, the percentage of responding countries reporting access to neurological services in specialized settings in both urban and rural areas was lowest in the African Region (4%), ranging from 13% to 25% in other regions (Figure 4.13). In low-income and lower-middle-income countries, accessibility was almost entirely restricted to the capital or urban areas, with 0% of low-income countries and only 5% of lower-middle-income countries reporting their accessibility in rural and urban areas (Figure 4.14).

Only 16 countries report that neurological services in specialized settings are accessible in both urban and rural areas.

Figure 4.13

Accessibility of neurological services in specialized settings (% of responding countries), by WHO region (2022)

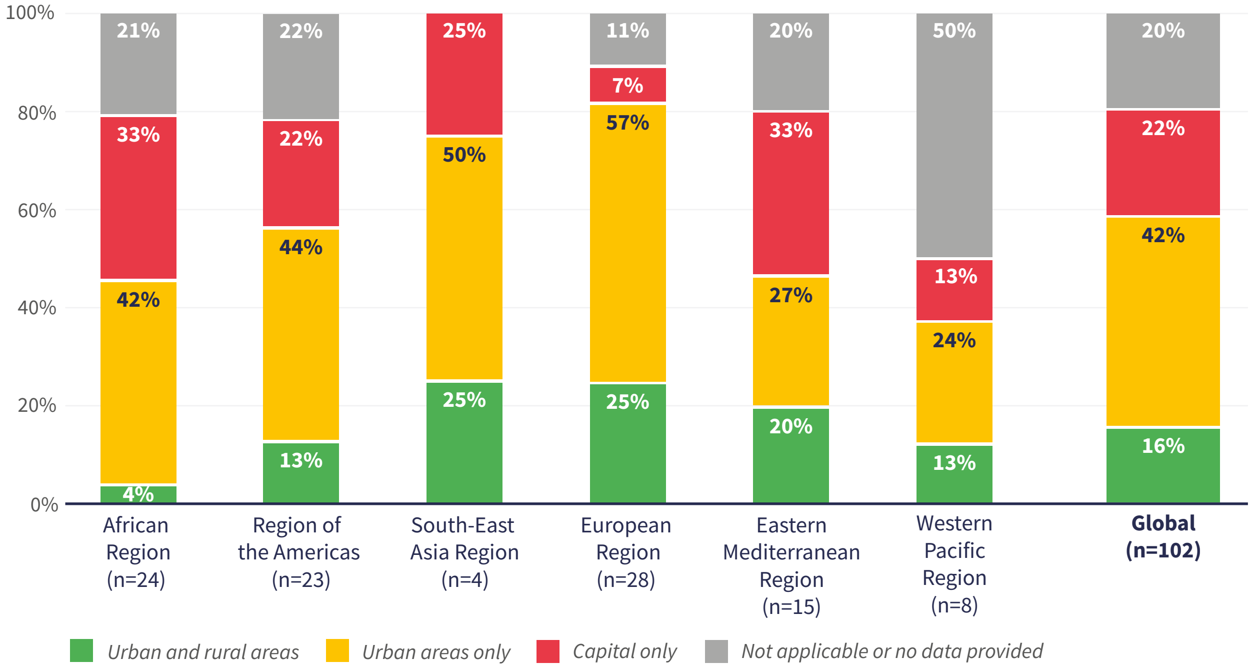
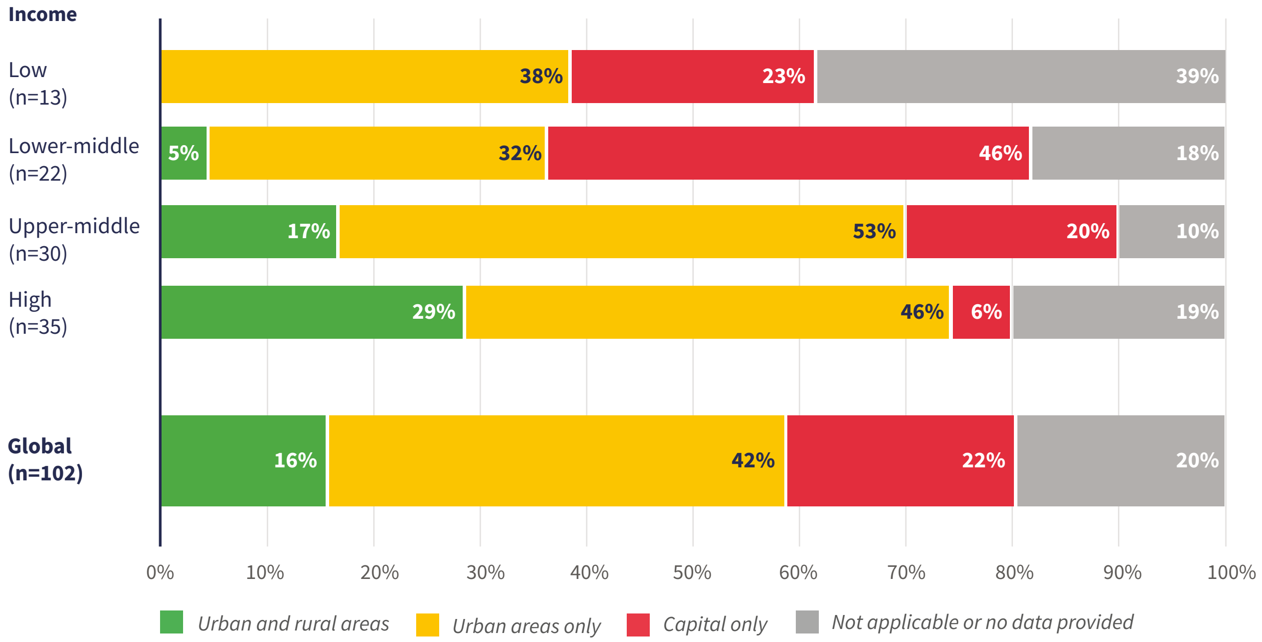


Figure 4.14

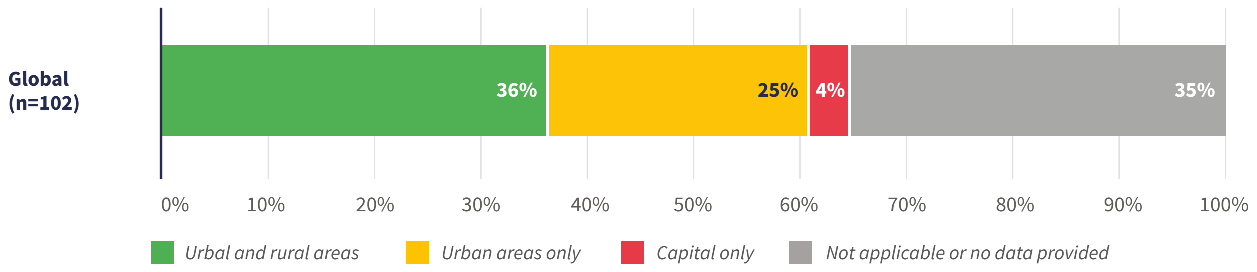
Accessibility of neurological services in specialized settings (% of responding countries), by World Bank income group (2022)



By contrast, neurological services in non-specialized settings were reportedly more universally accessible, with more than one third (36%) of responding countries reporting their accessibility in both rural and urban areas (Figure 4.15). Only 4% of responding countries stated that neurological services in non-specialized settings were limited to the capital, while 25% reported that such services were at least accessible in urban areas. Reported universal (urban and rural) service accessibility rates for non-specialized settings were greatest in the Western Pacific Region (50%) and the European Region (46%) and increased with countries' income group levels, ranging from 23% in low-income countries to 49% in high-income ones (Annex 4, Table A4.9).

Figure 4.15

Accessibility of neurological services in non-specialized settings (% of responding countries, n=102) (2022)



Service provider

Among responding countries, neurological services in specialized settings were mostly provided by the public sector (41%) or by a combination of public and private sectors (28%) (Figure 4.16). Only 11% of responding countries stated that such services were largely provided by the private sector, with the highest rates in the South-East Asia Region (25%) and the Eastern Mediterranean Region (27%) (Annex 4, Table A4.10). Some 13–23% of low-income, lower-middle-income, and upper-middle-income countries reported majority private sector service provision, whereas no high-income countries did so (Annex 4, Table A4.10).

For neurological services in non-specialized settings, the share of responding countries reporting exclusive private sector service provision was very small (3%) (Figure 4.17), ranging from 0% in most WHO regions to 13% in the Eastern Mediterranean Region (Annex 4, Table A4.11).

Figure 4.16

Majority provider of neurological services in specialized settings (% of responding countries, n=102) (2022)

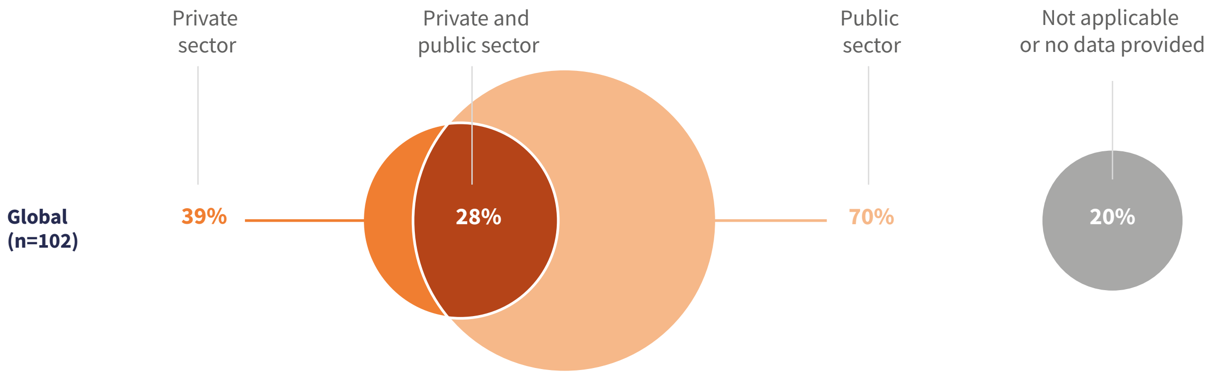
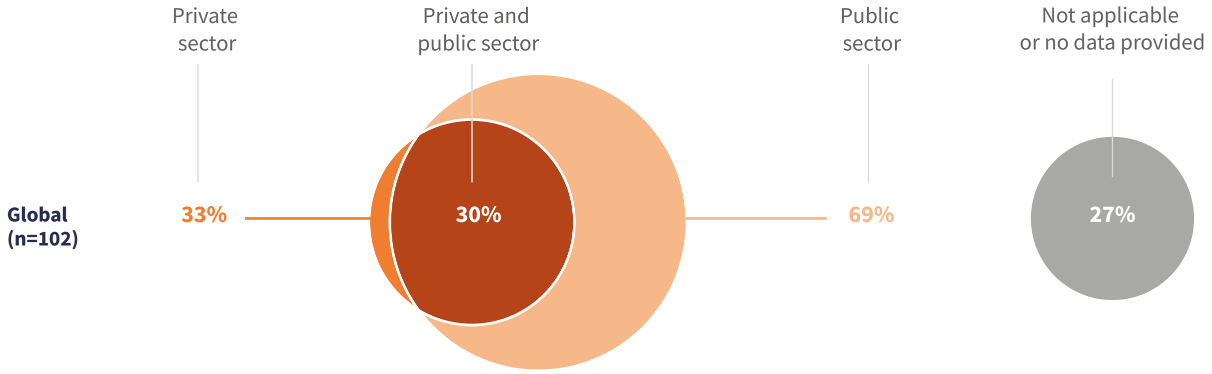


Figure 4.17

Majority provider of neurological services in non-specialized settings (% of responding countries, n=102) (2022)



Access to carer services, supports or programmes

IGAP survey data indicate insufficient availability of services, supports, or programmes for carers of people with neurological disorders. Globally, less than half of responding countries (45%) reported providing these services. The Eastern Mediterranean Region reported the lowest rates (20%) and the European Region the highest rates (68%) (Figure 4.18). Inequities across income groups were substantial, with low-income countries reporting the lowest rates (15%), followed by lower-middle-income countries (27%), whereas the majority of high-income countries stated that they provided such services (Figure 4.19).

Figure 4.18

Availability of services, supports or programmes for carers of people with neurological disorders (% of responding countries), by WHO region (2022)

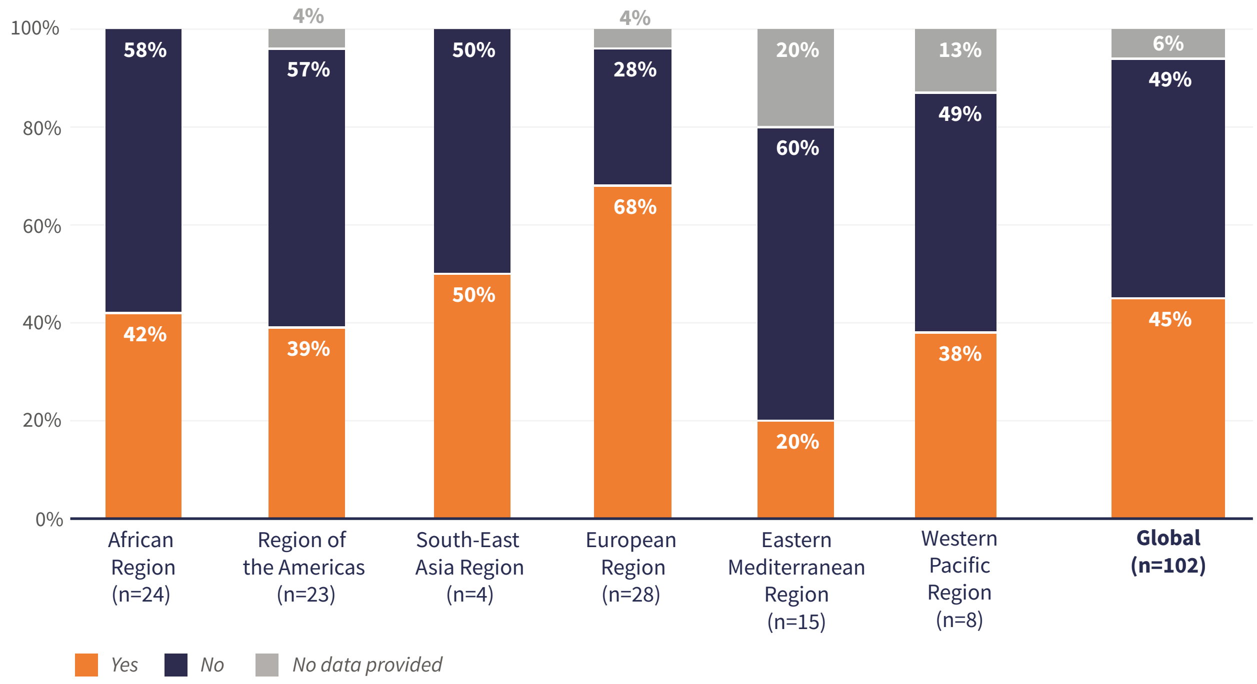
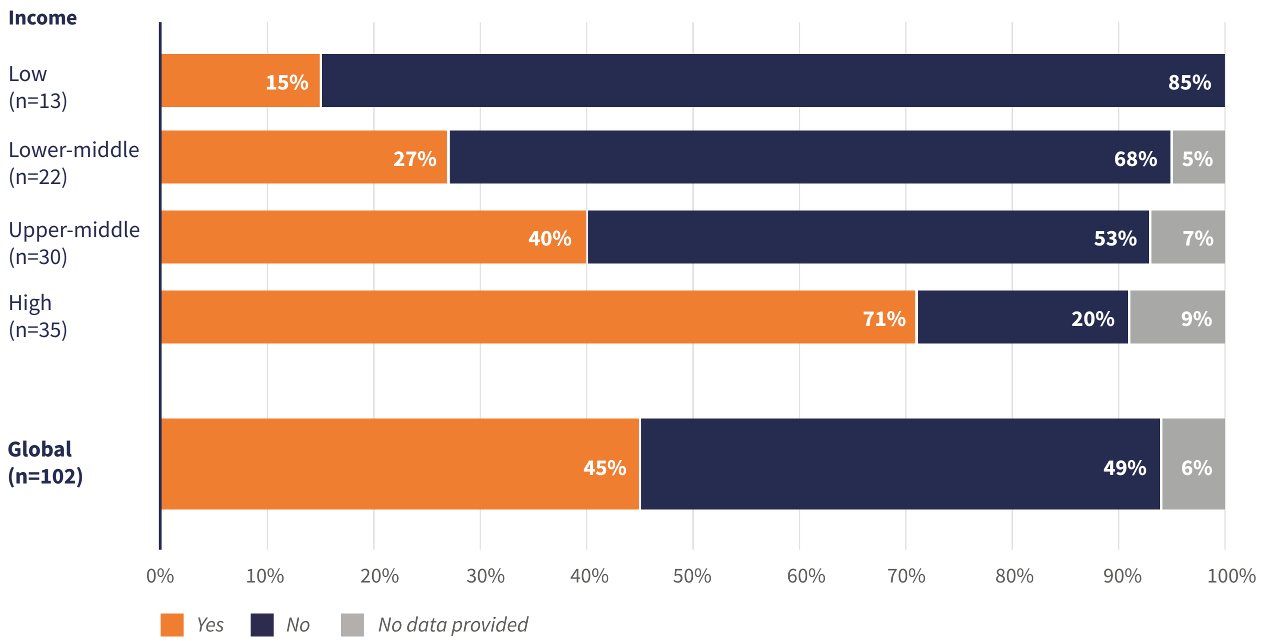


Figure 4.19

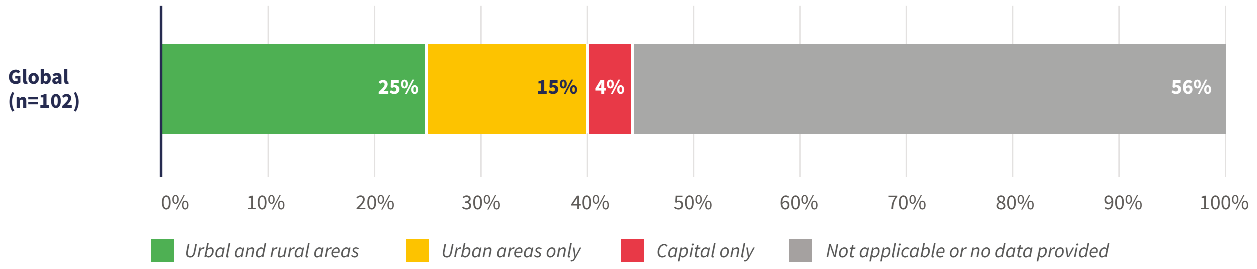
Availability of services, supports or programmes for carers of people with neurological disorders (% of responding countries), by World Bank income group (2022)



Globally, only a quarter of responding countries reported that carer services were accessible in both urban and rural areas (Figure 4.20). The European Region reported the highest access of all regions (46%) and high-income countries reported substantially higher access rates than low-income, lower-middle-income, and upper-middle-income countries (51% and 8%, 9%, 17%, respectively) (Annex 4, Table A4.12).

Figure 4.20

Accessibility of services, supports or programmes for carers of people with neurological disorders (% of responding countries, n=102) (2022)



Globally, less than half of responding countries stated that they provided social and financial protection benefits to carers of people with neurological disorders (Figures 4.21 and 4.22). Regionally, less than one third of responding countries in the African, Americas and South-East Asia regions reported having such mechanisms, compared to over two thirds of responding countries in the European Region (Figure 4.21). These mechanisms were reported to be entirely absent in low-income countries and unavailable in most lower-middle-income countries (77%), while only 20% of high-income countries reported not having them (Figure 4.22).

Figure 4.21

Existence of social and financial protection mechanisms for carers of people with neurological disorders (% of responding countries), by WHO region (2022)

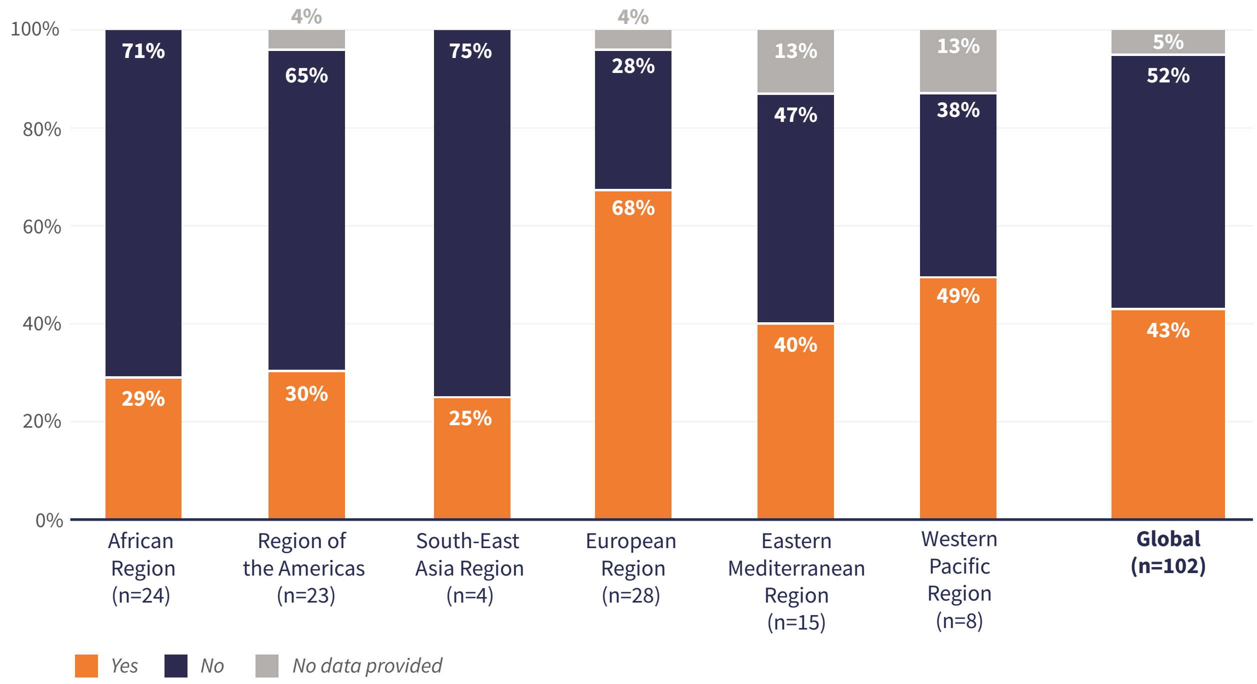
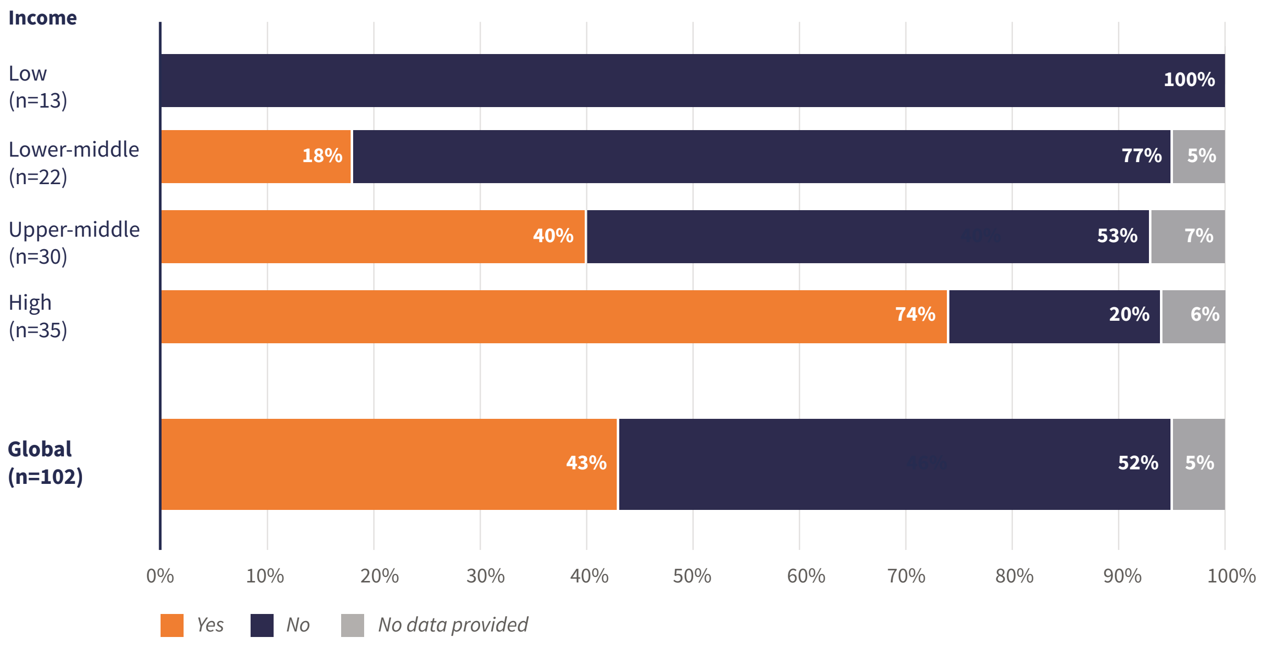


Figure 4.22

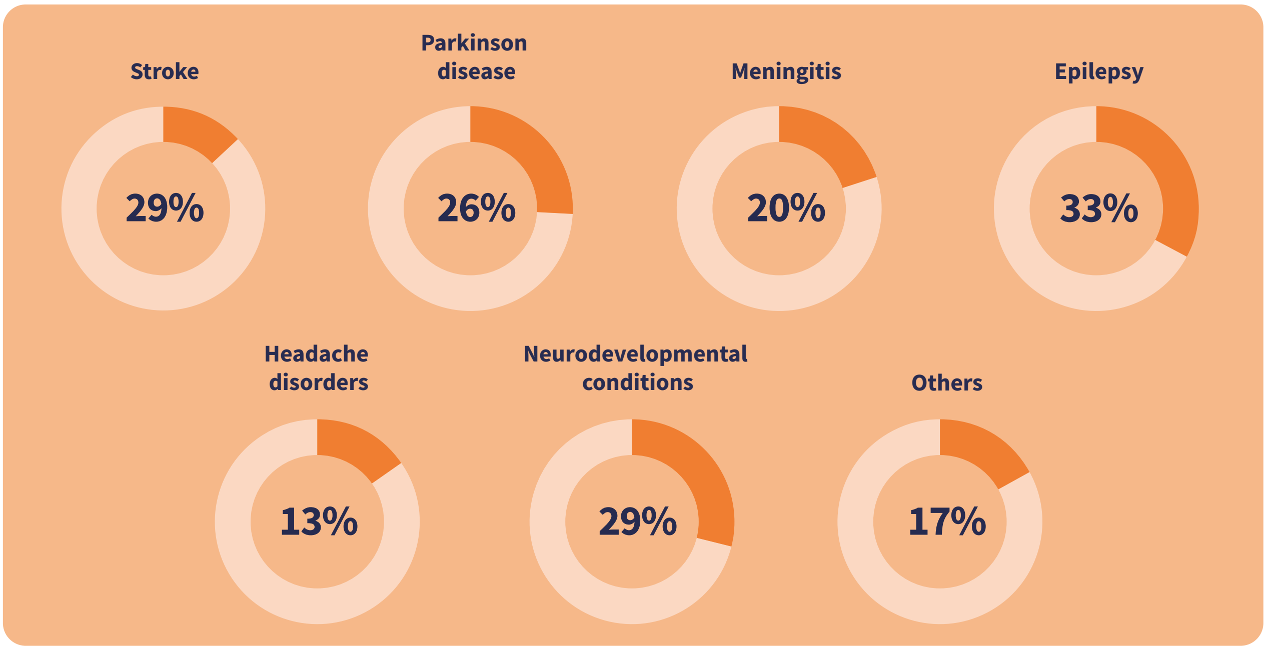
Existence of social and financial protection mechanisms for carers of people with neurological disorders (% of responding countries), by World Bank income group (2022)



Globally, epilepsy is the neurological tracer condition for which most responding countries (33%) reported providing social/financial protection benefits to carers, followed by stroke and neurodevelopmental conditions (29% each) (see Figure 4.23). Headache disorders were least commonly included. The proportion of countries providing protection benefits for each tracer condition increased with responding countries' income levels. Across WHO regions, the European Region reported the greatest proportion of countries providing carer benefits, with rates exceeding 30% for all tracer conditions (except headache disorders) (Annex 4, Table A4.13).

Figure 4.23

Neurological disorders included in social/financial protection mechanisms for carers (% of responding countries, n=102) (2022)



Availability of medicines, diagnostics and other health products for neurology

IGAP stipulates (in its global target 2.2) the need for Member States to provide essential medicines and basic technologies for neurological disorders in primary care. In the IGAP survey, the latter were defined as including diagnostic and therapeutic technologies, medical devices, assistive technologies, digital health technologies, information and communication technologies, technology-assisted information and training, and other technologies required for the effective management of neurological disorders.

At baseline, 57 countries (56% of responding countries, 29% of WHO Member States) met global target 2.2 by reporting the provision of essential medicines and basic technologies for neurological disorders in primary care with universal accessibility (urban and rural areas) (Table 4.3). Reported rates of WHO Member States meeting this target were generally low, ranging from 15% in the Western Pacific Region to 38% in the African Region, and increased slightly with countries' income levels. Notably, less than one fourth of WHO Member States met a stricter definition of the global target, requiring essential medicines to also be affordable (50% or less out-of-pocket payment) (Annex 4, Table A4.14).

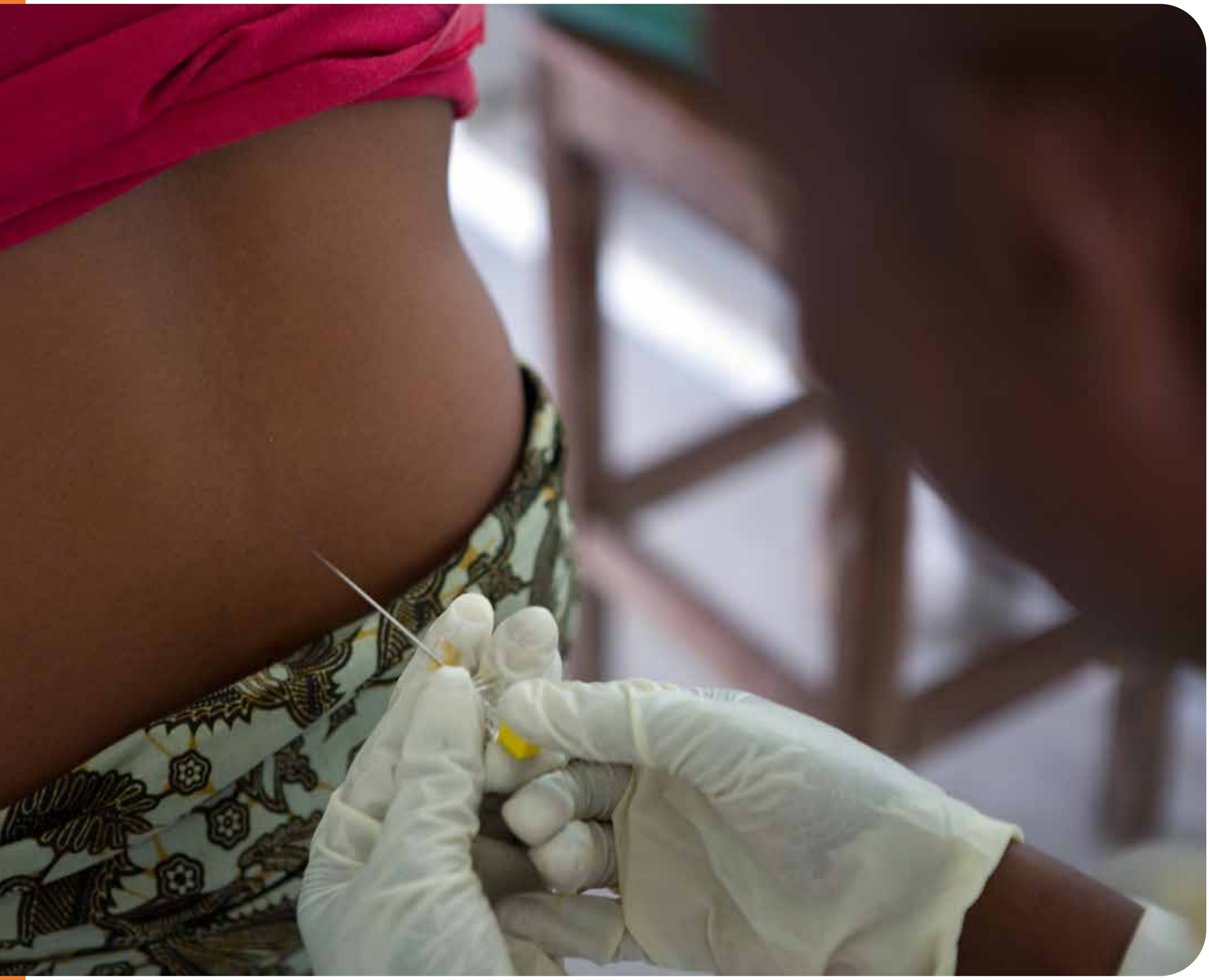
Table 4.3

IGAP global target 2.2: Provision of essential medicines and basic technologies for neurological disorders in primary care (2022)

	Countries with universal accessibility (urban and rural areas)	Percentage of responding countries	Percentage of WHO Member States
Global (n=102)	**57**	**56%**	**29%**
WHO region			
African Region (n=24)	18	75%	38%
Region of the Americas (n=23)	10	43%	29%
South-East Asia Region (n=4)	2	50%	18%
European Region (n=28)	19	68%	36%
Eastern Mediterranean Region (n=15)	4	27%	19%
Western Pacific Region (n=8)	4	50%	15%
World Bank income group			
Low-income (n=13)	6	46%	23%
Lower-middle-income (n=22)	12	55%	24%
Upper-middle-income (n=30)	15	50%	29%
High-income (n=35)	24	69%	38%

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

In total, 82 responding countries (80%) reported the availability of essential medicines and basic technologies for managing neurological disorders in primary care, although with varying degrees of accessibility (Figures 4.24 and 4.25). While more than half of responding countries reported universal accessibility (urban and rural areas), meeting global target 2.2, a fifth reported that accessibility was limited to urban areas, and four countries stated that these resources were accessible only in their capital cities. Universal accessibility rates varied substantially across WHO regions, with the highest rates reported in the African (75%) and European regions (68%) and the lowest in the Eastern Mediterranean Region (27%) (Figure 4.24). However, when factoring in affordability – defined here as 50% or less out-of-pocket payment – as a criterion for the accessibility of essential medicines, universal accessibility rates in the African Region declined to 38%, while rates in the European Region remained stable at 68% (Annex 4, Table A4.14). Across World Bank income groups, universal accessibility was reported to be highest in high-income countries (69%) and lowest in low-income countries (46%) (Figure 4.25).



A health care provider performing a diagnostic lumbar puncture in a patient with African trypanosomiasis (sleeping sickness) at the Center of Trypanosomiasis screening, prevention and control, Malouka Hospital. Democratic Republic of the Congo, 2013. © WHO / Harandane Dicko

Figure 4.24

Accessibility of essential medicines and basic technologies for neurological disorders in primary care (% of responding countries), by WHO region (2022)

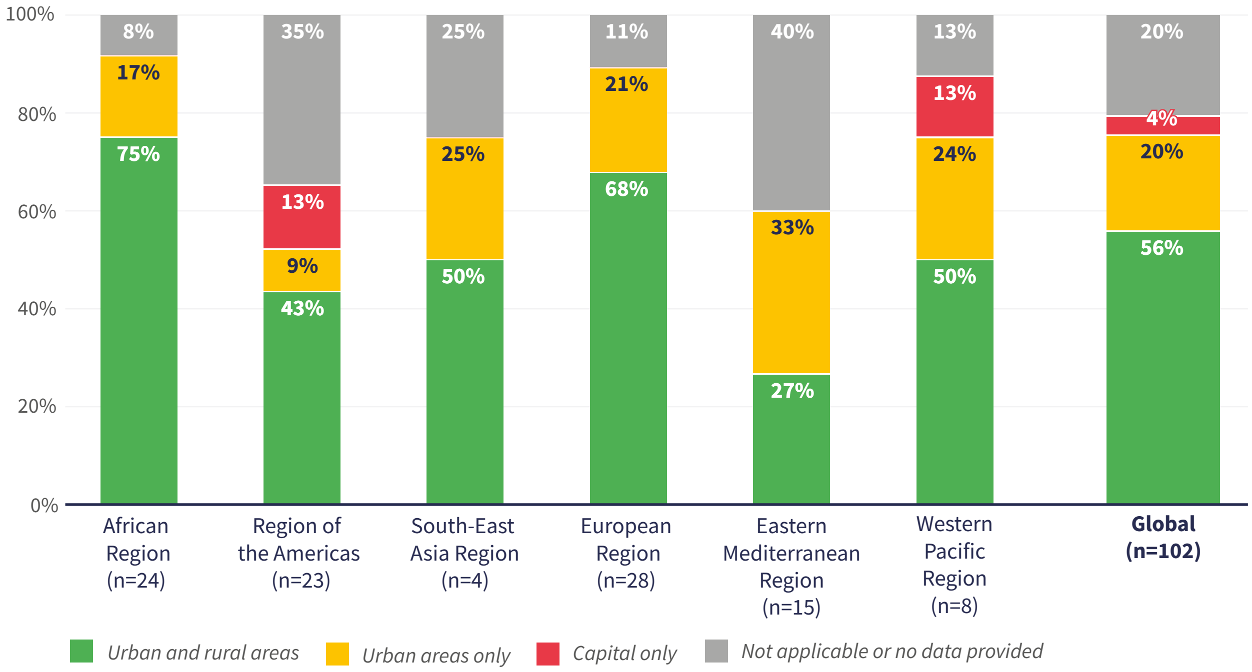
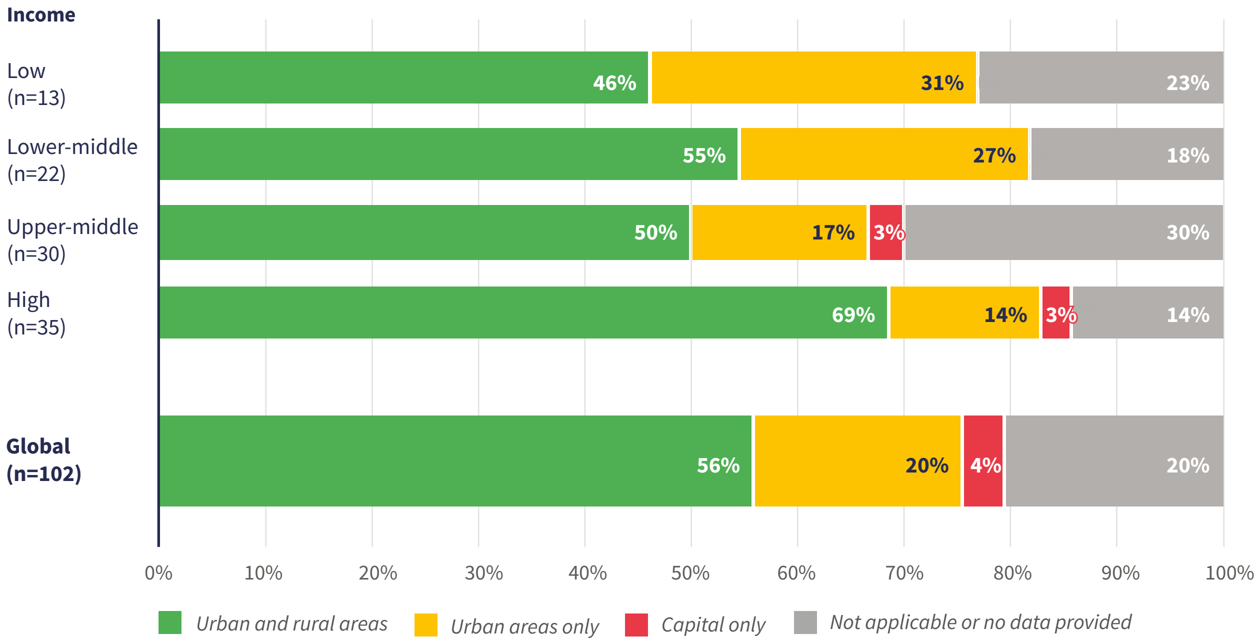


Figure 4.25

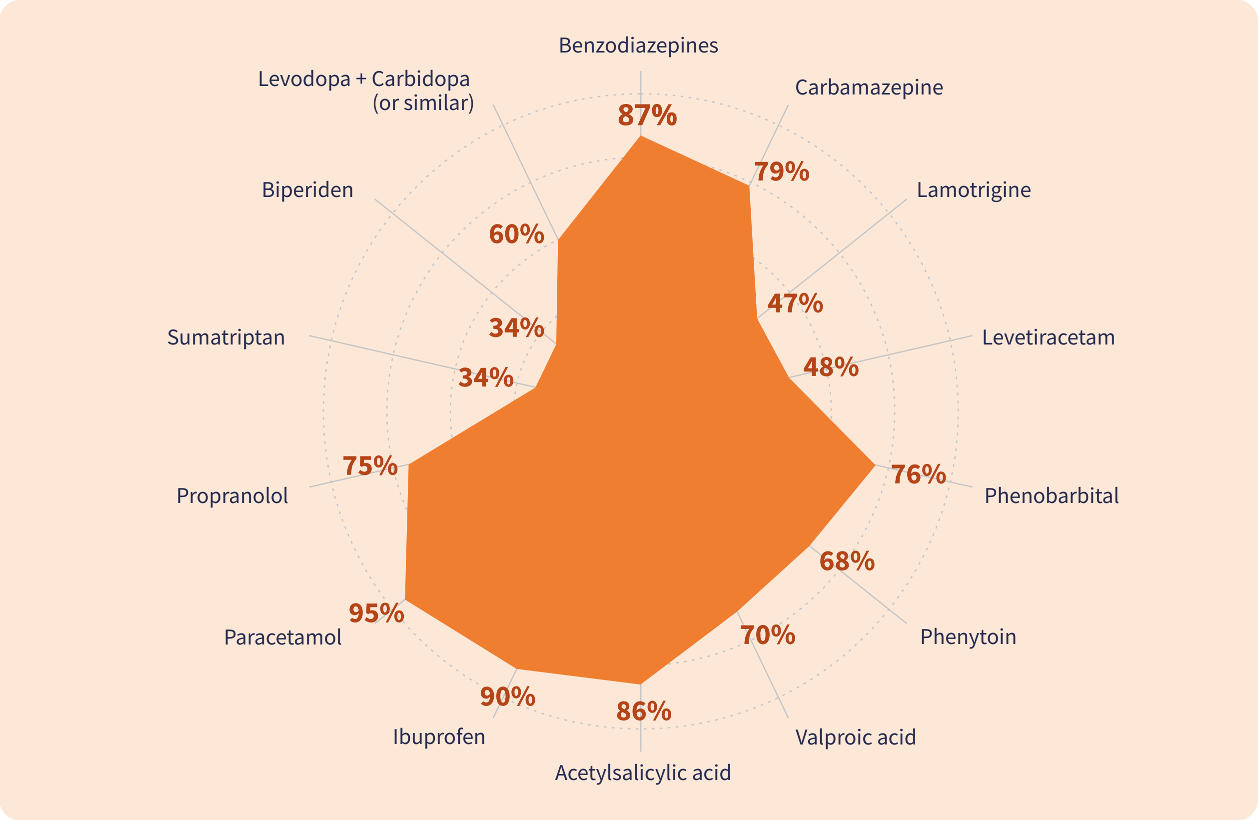
Accessibility of essential medicines and basic technologies for neurological disorders in primary care (% of responding countries), by World Bank income group (2022)



Global reporting on a basket of essential medicines for neurological disorders (including selected antiseizure, antimigraine/headache and antiparkinsonian medicines) suggests that 10 of the 14 included medicines were generally available in primary care facilities in at least half of the responding countries (Figure 4.26). Paracetamol (95%) and ibuprofen (90%) were the most widely available essential medicines in responding countries, followed by benzodiazepines (87%) and acetylsalicylic acid (86%). The least available medicines were biperiden and sumatriptan (34% each). Overall, low-income and lower-middle-income countries reported lower general availability of the 14 medicines in primary care facilities (see Annex 4, Table A4.15, for a breakdown by WHO regions and World Bank income groups).

Figure 4.26

Medicines for neurological disorders generally available* in public sector primary care facilities (% of responding countries, n=102) (2022)



*"Generally available" refers to medicines available in 50% or more of primary care facilities.

Health workers’ capacity, training and support

IGAP stresses the importance of strengthening the health and social care workforce capacity, including through training and education of an interdisciplinary workforce extending to the primary health care level, to provide adequate, holistic and person-centred care to people with neurological disorders.

Health workers’ capacity

IGAP survey data indicate a dearth of neurological workforce in many parts of the world. Data from reporting countries indicate that the median number of neurologists was approximately 0.94 (70 countries), child neurologists 0.10 (57 countries), and neurosurgeons 0.56 (59 countries) per 100 000 population, with uneven distribution across WHO regions and World Bank income groups (see Table 4.4, Figure 4.27). Among the 70 responding countries, high-income countries reported a median number of neurologists that was 2.3 times that of upper-middle-income countries, nearly 18 times that of lower-middle-income countries, and over 80 times that of low-income countries (Table 4.4). Overall, reported median workforce numbers were lowest among child neurologists – approximately one child neurologist per 1 million population globally – with even greater discrepancies observed across World Bank income groups. Contributing high-income countries also reported a higher median density of neurosurgeons per 100 000 population compared to other income groups – twice as many as upper-middle-income countries, six times as many as lower-middle-income countries, and over 60 times as many as low-income countries (Table 4.4). Regional variations were substantial, with the lowest median neurological workforce numbers reported in the African and South-East Asia regions and the highest numbers in the European Region. For example, contributing countries in the European Region reported a median number of neurologists per 100 000 population that was 8.63, corresponding to a rate 227 times greater than for contributing countries in the African Region and 47 times greater than for contributing countries in the South-East Asia Region (Table 4.4). Contributing low-income countries reported having, on average, 1 neurologist per 2.5 million population (0.04/100 000), while in contributing high-income countries the figure was 1 neurologist per 17 800 population (5.63/100 000) (Table 4.4).

> "IGAP survey data indicate a dearth of neurological workforce in many parts of the world."

Table 4.4

Average and median number of specialist neurological workforce per 100 000 population (public and private sectors combined) (2022)

	Neurologists					Child neurologists					Neurosurgeons					N[1]	N[2]
	Median of country-level densities	Average of country-level densities	Min	Max	n	Median of country-level densities	Average of country-level densities	Min	Max	n	Median of country-level densities	Average of country-level densities	Min	Max	n		
Global	**0.94**	**2.87**	**0**	**15.25**	**70**	**0.10**	**0.37**	**0**	**2.43**	**57**	**0.56**	**0.88**	**0**	**3.24**	**59**	**102**	**194**
WHO region																	
African Region	0.04	0.24	0.00	1.87	20	0.01	0.03	0.00	0.17	15	0.05	0.15	0.00	0.93	17	24	47
Region of the Americas	0.74	0.75	0.06	1.59	11	0.06	0.08	0.00	0.33	9	0.42	0.60	0.07	1.59	8	23	35
South-East Asia Region	0.18	0.28	0.00	0.76	4	0.03	0.06	0.00	0.20	4	0.26	0.30	0.08	0.62	4	4	11
European Region	8.63	8.46	1.88	15.25	20	0.82	0.99	0.05	2.43	18	1.92	1.78	0.36	3.24	20	28	53
Eastern Mediterranean Region	1.38	1.41	0.08	3.19	11	0.16	0.18	0.00	0.34	8	0.82	0.87	0.04	2.18	7	15	21
Western Pacific Region	0.52	0.56	0.01	1.34	4	0.08	0.06	0.00	0.09	3	0.49	0.55	0.04	1.10	3	8	27
World Bank income group																	
Low-income	0.03	0.04	0.00	0.10	11	0.00	0.003	0.00	0.01	8	0.02	0.03	0.00	0.07	9	13	26
Lower-middle-income	0.15	0.43	0.00	2.09	17	0.02	0.05	0.00	0.20	16	0.20	0.25	0.04	0.85	14	22	50
Upper-middle-income	1.18	3.24	0.11	15.25	18	0.16	0.47	0.00	2.43	16	0.62	1.04	0.12	2.46	15	30	52
High-income	2.70	5.63	0.39	13.96	24	0.76	0.74	0.00	2.22	17	1.23	1.55	0.28	3.24	21	35	63

*Average per 100,000 population, n = reporting countries, N[1] = responding countries, N[2]= WHO Member States

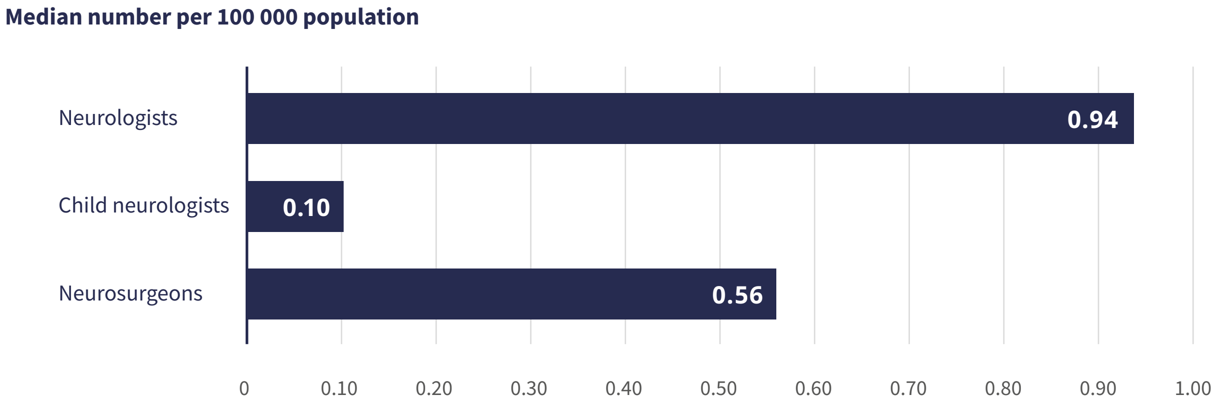
Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing. Values are rounded to two decimals.

Figures presented are based on country-level densities. For regions and sub-groups with low response rates, averages may not be representative of the overall population.

Analyses concerning the accessibility of specialist neurological workforce were hampered by limited data, with less than 25% of responding countries reporting on disaggregation of specialist neurological workforce numbers by rural and urban areas.

Figure 4.27

Neurological workforce availability, global (2022)

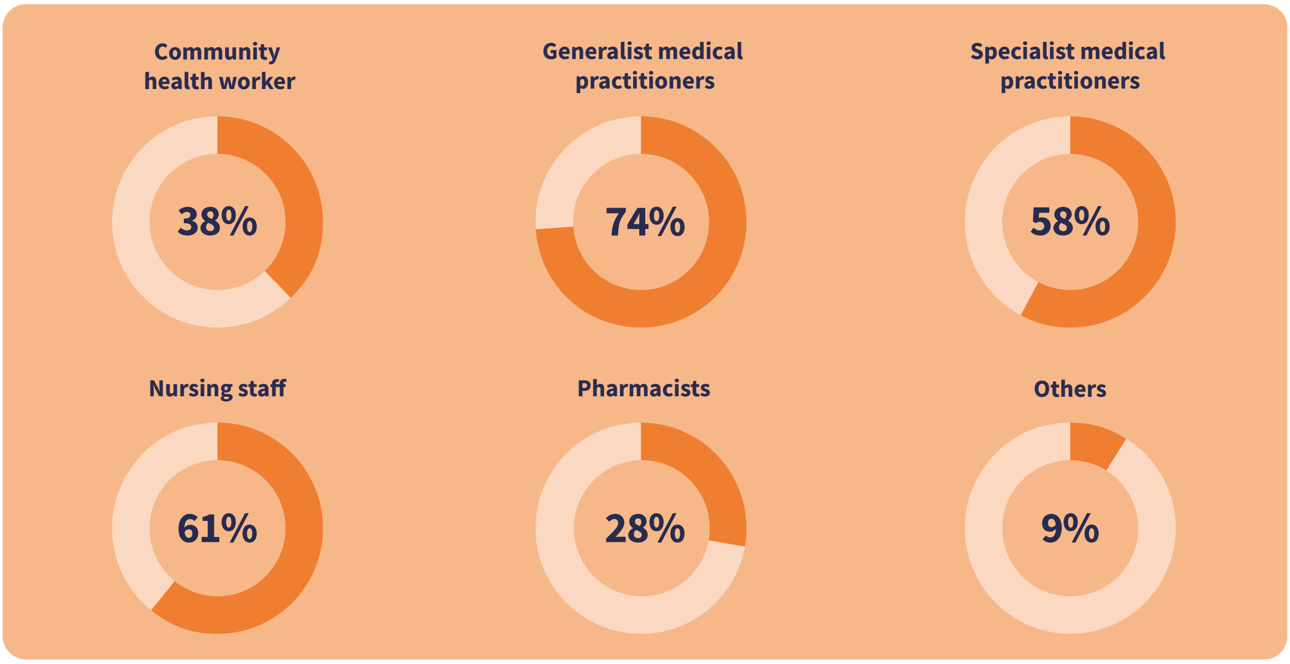


Health workers’ training and support

IGAP survey data indicate that most responding countries (n=78; 76%) across WHO regions and World Bank income groups provided training to the health workforce at the primary care level to identify, refer and/or manage people with neurological disorders (Annex 4, Table A4.16). Among these, most (n=55; 71%) reported providing both pre-service education and in-service training, while fewer offered only in-service training (n=14; 18%) or only pre-service education (n=2; 3%) (data not shown). The cadres most trained (training rates >50% across responding countries) were generalist medical practitioners (e.g. general doctors), nursing professionals and specialist medical practitioners (e.g. neurologists), with proportionally less training provided to community health workers and pharmacists (Figure 4.28). When interpreting these results, it is important to acknowledge that while community health workers constitute an integral health workforce component of many health-care systems – especially in LMICs – not all countries may have established this workforce cadre. Training rates varied by WHO region and World Bank income group. For example, low-income countries reported significantly higher training rates for community health workers than did other income groups, while high-income countries had the highest rates for specialist medical practitioners (Annex 4, Table A4.17).

Figure 4.28

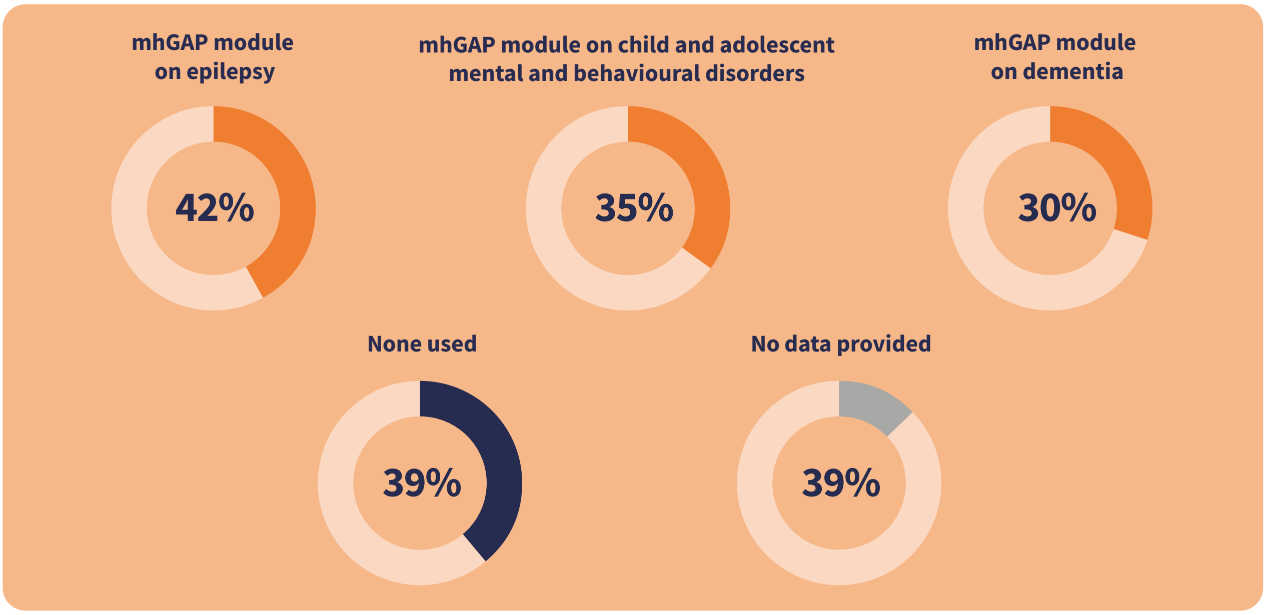
Cadres of health-care workers receiving neurology training at primary care level (% of responding countries, n=102) (2022)



Globally, approximately half of responding countries (n=48; 47%; Annex 4, Table A4.18) reported using mhGAP modules for training in care provision for people with neurological disorders (including epilepsy, child and adolescent mental and behavioural disorders, and dementia). Specifically, 14% of responding countries used one module, 8% used two modules, and 25% used all three modules (Annex 4, Table A4.18). Notably, mhGAP implementation rates were substantially higher in lower-resource countries (46%–92%) compared to high-income countries (9–17%). Among responding countries, the epilepsy module was the most frequently used, followed by the modules on child and adolescent mental and behavioural disorders and on dementia (see Figure 4.29). In the European Region and among high-income countries, the module on child and adolescent mental and behavioural disorders was the most frequently used. However, overall mhGAP utilization in these areas was among the lowest compared to other regions and income groups (Annex 4, Table A4.19).

Figure 4.29

Types of mhGAP modules for neurological disorders used for training (% of responding countries, n=102) (2022)



Next steps for impact

The IGAP survey data reveal major barriers to effective and timely diagnosis, treatment and care of neurological disorders. Access to essential neurological services remains limited in many parts of the world. This access is hindered by insufficient financial and human resource allocation, and the exclusion of neurological disorders from UHC, thus compromising service availability and/or affordability for people with neurological conditions. Service delivery challenges in low-income and lower-middle-income countries include limited specialist care and infrastructure (e.g. stroke and neuro-intensive care units, rehabilitation, palliative care). Even where services exist, fragmentation and inadequate cross-sector coordination hinder the continuity of care. Primary and community care capacity for neurology remains underdeveloped compared to specialist services, underscoring the need for better-integrated care pathways. Profound social and financial protection inequities persist for individuals with neurological conditions and their carers because such mechanisms and adequate carer support services are largely absent in resource-limited countries. Nearly half of responding countries lack universal access to essential medicines, assistive technologies and other health products for neurological disorders in primary care settings, posing a major barrier to timely and effective diagnosis and care. These issues are compounded by a specialist neurological workforce shortage which disproportionally affects low-income and lower-middle-income countries.

Addressing these barriers requires bold, coordinated and multipronged action as well as structural changes across all health-system components (Figure 4.30). Person-centered care and the involvement of people with lived experience, as well as civil society lie at the core of delivering diagnosis, treatment and care and should be incorporated into any strategic action planning (Figure 4.31).

IGAP 2

Figure 4.30

Priority actions, barriers and accelerators **for implementing strategies for effective, timely and responsive diagnosis, treatment and care**

Priority actions

Develop integrated, person-centred care pathways embedded within UHC.

Expand essential neurology services across all levels of care, integrating services across providers, levels and sectors, scaling cost-effective interventions and leveraging digital health tools. Embed essential neurology services into existing health programmes and community-based care structures (including by engaging community health and social workers, traditional healers and support groups).

Ensure equitable and sustainable access to quality-assured, safe and effective essential medicines, diagnostics and other health products.

Regularly update national essential medicines and diagnostics lists in line with national clinical guidelines and global guidance (e.g. WHO Essential Medicines List). Strengthen regulatory capacity and engage in collaborative reliance mechanisms. Reinforce supply chains across forecasting, procurement, storage and inventory-keeping to reduce stockouts. Pursue pooled procurement mechanisms to enhance affordability, purchasing and negotiation power, and sustainability of supply.

Build and sustain an interdisciplinary neurology workforce across levels of care.

Strengthen workforce capacity and expertise by promoting locally based training partnerships, knowledge sharing (including across disciplines and health and social care sectors), task-sharing/shifting, and outreach services such as tele-neurology. Develop and retain both the specialist and non-specialist workforce through accessible and adequately funded pre- and in-service training programmes. Ensure clear standards and qualifications; recognition and incentives; safe working conditions; and support systems.

Provide adequate carer training, support and protection.

Involve people with lived experience in care planning and policy development. Strengthen carer support networks, provide training programmes (e.g. online skills training, self-care tools) and support services (e.g. respite care, mental health services). Develop social and financial protection mechanisms for carers.

Figure 4.30. Priority actions, barriers and accelerators **for implementing strategies for effective, timely and responsive diagnosis, treatment and care**

Identified barriers

Inequitable access to essential services for people with neurological conditions.

Inaccessibility due to lack of availability and/or lack of affordability of essential medicines, diagnostics (e.g. cerebrospinal fluid analysis, neuroimaging), care services and infrastructure which curtails timely diagnosis and treatment, increasing morbidity and mortality from neurological disorders. Inequities of access are most pronounced in LMICs, rural/remote areas, and among vulnerable populations.

Critical neurological workforce shortages, particularly in LMICs.

Specialist and non-specialist workforce shortages in most LMICs compromise the delivery of neurological services, especially at primary and community health-care levels, in rural/remote areas, and in disciplines such as paediatric neurology, rehabilitation, and palliative and long-term care. Inadequate planning and resourcing, limited education and training, weak supervision and support and poor remuneration hinder workforce retention.

Inadequate training, support and protection for carers and families.

Many people with neurological conditions have complex, long-term care needs, often managed by unpaid informal carers. Policies and programmes for carer training, as well as support and social and financial protection, are crucial for reducing carer strain and economic risks, but such mechanisms are lacking in many countries.

Figure 4.30. Priority actions, barriers and accelerators
for implementing strategies for effective, timely and responsive diagnosis, treatment and care

WHO resources to accelerate action

- For strengthening primary health care: *Mental Health Gap Action Programme (mhGAP) guideline for mental, neurological and substance use disorders (17)*; *Integrated care for older people (ICOPE): guidance for person-centred assessment and pathways in primary care, second edition (95)*.
- For UHC: *UHC Service Planning Delivery & Implementation platform (96)*; *Primary health care measurement framework and indicators (97)*.
- WHO lists relevant to neurology: *WHO Model List of Essential Medicines (98)*; *WHO Priority assistive products list (99)*; *WHO list of priority medical devices for management of cardiovascular diseases and diabetes (100)*; *WHO list of priority medical devices for cancer management (101)*.
- For access to medicines: WHO *Improving access to medicines for neurological disorders (25)*.
- For acute (emergency) care: WHO-ICRC *Basic emergency care: approach to the acutely ill and injured (102)*.
- For rehabilitation: *Rehabilitation 2030 (103)*, Package of interventions for rehabilitation *Module 3 (neurological conditions) (104)* and *5 (neurodevelopmental disorders) (105)*.
- For long-term care: WHO *Framework for countries to achieve an integrated continuum of long-term care (106)*; *Long-term care for older people: package for universal health coverage (107)*; *Integrated care for older people (ICOPE): guidance for person-centred assessment and pathways in primary care, second edition (95)*.
- For palliative care: WHO *Palliative care fact sheet* (diverse links to relevant technical products) *(108)*.
- For carer training and support: WHO *iSupport for dementia (109)*; WHO *Caregiver skills training for families of children with developmental delays or disabilities (110)*.
- For self-care interventions: WHO *Implementation of self-care interventions for health and well-being (111)*.
- For pre-service education: WHO *Educating medical and nursing students to provide mental health, neurological and substance use care: a practical guide for pre-service education (112)*.

Figure 4.31

The voice of people with lived experience

KEY MESSAGES TO POLICY-MAKERS

"Access to timely and responsive diagnosis, treatment, and care is a **human right**, critical for effective health outcomes and to improve the lives of people with neurological conditions."

On access to diagnostics, treatment, care and rehabilitation:

"Everyone who develops a neurological condition should be given access to rehabilitation for the time they need it, even if this is only two weeks."

"Availability of medication is good for old and cheap treatments in my country, but sometimes we have shortages, as happens for rare neurological disorders. Access to new treatments is very limited, as these treatments are expensive."

On geographical factors and the treatment gap:

"Context matters: in the African Region and other low- and middle-income countries where working and partnering with stakeholders such as traditional and faith healers is important."

"As treatment is often available only in large metropolitan areas, many people with neurological conditions living in villages and rural areas are left behind."

On carer support:

"My two sons are on the spectrum, and I know how much I have to pay out-of-pocket every month for their therapy."

Figure 4.31

The voice of people with lived experience

KEY MESSAGES TO HEALTH-CARE PROFESSIONALS

"Recognize the disparities and challenges that we face. Advocate for us and **with us.**"

On holistic diagnosis, treatment and care:

"Remember how important it is to treat the patient, not the diagnosis or symptoms alone. You must take into consideration a number of variables – education, family dynamics, cultural and ethnic influence, socioeconomic status – in order to truly have an impact on quality of life for patients with any medical disorder."

On communication:

"Use the 'Teach Back' method in when consulting with patients to ensure they understand their condition, treatment, medicine etc. and to identify gaps in their knowledge about their condition and health."

"Use plain language when communicating with patients and their carers."

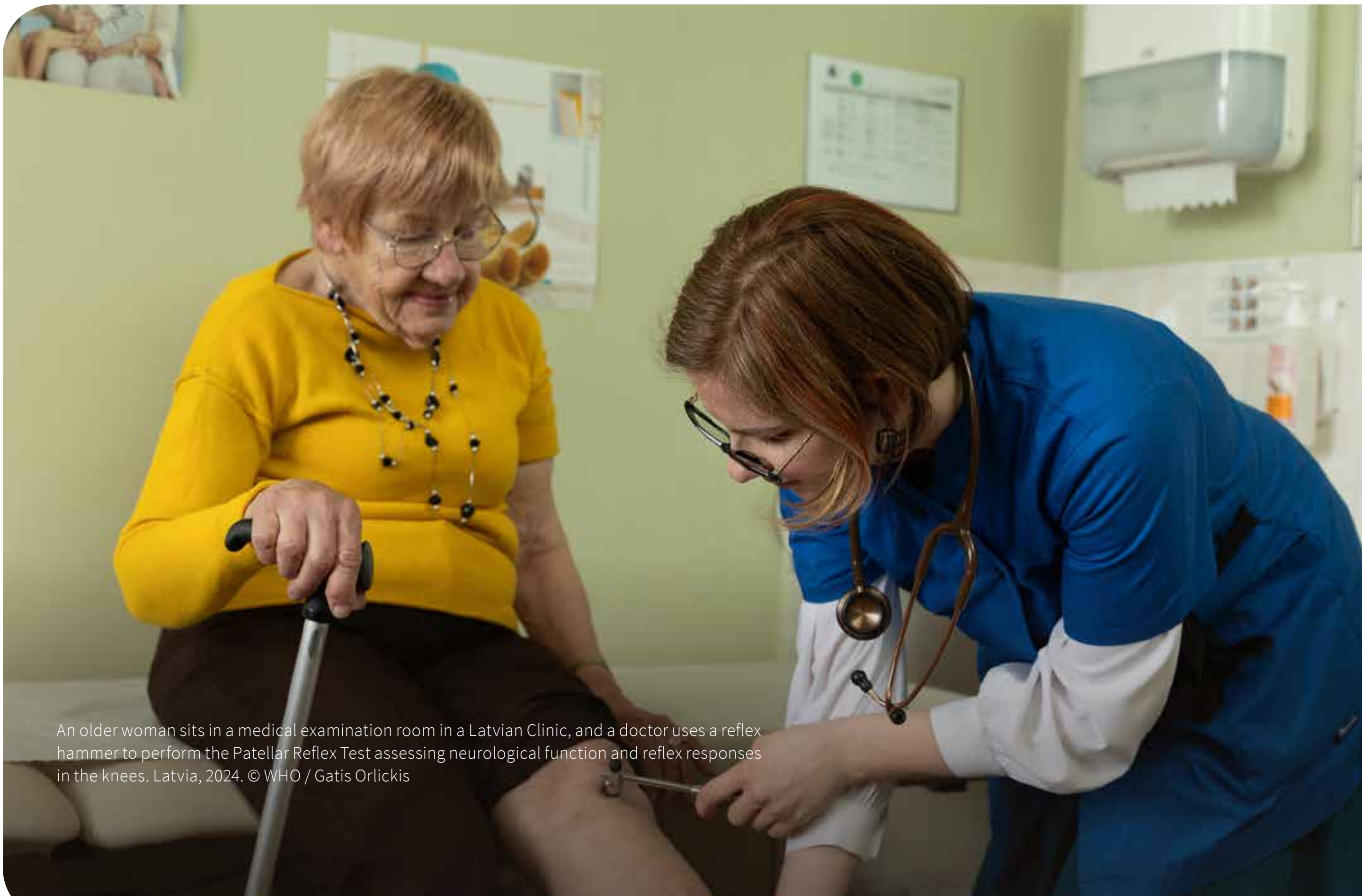
OPPORTUNITIES AND GOOD PRACTICES

- **Ensure early and meaningful involvement** in health research, care delivery (shared decision-making) and health-care professional education (curriculum design, story-sharing) fosters needs-based treatment and care, and reduces stigma and misconceptions.
- **Use concerted advocacy to target the treatment gap**, such as equitable access to essential neurological medicines and services, strengthening primary health care in rural/remote areas, and UHC and social security for people with neurological conditions.
- **Promote greater health literacy**, including by leveraging digital health technologies for improved reach of interventions (e.g. eLearning, telehealth services, and artificial intelligence-based health apps).
- **Foster partnerships** between people with lived experience, advocacy groups, academia, and the public and private sectors.
- **Create formal and informal carer support services**, including peer networks, skills training, emotional support, mental health services and respite opportunities.

To expedite progress towards IGAP Strategic objective 2, countries should address the most immediate needs and practical steps that are achievable and implementable with existing resources. Depending on identified national priorities, contextual factors and available resources (see also Chapter 3), these actions may include: 1) scaling up existing high-yield, cost-effective interventions supported by digital health solutions; 2) strengthening community-based and primary care by embedding neurology service needs into existing related services and programmes; 3) expanding national essential medicines and diagnostic lists, procuring and distributing products; and 4) partnering with civil society organizations to deliver essential workforce training and carer support networks and services.

Simultaneously, Member States should define and put into practice long-term strategies to develop a sustainable and resilient infrastructure for neurological care. Achieving broader transformation of the health system will require robust political and financial commitment. This may involve: 1) establishing policies for well-coordinated, integrated, person-centred care pathways within UHC; 2) developing adequate infrastructure and supply chains to improve access to essential medicines, diagnostics and other health products, and deliver quality neurological services across the care continuum; and 3) expanding accredited training programmes for both specialists and non-specialists to strengthen workforce capacity and retention. Evidence-driven innovation, intersectoral partnerships and skilful leadership will be essential to drive timely and sustained change.

Multiple initiatives by WHO and neurology stakeholders can provide guidance on IGAP implementation and can serve as action accelerators towards achieving effective and timely diagnosis, treatment and care for people with neurological conditions. For instance, the UHC Service Package Delivery & Implementation tool supports countries to develop context-relevant national UHC packages for effective planning and implementation *(96)*. Technical products on selected neurological conditions – such as Parkinson disease *(11)*, epilepsy *(6)* and encephalitis *(20)* – highlight targeted actions to improve the lives of people with those conditions. Model lists of essential medicines *(113)*, in vitro diagnostics *(114)*, and priority assistive products *(99)* indicate which products should be available in functioning health systems at all times. These, together with WHO guidelines – such as mhGAP guidelines *(17)*, guidelines on meningitis diagnosis, treatment and care *(19)*, and ICOPE *(95)* – should be leveraged to advocate for product availability. The WHO report on *Improving access to medicines for neurological disorders (25)* (Box 4.1) outlines strategies to overcome key challenges in improving access.



An older woman sits in a medical examination room in a Latvian Clinic, and a doctor uses a reflex hammer to perform the Patellar Reflex Test assessing neurological function and reflex responses in the knees. Latvia, 2024. © WHO / Gatis Orlickis

Box 4.1

WHO resource – Improving access to medicines for neurological disorders

Medicines are essential for optimizing brain health as they can reduce mortality and morbidity and improve the quality of life. Certain neurological disorders – such as epilepsy, stroke, treatable neurometabolic diseases or multiple sclerosis – require treatment with medicines for many years and sometimes for a lifetime. The abrupt withdrawal of certain medications, such as antiseizure medicines, may be life-threatening. Consequently, it is essential to ensure that access to high-quality, safe and affordable neurological medicines is sustained over time. Policies should be in place to monitor supply chains and stock-outs in health facilities and to address possible disruptions – particularly in health emergencies and humanitarian crises.

The WHO report *Improving access to medicines for neurological disorders (25)* is a landmark publication that analyses in depth the factors that affect access to medicines. Through a landscape analysis of tracer conditions that mapped research activity and policy around the world, as well as consultations with experts globally, the report assesses technical, financial and regulatory issues, as well as the role of stigma and the need for workforce training. The actions proposed to strengthen access to medicines for neurological disorders are grouped in eight key areas, namely:

- strengthening leadership to advocate and empower global leaders;
- promoting appropriate selection and use of essential medicines;
- strengthening regulatory environments to improve registration and market authorization;
- strengthening supply chain and procurement systems;
- improving financing for, and affordability of, neurological medicines;
- building health system workforce capacity;
- strengthening data and health information systems; and
- encouraging coordination, partnership and convening of stakeholders.

Additionally, WHO has developed dedicated resources aimed at strengthening emergency, rehabilitation, long-term and palliative care services that are integral to providing holistic care for people with neurological conditions. For instance, the *WHO Prehospital toolkit (115)* has guidance and clinical protocols for patients with suspected neurological emergencies, and links to the WHO *Basic Emergency Care course (116)* in its structured approach to assessment, management and referral. WHO's Rehabilitation Taskforce provides objectives, competency frameworks and assessment strategies for integrated rehabilitation services. The Package of interventions for rehabilitation *Module 3 (104)* and *Module 5 (105)* outline priority neurorehabilitation interventions for neurological conditions and neurodevelopmental conditions, respectively. Neurorehabilitation is an essential component of managing acute and chronic neurological conditions, supporting recovery, restoring function and the quality of life. Likewise, ensuring health system readiness for the delivery of essential neurological care in emergency settings is critical. The value of integrated models combining neurological care and rehabilitation in emergencies has already been demonstrated in numerous countries and contexts (Box 4.2).

Box 4.2

IGAP in Action

Strengthening neurological care in emergencies

Emergencies create surges in neurological conditions while also disrupting access to essential health services for those with pre-existing conditions. Trauma emergencies such as those caused by earthquakes or conflicts can create large numbers of spinal cord injuries, traumatic brain injuries and peripheral nerve injuries. Management is often hampered by lack of access to essential investigations such as computed tomography and long delays or an absence of specialized surgical intervention or post-acute care. Infectious disease outbreaks also often have neurological consequences. For instance, the acute and post-acute neurological consequences of COVID-19 are becoming increasingly evident. Systematic early identification and management of the neurological consequences of any unknown pathogen remain key challenges in future pandemics. Emergencies also disrupt essential neurological services. Efforts must be made to prepare neurological services for emergencies, including planning for continuity of essential services. The following case examples highlight the importance of ensuring health system readiness for neurological care delivery in emergency settings:

Ukraine: Spinal cord injury in conflict and disaster

Emergency responses are more efficient and clinical outcomes are better if people with complex conditions can be treated in appropriate centres that are staffed and equipped to manage them. With the onset of war in Ukraine, the Ukrainian Ministry of Health, with support from WHO and partners, made efforts to establish referral pathways for people with spinal cord injury, and to strengthen national and subnational spinal cord injury referral centres. The intention was to decompress acute hospital beds while also ensuring the best possible outcomes for people with new spinal cord injury by concentrating specialist clinical expertise and resources in a smaller number of facilities. Successful efforts require a comprehensive approach, ideally adopted during preparedness, including adapted systems such as referral pathways and financing mechanisms, and planning for associated increased requirements for infrastructure, equipment, staffing and supplies.

Syria and Türkiye: Peripheral nerve injury in earthquakes

Peripheral nerve injuries are often a neglected cause of impairment resulting from major trauma emergencies, particularly earthquakes, and may be missed by medical teams doing their best to save the life or limb of affected individuals. Following the 2023 earthquake in Syria and Türkiye, rehabilitation professionals reported encountering major surges in peripheral nerve injuries as a result of trauma. Foot drop and wrist drop were among the most commonly encountered injuries *(117)*. Mechanism of injury, limited access to electromyography nerve conduction studies, and limited access to microsurgery often mean that early nerve repair in earthquakes is not an option. Medical teams responding to major trauma emergencies should be aware of the risk of nerve injury, and follow-up should include screening to identify missed injuries and referral to surgical or rehabilitative care as appropriate. Where surgery is not an option, protection of the limb, patient education and ongoing rehabilitation play a role in ensuring the best possible outcomes.

Box 4.2. IGAP in action

Strengthening neurological care in emergencies

Bangladesh: Diphtheritic polyneuropathy

As with many outbreaks, diphtheria can result in serious neurological sequalae. Latent diphtheritic polyneuropathy most commonly presents several weeks after initial infection, with a bulbar onset demyelinating neuropathy. Management is supportive, but patients benefit from rehabilitation input to maintain function and prevent complications. Clinical follow-up is recommended for up to six months. Following a major outbreak in Cox's Bazar refugee camp in Bangladesh in late 2017, WHO and partners collaborated to establish follow-up services that included identification, specialist referral and rehabilitation. The response highlighted the importance of integrating follow-up into outbreak responses routinely from the outset.

To address neurological workforce shortages, various professional neurological organizations provide training opportunities aimed at the continuous professional development and upskilling of specialists and non-specialists. In addition to in-person workshops and training, hybrid and/or online courses are increasingly used to enhance outreach and accessibility. Notably, certain countries have successfully implemented specialist neurology training programmes for enhanced workforce capacity-building and retention (see Box 4.3 and 4.4 as examples).

Simultaneously, it is paramount to invest in capacity-building for care workers. Beyond devising social and financial protection measures for carers, Member States should promote equitable access to carer services, supports and trainings, including by leveraging existing digital tools and resources. WHO has developed numerous digital resources to upskill and support formal and informal caregivers of persons with neurological conditions, including for dementia *(109)* and neurodevelopmental conditions *(118)*. Additionally, the introduction of self-care interventions into health-care systems represents an adjunct supportive strategy to promote brain health and improve neurological care. New guidance has been developed to support countries with developing and upscaling self-care interventions at the national or subnational level *(111)*.

Box 4.3

IGAP in Action

Development of a neurology training programme in Zambia

Zambia is a country of around 21 million people, with a high burden of neurological disorders (e.g. stroke is among the leading causes of death *(119)*). However, prior to 2018, all neurological care was provided by a small number of expatriate neurologists in the capital city of Lusaka.

Zambia's first postgraduate training programme in neurology was launched in 2018 in conjunction with the Zambia Ministry of Health's increased focus on specialist training. The goals were to develop a sustainable programme to train specialist neurologists in the country with the resources available in the local setting and with the epidemiology and disease spectrum commonly encountered there. The programme was initially implemented with outside support from the Johns Hopkins University School of Medicine in the USA with funding from the United States Fulbright programme. However, an intentional effort was made from the onset to ensure that the programme's first graduates maintained positions within the hospital where the training occurred and to provide graduates with ongoing clinical, leadership and research mentorship after graduation. As such, the programme was implemented with succession in mind, and these first graduates are now leading the Zambia neurology training programme.

Between 2018 and 2024, the programme successfully trained 19 neurologists (16 adult neurologists, three paediatric neurologists), and all of its graduates have remained in the public sector. Several are now based at provincial hospitals outside Lusaka, further decentralizing neurological care and improving access to specialist neurological care outside of the capital city. Furthermore, in an example of a South–South partnership, the programme has begun training neurologists from across sub-Saharan Africa. As a regional training centre, the programme offers several benefits for African neurology trainees compared to training in high-income settings – e.g. learning to work in a resource-limited environment with exposure to a similar epidemiology and spectrum of neurological conditions that they are likely to encounter when they return to their home environments.

For more information, see:

- https://www.ilae.org/journals/epigraph/epigraph-vol-23-issue-3-fall-2021/epilepsy-care-in-zambia-now-that-we-have-neurologists-we-will-have-a-voice *(120)*
- https://www.msif.org/news/2024/09/11/improving-awareness-of-ms-in-africa-with-young-neurologists-leading-the-way/ *(121)*
- https://pulitzercenter.org/stories/zambia-has-17-million-people-stroke-epidemic-and-no-neurologists *(122)*

Box 4.4

Improving diagnosis, treatment and care for people with multiple sclerosis in Egypt

Health care for people with multiple sclerosis (MS) in Egypt has improved significantly over the last decade. A key driver has been the ongoing collaboration between MS organizations and health-care providers in establishing MS clinical centres, creating registries, fostering evidence-informed advocacy, and training health-care providers.

Since, 2017, Ain Shams University Hospital in Eastern Cairo has collaborated with neurologists across Egypt to establish five MS clinical centres. This initiative has improved access to specialist diagnosis, treatment and care for people with MS, especially in rural areas and low-resource settings. The hospital's approach has involved training local neurologists in MS-specific competencies and setting up provider-to-provider telemedicine services, improving satisfaction rates and reducing symptom burden among people with MS.

Establishing MS clinical centres across the country has enabled the collection of standardized clinical data and the creation of the Egyptian MS Registry. A research collaboration with the national patient organisation, MS Care Egypt, helped quantify the economic burden of MS. Combined with the registry data, this provided robust evidence to advocate for better access to MS treatments, leading to full reimbursement of multiple disease-modifying therapies by the government and improved outcomes for people with MS across the country.

Ain Shams University Virtual Hospital has leveraged its telemedicine expertise to improve MS care, supplement neurology education programmes and strengthen neurology workforce capacity across Africa. Jointly funded by universities, government, NGOs and the private sector, the "Treat and Teach Initiative" was launched in 2016. In countries with limited awareness of MS and few neurologists, Ain Shams University has established telemedicine support services for neurology clinics, training over 100 health-care providers across 20 countries.

For more information, see:

- The Egyptian-African Telemedicine Network: The Treat and Teach Comprehensive Model - ScienceDirect *(123)*
- The feasibility of the "treat and teach" telemedicine package: the Somali pilot | Health and Technology *(124)*
- Assessment of the role of telemedicine in the outcome of multiple sclerosis patients | The Egyptian Journal of Neurology, Psychiatry and Neurosurgery *(125)*

A group of people with diabetes exercising in the early morning at public ground in Mumbai. India, 2016. © WHO / Panos / Atul Loke

Chapter 5

Brain health promotion and prevention of neurological disorders

> **“More attention is needed to prevention and promotion. The last 1000 days [of life] take a great part of health costs but more prevention and attention in the first 1000 days is fundamental.”**
>
> – Person with lived experience

KEY MESSAGES

- Brain health promotion and prevention are fundamental to reducing the global neurological burden and fostering optimal brain development and functioning. At baseline, only one fifth of WHO Member States (38% of responding countries) reported the implementation of a promotion/prevention programme that was at least minimally functional (IGAP global target 3.1).

- Functional promotion and prevention programmes require dedicated resources, clear implementation frameworks, and robust monitoring to demonstrate their impact. They should be intersectoral and take a life course approach – elements that are often lacking in existing programmes – underscoring the need for stronger technical guidance and support for implementation.

- Addressing all brain health determinants requires coordinated cross-sectoral policies that target the promotion of healthy behaviours and nutrition, infectious disease control, the prevention of head and spinal trauma, and reduction of exposure to violence and environmental pollutants.

- Achieving the relevant targets of WHO’s global health mandates on NCDs, meningitis, and newborn and maternal health is integral to the optimization of brain health. However, progress towards these global benchmarks, as stipulated in IGAP global target 3.2, remains insufficient and should be urgently re-prioritized.

- By investing into effective promotion and prevention strategies, mainstreaming brain health-in-all-policies and developing and applying robust brain health measurement frameworks, countries can achieve measurable and sustainable health, social and economic gains.

Context

Brain health optimization is integral to reducing the global neurological burden, fostering brain development and functioning, and enabling each person to realize their full potential over the life course. In practice, this requires multipronged promotion and prevention strategies to reduce modifiable risk factors for neurological disorders and to enhance protective factors across all life stages (i.e. perinatal, infancy, early childhood, adolescence, adulthood and older age). Some of the key enabling concepts at a systems level are: 1) UHC *(126)*, which ensures access to affordable and quality health care including preventive and promotional services; 2) One Health, which balances and optimizes the health of people, animals and the environment *(127)*; and 3) community engagement, which enables changes in behaviour, environments, policies, programmes and practices within communities *(128)*.

> "Brain health optimization is integral to reducing the global neurological burden, fostering brain development and functioning, and enabling each person to realize their full potential over the life course."

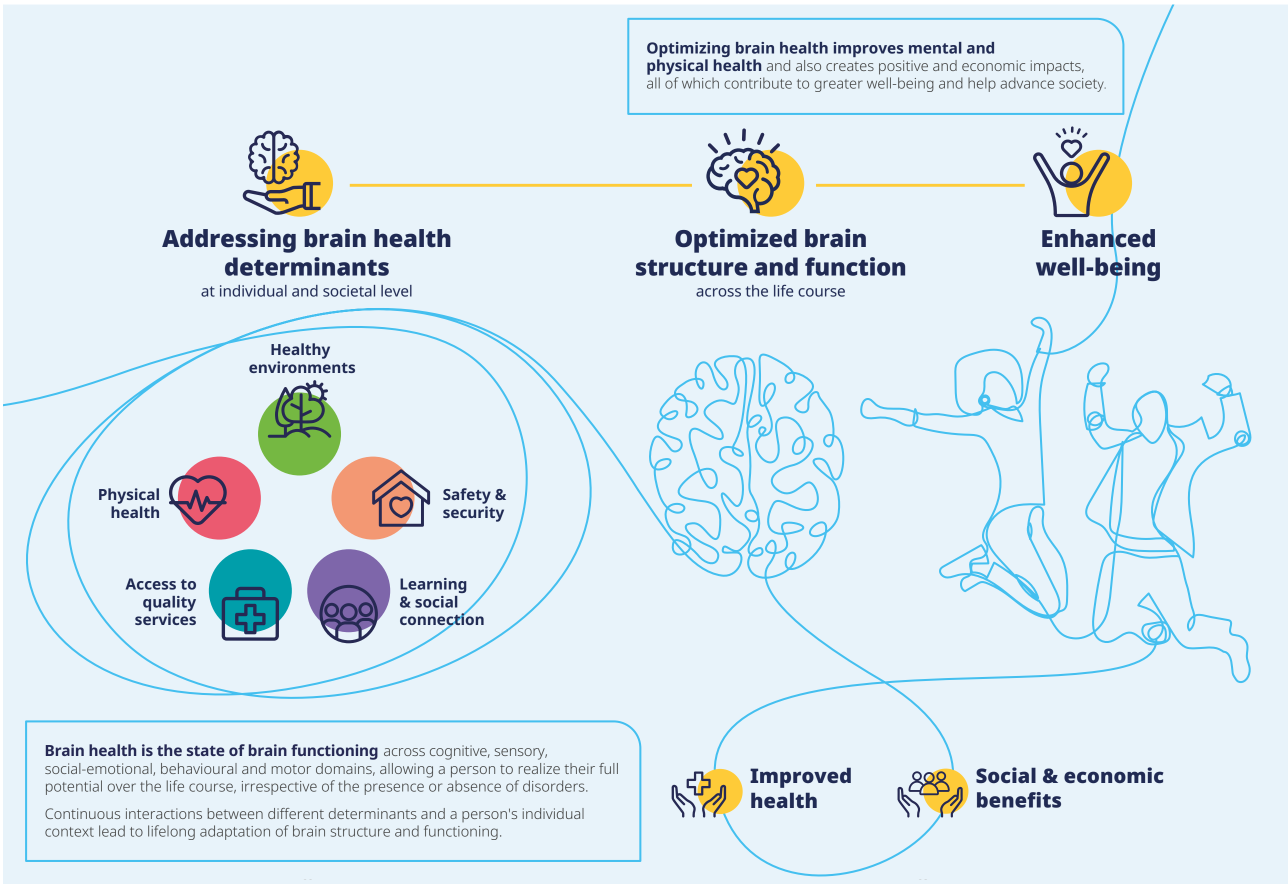
A nurse with the Chihuahua Health Secretariat reviews the vaccination card of a woman at an indigenous camp in Chihuahua City. Mexico, 2024. © WHO / Felix Marquez

Championing intersectoral and integrated approaches

Brain health is influenced by multiple factors across various domains, sharing bidirectional links with social, economic, legal, infrastructure, and environmental sectors, among others. WHO's position paper *Optimizing brain health across the life course* provides a conceptual framework for optimizing brain health across five key determinants: physical health, healthy environments, safety and security, learning and social connection, and access to quality services *(22)* (Figure 5.1).

Figure 5.1

A framework for brain health optimization



Optimizing brain health improves mental and physical health and also creates positive and economic impacts, all of which contribute to greater well-being and help advance society.

Brain health is the state of brain functioning across cognitive, sensory, social-emotional, behavioural and motor domains, allowing a person to realize their full potential over the life course, irrespective of the presence or absence of disorders.

Continuous interactions between different determinants and a person's individual context lead to lifelong adaptation of brain structure and functioning.

Brain health determinants are often interlinked, exerting complex and diverse influences at various stages of life. Comprehensive brain health promotion and prevention strategies should therefore be informed by intersectoral action and an integrated life course approach as major IGAP guiding principles *(8)*. Integrating such programmes at the primary healthcare and community levels – e.g. by embedding them into existing promotion/prevention efforts for NCDs, communicable diseases, and mental health – is vital for effective risk factor screening, early detection and timely treatment of neurological conditions. This approach also promotes long-term sustainability of the health system by alleviating pressure on specialized neurological services. Key programmatic action areas include healthy behaviours and adequate nutrition, infectious disease control, prevention of head and spinal trauma, and reducing exposure to violence and environmental pollutants – all through coordinated engagement of all relevant sectors beyond health *(8)*.

Promoting healthy behaviours entails fostering public knowledge about cardinal risk factors, effective and pragmatic risk reduction and disease-modifying strategies, including the use of behavioural approaches to achieve change. NCDs such as hypertension, diabetes and obesity, share links and common behavioural risk factors with major neurological disorders such as dementia, stroke and peripheral neuropathies. For instance, the latest GBD estimates suggest that diabetic neuropathy has become the fastest-growing neurological condition, with cases tripling globally since 1990 to reach 201 million in 2021, mirroring the worldwide rise in cases of diabetes *(1)*.

People in LMICs bear the greatest burden of infectious diseases – such as meningitis, encephalitis, neurocysticercosis, malaria, HIV, toxoplasmosis, polio, enterovirus, syphilis, rabies and Zika virus – and vulnerable, marginalized populations are particularly at risk. The resulting neurological sequelae (e.g. developmental disorders, vision and hearing loss, epilepsy, cognitive and/or motor impairment) can cause permanent disability that requires lifelong specialized care and rehabilitation needs. Additionally, global pandemics such as COVID-19 can adversely affect brain health, both directly through the SARS-CoV-2 virus causing neurological manifestations *(21)* and indirectly through stressors on various brain health determinants *(129)*.

Mitigation of head/spinal trauma and related disabilities is a major public health concern requiring intersectoral and life course promotion/prevention strategies to target upstream risk factors and root causes across all relevant sectors (Figure 5.2). Traumatic brain injury and spinal cord injury can cause substantial disability with complex and costly care needs, compounded by long-term adverse effects on brain health *(8)*. For instance, traumatic brain injuries can increase the risk of other neurological disorders such as epilepsy, stroke, and dementia *(22)* and spinal cord injuries can cause debilitating and potentially life-threatening secondary complications *(130)*. Neurosurgery and neurorehabilitation are crucial care elements for preventing long-term disability and restoring optimal levels of functioning; however, their availability is limited, particularly in LMICs *(8)*.

Figure 5.2

Value of synergistic intersectoral policies for brain health: head/spinal trauma prevention as an example

1

TRANSPORT AND INFRASTRUCTURE

Traffic laws (e.g. speed limits, helmet laws), road safety measures (e.g. street lighting, urban infrastructure for pedestrian walking, bike lanes)

2

SPORTS

Educational measures (e.g. for concussion prevention and detection), helmet and protective equipment policies, player substitution rules

3

MENTAL HEALTH AND SUBSTANCE USE

Alcohol policies, violence prevention programmes, improved access to mental health care

4

LABOR

Workplace safety (e.g. appropriate protective equipment) and accessibility (e.g., barrier-free environments)

5

URBAN PLANNING AND HOUSING

Home and community environment safety and accessibility, provision of assistive technologies

Reducing environmental risks to brain health requires comprehensive policy, regulatory and legal measures that minimize the exposure to neurotoxic environmental and occupational hazards. Known neurotoxicants include ambient pollutants (air, noise and light pollution), food and water contaminants, radiation, and over 200 industrial chemicals[1] *(22, 131)*. At a macro level, anthropogenic environmental impacts such as climate change and manmade disasters (such as nuclear explosions and chemical spills) jeopardize brain health in many ways, adding impetus to the urgency for bold and concerted global climate action *(22)*.

Promoting optimal brain development during life's formative stages, from conception to adolescence, is an imperative for prevention and enables young individuals to thrive. The brain's rapid development and heightened neuroplasticity during early childhood make it highly susceptible to environmental, nutritional, social and cognitive stimuli *(8)*. Estimates suggest that, in 2010, 43% of children under 5 years of age in LMICs were at risk of not reaching their full developmental potential due to poverty, malnutrition, environmental hazards and social adversities *(132)*. Adverse childhood experiences pose threats to optimal brain development and health[2] *(8, 22)*. Mitigating early childhood adversities can yield enormous health, social, and economic returns. As just one example, exclusive breastfeeding during the first six months of life is optimal for healthy development and could save the lives of over 820 000 children under the age of 5 years each year *(133, 134)*. However, in recent years less than 50% of infants aged 0–6 months globally have been exclusively breastfed *(135)*.

Available data show that robust and synergistic promotion/prevention measures targeting these five areas can avert much of the global neurological burden (Figure 5.3).

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[1] These include metals and inorganic compounds (such as lead, methylmercury, arsenic), pesticides (such as organophosphates), and organic solvents and compounds (such as trichlorethylene).

[2] Diverse adverse experiences in childhood include: 1) maltreatment, parental maladjustment, interpersonal loss, physical illness, economic adversities; 2) exposure to environmental hazards; 3) inequitable access to formal education (including for neurodivergent children and those with disabilities) and safe schooling environments (without stigma, discrimination or bullying); and 4) unhealthy behaviours (malnutrition, unbalanced diet, physical inactivity, inadequate sleep, lack of cognitive stimulation, social isolation, excessive screen-based entertainment).

Figure 5.3

Preventive impacts on nervous system health loss

PROMOTING HEALTHY BEHAVIOUR ACROSS THE LIFE COURSE

Removing key risk factors

(physical inactivity, unbalanced diets, tobacco use, harmful use of alcohol etc.)

could avert up to

84.2%

of DALYs due to stroke *(1)*

Diabetic neuropathy has become the fastest-growing neurological condition, with cases tripling globally since 1990 to reach 201 million in 2021, mirroring the worldwide rise in diabetes *(1)*

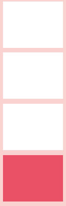
Reducing high-fasting plasma glucose levels alone could avert up to

14.6%

of DALYs due to dementia *(1)*

Nearly half of dementia cases

could be prevented by eliminating a set of 14 major risk factors *(136)*



About one fourth of all epilepsy cases can be prevented by public health measures – mainly those aimed at mitigating perinatal risk factors, traumatic brain injury, stroke and central nervous system infections *(6)*

Eliminating smoking could reduce DALYs from

stroke by 14.1%,

dementia by 4.3%

and multiple sclerosis by 11.4% *(1)*

Promoting good sleep hygiene *(137)*, intellectual stimulation, and social connection *(138)* and participation *(139)*

can optimize brain health and improve quality of life and well-being

CONTROLLING INFECTIOUS DISEASES

Robust immunization, as well as surveillance and control programmes

can substantially reduce neurological health loss from neurotropic infections such as meningitis, encephalitis, neurocysticercosis, malaria, HIV, toxoplasmosis, polio, enterovirus, syphilis, rabies, COVID-19 and Zika virus

PREVENTING HEAD/SPINAL TRAUMA AND ASSOCIATED DISABILITIES

Most traumatic brain injuries/ spinal cord injuries **occur due to preventable causes** such as road traffic injuries, falls, violence and sports- or work-related injuries *(140)*

Falls cause nearly 720 000 deaths annually, with 37.3 million severe enough to require medical attention, resulting in over **43.9 million DALYs lost each year** *(141)*

REDUCING ENVIRONMENTAL RISKS

Eliminating ambient and household air pollution could avert up to **28%** of the global burden of stroke (2021 data) *(142)*

Exposure to arsenic from contaminated groundwater in nearly 108 countries puts **230 million people at increased risk of adverse brain health outcomes** *(131, 143)*

Exposure to lead was estimated to account for 63.1% of the global burden of idiopathic intellectual disability in 2021 *(1)*

Exposure to lead, organophosphate pesticides and methylmercury is estimated to be responsible for over **40 million lost IQ points** among children under the age of 5 years in the United States (data from 2021) *(131, 144)*

Approximately 3.6 billion people already live in areas that are highly susceptible to climate change which, between 2030 and 2050, is expected to cause some **250 000 additional deaths per year** from undernutrition, malaria, diarrhoea and heat stress alone *(145)*

PROMOTING OPTIMAL BRAIN DEVELOPMENT IN CHILDREN AND ADOLESCENTS

Exclusive breastfeeding for the first 6 months of life is important for optimal brain development, providing essential nutrition, immune protection and mother–infant bonding *(22)*. Breastfeeding improves IQ and school attendance, is associated with higher incomes in adult life and reduces health costs, resulting in economic gains for individual families and countries *(134, 146)*.

Impacts of promoting brain health across the life course

Holistic prevention and promotion have a positive impact on brain structure and function and the overall physical health of individuals, resulting in fewer neurological, mental health, and substance use disorders, and improvements in the quality of life of those affected by these conditions *(22)*. Neuroprotective measures also influence brain-mediated stress responses, supporting allostasis and enhancing resilience to stress-related health conditions *(147, 148)*. IGAP implementation can therefore synergistically advance diverse public health resolutions and global commitments relevant to brain health, including those related to health systems, mental health and substance use, noncommunicable and communicable diseases, and family and child health and ageing *(22)*.

Beyond health-related benefits, investing in brain health can yield measurable social and economic gains, including substantial health system cost savings as detailed in Chapter 2. The highest returns on investment are potentially achievable through social interventions in early life *(22, 149)*. Optimizing brain development and building brain capital in children and adolescents can translate to lifelong societal benefits, such as greater population health, educational attainment and workforce productivity. Brain capital – encompassing cognitive, emotional, and social skills – is an essential resource for innovation, resilience, and economic growth. Finally, the interdependence of brain health with diverse policy domains highlights its crucial role in advancing broader policy frameworks – such as the 2030 United Nations Sustainable Development Agenda *(58, 150)* – and addressing emerging global challenges – such as demographic shifts, societal polarization, conflicts, pandemics and emergencies, climate change, and the rise of artificial intelligence and neurotechnology *(59)*.

Findings

This section reports on the key findings associated with the action areas included under IGAP's *Strategic objective 3: Implementing strategies for promotion and prevention*, and its two global targets:

Global target 3.1

80% of countries will have at least one functioning intersectoral programme for brain health promotion and the prevention of neurological disorders across the life course by 2031.

Global target 3.2

The global targets relevant for prevention of neurological disorders are achieved, as defined in: the *Global action plan for the prevention and control of noncommunicable diseases 2013–2030*; *Defeating meningitis by 2030: a global road map*; and *Every newborn: an action plan to end preventable deaths*.

Availability of programmes for brain health promotion and prevention of neurological disorders

IGAP indicates (in its global target 3.1) the need for countries to have at least one functioning intersectoral programme for brain health promotion and the prevention of neurological disorders across the life course. IGAP recommends that national programmes incorporate universal, population-level strategies, a life course approach, and unique strategies tailored to vulnerable groups. Programmes may be designed to cover brain health and/or neurological disorders in general or to focus on specific neurological disorders.

To establish a baseline for this target, the IGAP survey asked whether countries have an existing national promotion/prevention programme and, if so, what was its scope (in terms of conditions covered) and functionality. Programme functionality was determined on the basis of three criteria: 1) dedicated financial/ human resources; 2) a defined implementation plan; and 3) evidence of progress and/or impact (e.g. via a monitoring and evaluation plan). A programme meeting at least one criterion was considered minimally functional, while meeting all three criteria was considered fully functional. Additionally, countries could report whether programmes were intersectoral and/or included a life course approach to brain health / neurological disorders.

At baseline, 47 countries (46% of responding countries) stated that they had implemented one or more programmes for brain health promotion and/or prevention of neurological disorders during the past year. However, on functionality assessment, only 39 countries (38% of responding countries, 20% of WHO Member States) met global target 3.1 by reporting the implementation of a promotion/prevention programme that was at least minimally functional (Table 5.1). Across WHO regions, rates of Member States meeting this global target ranged from 11% in the Western Pacific Region to 36% in the South-East Asia Region, with the lowest rates reported in low-income countries (15%). Of these 39 responding countries that met the target, almost 70% (n=27/39) stated that they had implemented a programme that was fully functional (i.e. meeting all three criteria), including 54% (n=21/39) with programmes that were also intersectoral and incorporated a life course approach to brain health and/or neurological conditions (Annex 4, Table A5.1).

Table 5.1

IGAP global target 3.1: Functioning programmes for brain health promotion and/or prevention of neurological disorders (2022)

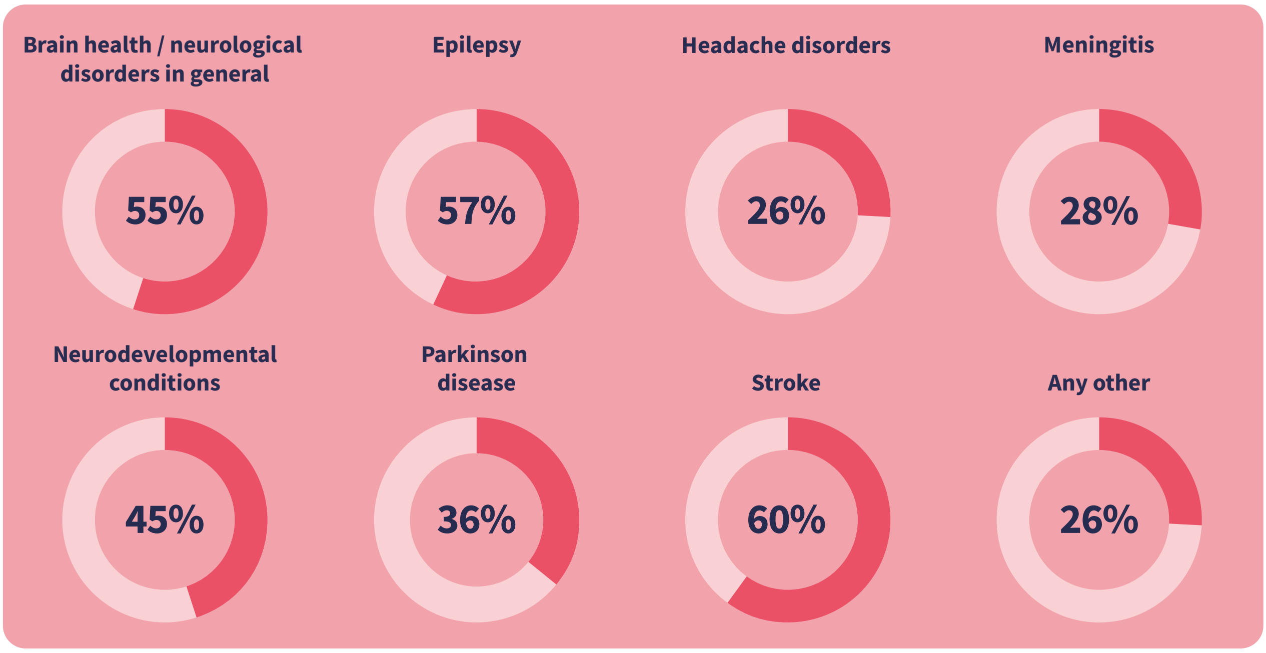
	Countries with at least one minimally functioning promotion/prevention programme	Percentage of responding countries	Percentage of WHO Member States
Global Global (n=102)	**39**	**38%**	**20%**
WHO region			
African Region (n=24)	11	46%	23%
Region of the Americas (n=23)	5	22%	14%
South-East Asia Region (n=4)	4	100%	36%
European Region (n=28)	12	43%	23%
Eastern Mediterranean Region (n=15)	4	27%	19%
Western Pacific Region (n=8)	3	38%	11%
World Bank income group			
Low-income (n=13)	4	31%	15%
Lower-middle-income (n=22)	10	45%	20%
Upper-middle-income (n=30)	12	40%	23%
High-income (n=35)	13	37%	21%

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Among the 47 responding countries with existing promotion/prevention programmes (regardless of functionality status), over half (55%) covered brain health and/or the prevention of neurological disorders in general. Additionally, the programmes were targeted at individual conditions, with most countries covering stroke (60%), epilepsy (57%) and neurodevelopmental conditions (45%) (Figure 5.4). There were some variations across WHO regions and World Bank income groups (Annex 4, Table A5.2). Of the 12 responding countries reporting at least one "other" programme, conditions covered by these programmes included dementia, amyotrophic lateral sclerosis, multiple sclerosis, Huntington disease, brain injuries and general health issues relevant to brain health (data not shown).

Figure 5.4

Types of existing programmes for brain health promotion and/or prevention of neurological disorders (% of countries with any programme, n=47) (2022)



Global progress on the prevention of neurological disorders

This section reports on global progress towards the prevention of neurological disorders across five action areas. The reporting on action areas of *Promoting healthy behaviour across the life course*, *Infectious disease control*, and *Promotion of optimal brain development in children and adolescents* is informed by data collected centrally through dedicated WHO monitoring mechanisms. These mechanisms capture global targets from specific global action plans that are relevant to the prevention of neurological disorders and are achievable by Member States by 2031, as defined in IGAP's global target 3.2. Reporting on the action areas of *Preventing head/spinal trauma and associated disabilities* and *Reducing environmental risks* is informed by other relevant WHO monitoring mechanisms and reports.

Promoting healthy behaviour across the life course (Action area 3.1)

IGAP indicates (in its global target 3.2) the need for countries to achieve identified global targets from the *Global action plan for the prevention and control of NCDs 2013–2030 (NCD-GAP)* *(30)* that reflect major modifiable risk factors shared between NCDs and neurological disorders (Figure 5.5).

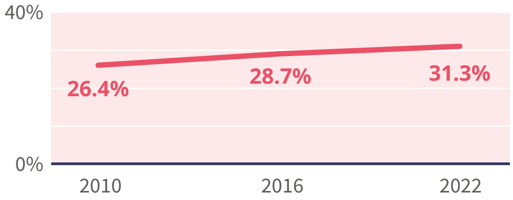
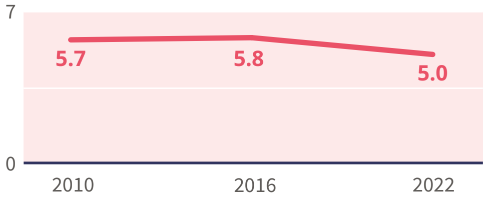
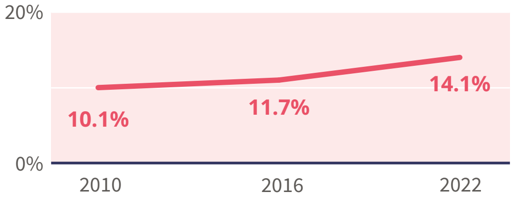
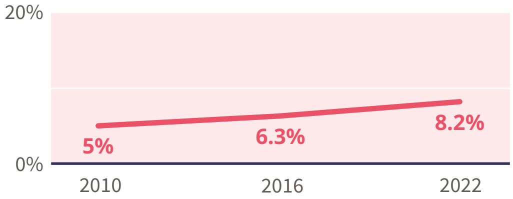
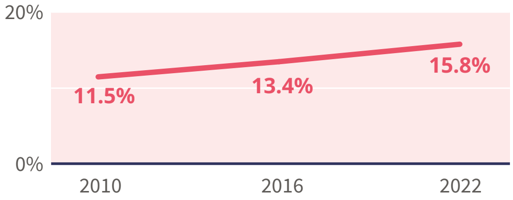
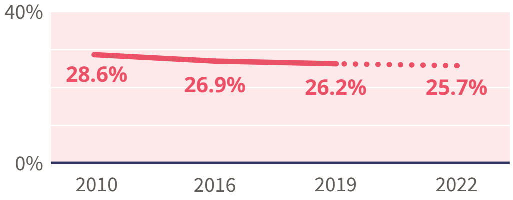
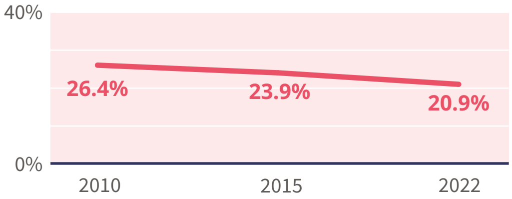
Figure 5.5 presents data from 2010 to 2022 for relevant indicators as captured by WHO's Global Health Observatory *(151)*. As of 2022, most NCD targets remained off track. The global prevalence of physical inactivity has steadily risen since 2010, with nearly one third (31.3%) of the population not meeting recommended physical activity levels in 2022 *(152)*. Globally, the total alcohol per capita consumption declined by 12% between 2010 and 2022; if this rate of reduction is maintained, the 20% reduction target will be met by 2030 *(153)*. Since 2010, the global prevalences of diabetes and obesity have risen, with an estimated 14% of adults having raised blood glucose or diabetes and 15.8% of adults considered obese in 2022. Over 1 in 4 people globally continue to be affected by raised blood pressure, with only minor reductions in prevalence noted between 2010 and 2019. Global tobacco use has steadily declined since 2010 but current projections indicate that the reduction will fall short of the 30% relative reduction in prevalence target by 2025 *(154)*. Overall, these figures suggest that urgent action is required to advance the prevention and control of NCDs while concurrently reducing the risk of neurological disorders.

Urgent action is required to advance the prevention and control of NCDs while concurrently reducing the risk of neurological disorders.

A health worker rubs an alcohol-soaked cotton ball on a baby's arm before administering a measles vaccine, as part of the Measles Outbreak Immunization Response in Cambodia. Cambodia, 2025. © WHO / Enric Catala Contreras

Figure 5.5

Progress towards the targets of the Global action plan for the prevention and control of noncommunicable diseases 2013–2030

Target for 2025*	Indicator	Progress
A 15% relative reduction in prevalence of insufficient physical activity (extended target for 2030).	Age-standardized prevalence of insufficiently physically active persons aged 18+ years	
A 20% relative reduction in the harmful use of alcohol, as appropriate, within the national context (extended target for 2030).	Total alcohol per capita (aged 15+ years old) consumption within a calendar year (in litres of pure alcohol; three-year average)	
A halt in the rise in diabetes and obesity.	Age-standardized prevalence of raised blood glucose/diabetes among persons aged 18+ years	
	Prevalence of obesity among children and adolescents aged 5 to 19 years	
	Age-standardized prevalence of obesity among adults aged 18+ years	
A 25% relative reduction in the prevalence of raised blood pressure or contain the prevalence of raised blood pressure according to national circumstances.	Prevalence of raised blood pressure (defined as having systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg) among adults aged 30-79.	
A 30% relative reduction in prevalence of current tobacco use	Age-standardized prevalence of current tobacco use among persons aged 15+ years	

The strong links between the risk factors for dementia and other NCDs offer and opportunity to implement the dementia risk reduction recommendations by paying attention to these potentially preventable risk factors (see Box 5.1).

Box 5.1

Dementia risk reduction across the life course

Worldwide, more than 57 million people have dementia and this number is expected to triple by 2050. Since there is at present no cure for dementia, dementia risk reduction is imperative. The 2024 report of the Lancet Standing Commission on Dementia prevention, intervention and care identified 14 modifiable risk factors across the life course that are attributable to 45% of global dementia risk *(136)*. Many risk factors for dementia are shared with NCDs and interventions for these risk factors are included in WHO guidelines.

WHO's guidelines on Risk reduction of cognitive decline and dementia (18) provide evidence-based recommendations on interventions to delay or prevent cognitive decline and dementia *(18)*. The guidelines were first published in 2019. Recommendations are included for the treatment of dyslipidaemia, diabetes mellitus, hypertension, weight management, alcohol use disorders, cognitive interventions, nutrition, tobacco cessation and physical activity. No recommendations were made for social activity, depression and hearing loss because of insufficient evidence at the time. Due to advancements in science and research over the last few years, these guidelines are now being updated. WHO is currently updating the recommendations included in the 2019 guidelines and examining the evidence for interventions addressing additional risk factors such as interventions for menopausal symptoms, HIV, stroke, vision impairment and sleep. After appraisal of all relevant available evidence, WHO anticipates having recommendations on individual-level interventions, multi-domain interventions and population-level policy interventions for dementia risk reduction.

The strong links between dementia risk factors and other NCDs offer a great opportunity to implement the dementia risk reduction recommendations through optimizing interventions for multiple conditions. In addition, the guideline is in close conceptual and strategic synergy with other WHO action plans and strategies. Related WHO guidelines and other relevant tools that provide general advice on how to treat or address conditions or behaviours that contribute to dementia risk can support the implementation of dementia risk reduction at country level. In addition, policy-level interventions and intersectoral action directed at the social and economic determinants of health are integral to interventions for dementia risk reduction.

Infectious disease control (Action area 3.2)

IGAP indicates (in its global target 3.2) the need for countries to achieve identified global targets from the *Defeating meningitis by 2030 global road map (32)*, which would be essential to the prevention and control of infectious brain conditions (Figure 5.6).

WHO is implementing a monitoring and evaluation framework to track implementation of the global road map. Figure 5.6 presents baseline data that are currently available for relevant targets. Available data indicate that global vaccine coverage rates against pathogens of the full immunization schedule have increased substantially between 2015 and 2022, including those for Haemophilus influenzae type B (Hib), Streptococcus pneumoniae (Spn), and Neisseria meningitidis (Nm).[3] Additionally, the past decade has seen the emergence of several global policies or strategies for the prevention and control of meningitis – specifically on Nm *(155)* and Spn *(156, 157, 158)* – to inform implementation.

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[3] For the most recent data on vaccine coverage, please refer to: Immunization Dashboard. World Health Organization (https://immunizationdata.who.int/)

Figure 5.6

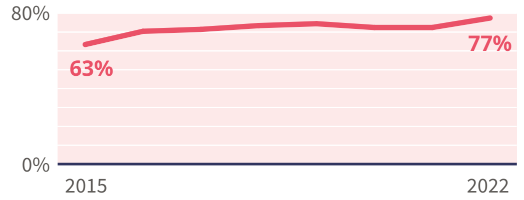
Progress towards the targets of the Defeating meningitis by 2030 global road map

TARGET FOR 2030
Vaccine coverage of the full immunization schedule for Neisseria meningitidis (Nm), Streptococcus pneumoniae (Spn), Haemophilus influenzae type B (Hib) maintained or achieved in all countries.

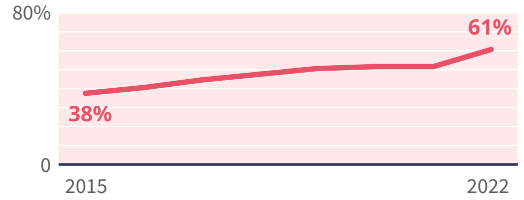
Indicator — **Progress**

Vaccine coverage rates for Spn, Hib, and multivalent Nm vaccines in the groups targeted for vaccination, as well as GBS vaccine when available

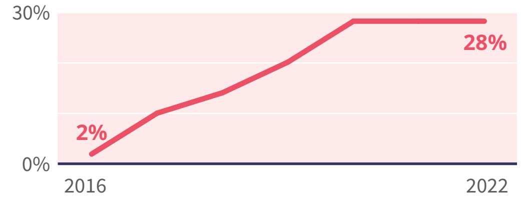
Global estimate for Hib (3rd dose)



Global estimate for Spn (Pneumococcal conjugate vaccine, final dose)

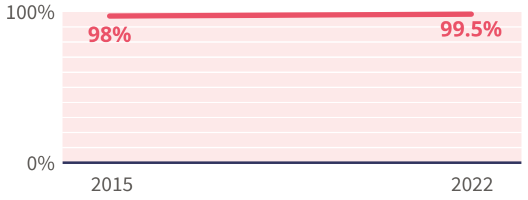


Global estimate for Meningococcal A conjugate vaccine, last dose



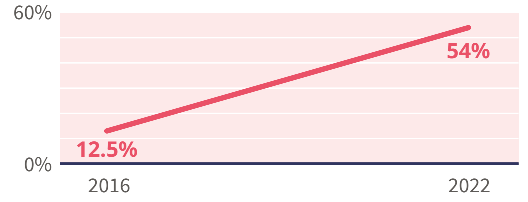
Percentage of countries that have implemented routine immunization programmes according to national guidelines against Nm, Spn and Hib, and against GBS when vaccine available

Global estimate for Hib (Haemophilus influenzae type B) vaccine (% of 194 countries)



Global estimate for Spn (Pneumococcal conjugate vaccine) (% of 194 countries)

Estimate for serogroup A in meningitis belt (% of 26 countries)



Recent WHO Global Health Estimates data suggest that, between 2000 and 2021, age-standardized DALY rates for meningitis decreased by 53.9% and those for encephalitis by 35.8%, most likely driven by the rollout of global disease eradication/elimination/control and immunization programmes. However, the estimated global burden remains substantial, with nearly 20 million DALYs in 2021 (15.3 million from meningitis and 4.5 million from encephalitis). Geographical and age disparities are substantial. For instance, most of the meningitis burden is borne by LMICs in sub-Saharan Africa, South- and South-east Asia and the Caribbean, having a disproportionate impact on children and adolescents.

Preventing the neurological consequences of other infectious diseases such as neurocysticercosis, malaria, HIV, tuberculosis, toxoplasmosis, polio, enterovirus, syphilis and rabies is equally critical to protecting brain health. Epidemiological trends suggest steady improvements in the prevention and control of most, but not all, of these preventable conditions over the past decade (Annex 4, Table A5.3). However, their overall global burden remains large and efforts in the areas of hygiene and sanitation, infectious disease management, and eradication/elimination/control and immunization need urgently to be scaled up.

Robust pandemic preparedness is essential for brain health protection, as underscored by the recent SARS-CoV-2 pandemic and Zika virus epidemic. For COVID-19, up to one third of infected individuals may develop neurological manifestations (for more information, see *2021 WHO Neurology and COVID-19 Scientific Brief*) *(21)*. As per GBD2021 estimates, 2021 saw 23.6 million COVID-19 cases with long-term cognitive symptoms or Guillain–Barré syndrome *(1)*. Zika virus infection during pregnancy can cause microcephaly and other congenital malformations in the infant; in older children and adults, potential Zika-related neurological complications include Guillain-Barré syndrome, neuropathy and myelitis *(159)*. As of December 2021, a total of 89 countries and territories have reported evidence of mosquito-transmitted Zika virus infection, including five of the six WHO regions *(160)*.

Preventing head/spinal trauma and associated disabilities (Action area 3.3)

The global burden of traumatic brain injury and spinal cord injury remains substantial. In 2021, approximately 38 million people lived with traumatic brain injury and more than 15 million people with spinal cord injury, resulting in over 5.4 and 4.5 million years of life lived with disability, respectively *(1)*.

The global burden of traumatic brain injury and spinal cord injury remains substantial.

Global prevention strategies that target cardinal risk factors include the *Global Plan for the United Nations Decade of Action for Road Safety 2021–2030*, which aims to halve global deaths and injuries from road traffic accidents by 2030 *(161)*. While road traffic deaths decreased by 5% between 2010 and 2021, current efforts still fall short of meeting the 2030 target. While 108 countries saw a reduction in the number of deaths, 66 countries experienced a rise. Regional disparities remain substantial as 9 out of 10 deaths occur in LMICs, with the WHO African, South-East Asia and Western Pacific regions affected the most *(162)*. Preventive policy actions have advanced modestly; as nearly 80% of all roads assessed do not meet minimum pedestrian safety standards and only six countries have laws that meet WHO's best practice criteria on addressing key risk factors (speeding, drink driving, motorcycle helmet use, seat belts and child restraint systems) *(162)*. For further information on this topic, see WHO's *Global status report on road safety 2023* *(162)*.

Reducing environmental risks (Action area 3.4)

WHO estimates that 99% of the world's population breathes polluted air *(163)*, a major hazard to brain development and health. The effects of air pollution amounted to an estimated 6.7 million deaths in 2019, disproportionally affecting LMICs *(164)*. The global nervous system health loss associated with ambient and household air pollution is substantial *(165, 166)* and is further compounded by exposure to neurotoxic chemicals such as lead *(167)*, arsenic *(168)*, highly hazardous pesticides *(169)* and methylmercury *(170)*. The harm from air pollution extends through the life course and across multiple neurological disorders, starting in utero *(171)* and affecting also older persons *(172)*. Climate change is another significant factor affecting neurological disorders. Mounting research evidence links climate change phenomena to changes in the incidence, prevalence and severity of neurological conditions, in part due to temperature extremes *(173)*.

WHO estimates that **99%** of the world's population breathes polluted air.

While some progress to reduce environmental risks to brain health has been made, collective global actions are insufficient and require urgent scale-up. The first global stocktaking conducted at the United Nations Climate Change Conference (COP28) in 2023 affirmed that the current trajectory of global emissions is not consistent with limiting global warming to 1.5 degrees Celsius, and that urgent, consistent and bold multisectoral actions are required to get back on track *(174)*. Air pollution remains one of the greatest environmental risks to health *(175)*. Recent data on the phasing-out of lead paint through regulatory and legal measures show that, as of January 2024, 48% of countries report legally binding controls on the production, import, sale and use of lead paints *(176)*. To address the adverse effects of mercury on human health and the environment, over 140 countries adopted the Minamata Convention on Mercury in 2013, with ongoing multilateral measures to phase out mercury and mercury-related compounds *(177)*.

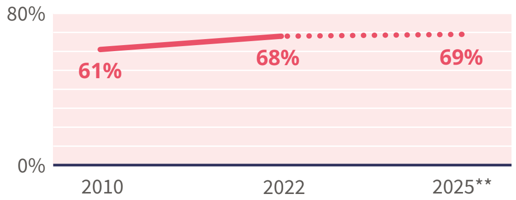
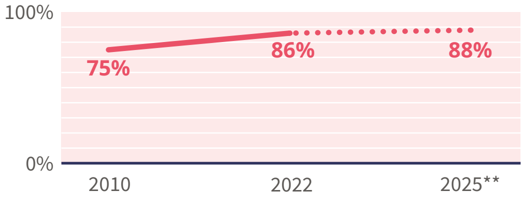
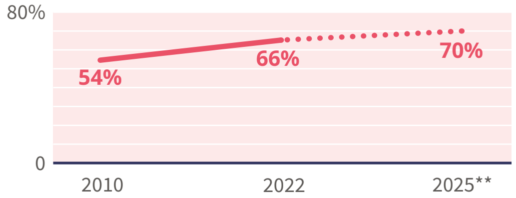
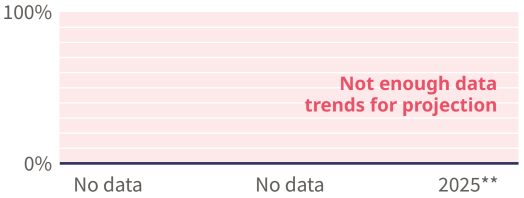
Promotion of optimal brain development in children and adolescents (Action area 3.5)

IGAP indicates (in its global target 3.2) the need for countries to achieve identified global coverage targets, as defined in *Every newborn action plan to end preventable deaths (ENAP)* *(31)*. The coverage targets are reported through the "Every Woman Every Newborn Everywhere (EWENE)" dashboard *(178)* and their attainment is essential to ensuring optimal neurodevelopment (Figure 5.7).

Figure 5.7, which is derived from the Improving maternal and newborn health and survival and reducing stillbirth: progress report 2023 *(179)*, presents 2022 data for several identified targets. Since 2010, progress towards the targets has been incremental but insufficient, with 2025 projections suggesting that countries will fall short of meeting most of the EWENE 2025 coverage targets. By 2025, nearly 90% of global births are expected to be attended by a skilled birth attendant. However, other targets are falling short: only 68% of women are estimated to receive at least four antenatal care contacts and just 66% are projected to receive postnatal care within two days of birth – far below the respective 2025 targets of 90% coverage for antenatal care and 80% coverage for early routine postnatal care. In 2022, among countries with key maternal and newborn health indicators in routine health information systems (n=105), only 44% included neonatal resuscitation, and only 40% included kangaroo mother care *(179)*. Coverage data for indicators on care for small and sick newborns are lacking. Similarly, few countries have trend data on stillbirths, highlighting a need for further implementation of data collection mechanisms and the integration of key facility-based indicators for maternal and newborn health and stillbirths into health information systems.

Figure 5.7

Progress towards the Every Woman Every Newborn Everywhere (EWENE)* coverage targets

Coverage target for 2025	Indicator	Progress
90% of pregnant women will attend four or more antenatal care contacts	Percentage of pregnant women receiving at least 4 antenatal care contacts (2022 estimate; cf. Figure 4 EWENE Progress Report 2023) (projection; cf. Figure 4 EWENE Progress Report 2023)	
90% of women will give birth attended by a skilled birth attendant	Percentage of births attended by skilled birth attendants (2022 estimate; cf. Figure 4 EWENE Progress Report 2023) (projection; cf. Figure 4 EWENE Progress Report 2023)	
90% of women and newborns will receive early postnatal care of high quality within two days of birth.	Percentage of women receiving postnatal care within 2 days of birth (2022 estimate; maternal postnatal care only) (projection; maternal postnatal care only)	
	Percentage of newborns receiving postnatal care within 2 days of birth	

*Formerly called ENAP (Every Newborn Action Plan)-EPMM (Ending Preventable Maternal Mortality)

**Projection

Healthy and balanced nutrition is equally paramount for promoting optimal brain development. Data from WHO's *Global nutrition targets 2025* *(180)* – which contain indicators on stunting, wasting, anaemia in women of reproductive age, low birthweight, childhood overweight, and exclusive breastfeeding – suggest incremental progress towards some, but not all, targets (Annex 4, Table A5.4). Most notably, the prevalence of exclusive breastfeeding in the first 6 months has increased by over 10 percentage points in the last decade (2012–2021), nearing the 2025 target of 50% global prevalence.

Beyond maternal and newborn health and nutrition, numerous other factors have a direct impact on neurodevelopment and brain health promotion in children and adolescents. An overview of relevant global policy directives, and the respective WHO reporting mechanisms, on factors such as alcohol and tobacco use and physical activity is provided Annex 4, Table A5.5.

Next steps for impact

The IGAP survey data suggest that progress towards brain health promotion and effective prevention strategies for neurological disorders across WHO regions remains challenging due to several critical barriers. Most countries have yet to implement effective promotion and prevention programmes, indicating insufficient policy prioritization in this critical area. Key operational challenges include limited human and financial resources, and inadequate cross-sectoral coordination – both essential for holistic, intersectoral and life course-oriented approaches. These findings suggest an unmet need; they present an opportunity to support countries with technical guidance, actionable recommendations and appropriate tools to develop such programmes (Figure 5.10).

Progress towards global targets for NCDs-, meningitis-, and newborn and maternal health global targets remains limited and must be urgently accelerated. Global NCD trends indicate that alcohol and tobacco use have gradually declined since 2010; however, overweight and obesity, physical inactivity, and diabetes continue to rise. Stalling progress on controlling these risk factors is contributing to the rising neurological health loss, including the burden of stroke, dementia and other conditions. While the past decade has seen remarkable improvements in the prevention and control of many neurotropic infectious diseases, such as meningitis and encephalitis, further scale-up of preventive efforts is needed, particularly in LMICs. Robust policy actions and pandemic preparedness frameworks should underpin these efforts. Projections for newborn and maternal health global targets indicate incremental improvements but emphasize the need to expedite efforts and implement robust monitoring frameworks. Simultaneously, bold intersectoral policy actions are paramount to mitigate the preventable neurological nervous system health loss caused by head/spinal trauma and environmental hazards.

A WHO staff member attaching an informational poster as part of a meningitis immunization campaign in Niamey. Niger, 2024. © WHO / Myriam Vololonarivo

IGAP 3

Figure 5.10

Priority actions, barriers and accelerators **for implementing strategies for promotion and prevention**

Priority actions

Mainstream brain health-in-all-policies.

Integrate brain health directives into existing policies, programmes, guidelines and campaigns that target relevant public issues (e.g. environment, education, sports) and health agendas (such as NCDs, mental health, healthy ageing, maternal, newborn and child health).

Implement cost-effective promotion and prevention strategies at all levels of care.

Implement population-wide interventions such as NCD best buys, cognitive decline risk reduction and screening programmes, infectious disease control and immunization, and quality prenatal, perinatal, and child health care. Coordinated action across different sectors is essential in addressing all brain health determinants and neurological risk factors simultaneously, synergistically and sustainably.

Mobilize inclusive and tailored education for all stakeholders.

Develop inclusive, context-specific educational measures/trainings tailored to all age-groups, key stakeholders (e.g. primary and community health and social workers, educators, people with lived experience) and settings (e.g. workplaces, schools, health and other public institutions).

Develop robust brain health measurement and surveillance mechanisms.

Appropriate frameworks should capture key brain health metrics across the life course (from early neurodevelopment to older populations), and monitor the effectiveness of interventions, including their health, societal and economic impacts.

Figure 5.10. Priority actions, barriers and accelerators
for implementing strategies for promotion and prevention

Identified barriers

Insufficient prioritization and fragmented government action on brain health.

Programmes for the promotion of brain health and prevention of neurological disorders remain insufficiently prioritized and resourced in public health agendas because of competing priorities, limited awareness of their impact on neurological health, delayed benefits, and the complexity of coordinating multisectoral preventive efforts.

Low awareness of brain health and inequitable access to essential information.

Poor knowledge of brain health and its determinants at all societal levels, aggravated by stigma around neurological conditions, hinders the adoption of preventive and health-promoting behaviours. Digital, communication, socioeconomic, physical, financial and legal barriers further restrict access to essential information and full participation in brain healthy community initiatives. This often has a disproportionate impact on individuals living in rural/remote areas and on vulnerable populations.

Complexities of measuring population-level brain health.

Development of robust metrics for brain health measurement is challenging. It will require sustained and well-resourced interdisciplinary research efforts, international consensus-building, context-specific adaptation and robust validation procedures.

WHO resources to accelerate action

- *Optimizing brain health across the life course: WHO position paper (22)*.
- *Global Scales for Early Development (GSED) package (181)*.
- *Framework to implement a life course approach in practice (182)*.
- *Risk reduction of cognitive decline and dementia: WHO guidelines* (2019) *(18)*.
- *Tackling NCDs: best buys and other recommended interventions for the prevention and control of noncommunicable diseases, second edition* (2024) *(183)*.
- *Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks (184)*.
- *Step safely: strategies for preventing and managing falls across the life-course (185)*.
- *The WHO SAFER initiative: a world free from alcohol related harm (186)*.
- AI-informed digital health promoters such as WHO's S.A.R.A.H. *(187)*.
- *International travel and health collection: module 5: mental, neurological and substance use conditions (188)*.

Figure 5.11

The voice of people with lived experience

KEY MESSAGES TO POLICY-MAKERS

"**Brain health affects everyone** throughout the life course and this stance should be promoted at all levels within government and across departments."

"Brain health should be viewed as being equal in importance to physical and mental health. The brain should be promoted as an essential organ in the body that needs to be exercised and cared for."

On prioritizing brain health prevention and promotion:

"There are treatments and interventions that work for several neurological disorders; investing in these will benefit more people with the same budget."

On embracing neurodiversity:

"One of the things I've really noticed is that, in some ways, knowing you are autistic is something of an advantage. Not because being autistic is necessarily an advantage, but because understanding yourself is something of an advantage."

OPPORTUNITIES AND GOOD PRACTICES

"The greatest opportunity that I have is a living example of what one can achieve despite a brain challenge, which hopefully will inspire and encourage others to protect and develop their own brains."

- ▶ **Engage with traditional and social media** to shape the public discourse and enhance both quality and frequency of coverage on brain health and neurological conditions.
- ▶ **Raise brain health awareness in specific populations** such as younger people (children, adolescents, young adults and their parents, including in educational settings), older people, those participating in contact sports and others in order to foster knowledge, cultivate preventive health behaviours and ensure early diagnosis of neurological conditions.
- ▶ **Train all relevant stakeholders**, including policy-makers, health-care professionals, educators, employers and the public so they understand and can meet the unique needs of people living with neurological conditions.
- ▶ **Emphasize positive campaign messaging** that highlights the diverse individual and societal benefits of investing in brain health promotion across the life course.

To expedite progress towards IGAP's Strategic objective 3, it is essential to integrate brain heath directives into relevant national or subnational promotion/prevention policies, programmes and campaigns. Brain health can be mainstreamed into sectors beyond health such as food and agriculture, transport and infrastructure, urban planning, environment and sports (see Box 5.2 for an example). Cost-effective brain health population strategies and training programmes should be developed, implemented and monitored, guided by an intersectoral, integrated and life course approach (see also Boxes 5.1 and 5.3). Embedding these programmes into primary and community care settings is essential to promote brain-healthy behaviours, enable early detection of neurological symptoms (e.g. cognitive decline) and ensure timely intervention. Collaboration with local populations and people with lived experience should be sought from the outset to ensure that programmes are needs-based, context-specific, culturally relevant and inclusive (Figure 5.11).

> "Collaboration with local populations and people with lived experience should be sought from the outset to ensure that programmes are needs-based, context-specific, culturally relevant and inclusive."

A mother provides skin-to-skin care to her preterm baby at the Kangaroo mother care (KMC) unit at Felege Hiwot Hospital in Bahir Dar. Ethiopia, 2021.
© WHO / Blink Media - Hilina Abebe

Box 5.2

IGAP in Action

Fostering global concussion awareness: an educational campaign by FIFA and WHO

Traumatic brain injury is a public health issue of concern affecting some 38 million people globally and resulting in substantial nervous system health loss *(1)*. Most cases occur due to preventable causes such as road traffic injuries, falls, violence and work- or sports-related injuries *(140)*. Concussion is the most common form of sports-related traumatic brain injury *(189)*, estimated to affect 1.6–3.8 million individuals annually in the United States alone *(189, 190)*. Actual figures are likely to be higher due to insufficient recognition of the signs and symptoms of concussion, leading to under-reporting.

In 2024, the International Federation of Association Football (FIFA) launched the global concussion awareness campaign Suspect and Protect: No Match is Worth the Risk in partnership with the World Health Organization *(191)*.

The educational campaign highlights concussion as a traumatic brain injury posing a risk to every player on the pitch. It aims to improve timely recognition of concussion signs and symptoms among players, coaches, medical staff, parents of young footballers and the public. Emphasizing that concussion should always be taken seriously, it offers guidance on proper detection and timely management, and advises on safe return to play after a suspected or confirmed concussion.

In collaboration with over 200 FIFA Member Associations, the campaign's educational resources were disseminated to all corners of the world to raise awareness and empower national team stakeholders, professional clubs and leagues, and grassroots and amateur communities at the country level.

This collaborative effort emphasizes the synergistic value of intersectoral promotion and prevention strategies that extend beyond the health sector to address the various determinants that have an impact on brain health across the life course.

For more information, see:
https://www.who.int/news/item/18-09-2024-fifa-and-world-health-organization-launch-global-concussion-awareness-campaign *(191)*

Image adapted from: *Concussion: suspect and protect.* YouTube video

Box 5.3

WHO resource – WHO framework to implement a life course approach in practice

Brain health is shaped by a dynamic interaction of determinants and risk factors, beginning before birth and continuing into older age. Interventions applying a life course approach must focus on the whole person, promote health equity across life stages, enable early and timely action, apply evidence-based strategies, foster collaboration across sectors and generations, and ensure continuity throughout the life course *(182)*. WHO's *Framework to implement a life course approach in practice* focuses on ways to reorient health systems to produce health and well-being – not only prevent and manage disease. This includes ensuring there is evidence on what can be done to optimize physical and mental capacities and to inform strategies and programmes.

A recent mapping review *(192)* of Cochrane and Campbell systematic reviews on what can optimize cognitive capacity across the life course, found that, while most interventions targeted multiple age groups (63%), none evaluated cognitive outcomes across more than two life stages. Practical support interventions were most frequently assessed (60%), particularly among adolescents. For these interventions, the most common outcomes explored were intellectual functions and psychomotor functions, with a high number of outcomes related to cognition. These findings highlight the need for more systematic reviews adopting a full life course perspective to understand how early interventions affect cognitive health in each life stage, and later in life.

Moreover, the return on investments should account for improvements in health and other social impacts. Thus, investments in brain health – through education, access to health care, and healthy environments – should not only reduce the risk of neurological disorders but should also lead to broader mental, physical, social and economic benefits.

Key takeaways:

- The life course framework emphasizes the optimization of brain health through integrated, multisectoral action across all stages of life – with prevention, care and rehabilitation sustained and connected across sectors throughout the life course.
- Promote early interventions linking education, mental health and healthy ageing, including during critical and sensitive periods.
- Ensure continuity of prevention and care across all life stages.
- Address evidence gaps for interventions.

The cultivation of brain health-friendly policy environments requires implementation of relevant global policy mandates across all five action areas, as shown in Annex 4, Table A5.6. In alignment with these frameworks, *WHO's brain health position paper* outlines a set of proposed intersectoral actions addressing key brain health determinants *(22)*. These synergistic actions should be complemented by developing, deploying and validating robust metrics, measurement frameworks and surveillance mechanisms in order to monitor and evaluate brain health promotion/prevention strategies across the life course. This also entails leveraging programmatic synergies in the promotion of mental health and brain health alike (see Box 5.4 for an example).

Box 5.4

Perinatal mental health in brain health promotion and prevention of neurological disorders

Perinatal mental health refers to the psychological well-being of women during pregnancy and in the postpartum period. It encompasses conditions such as depression and anxiety that can arise during this time, often as a result of hormonal changes, life adjustments, or pre-existing mental health issues. Perinatal mental health is critical as it affects not only the mother's health but also the child's growth and development.

WHO recognizes perinatal mental health as a key component of its *Comprehensive Mental Health Action Plan 2013–2030 (193)*. It is also emphasized in the *WHO recommendations on maternal and newborn care for a positive postnatal experience (194)*, WHO's *Guidelines on improving early childhood development (195)* and in *Nurturing Care framework for Early Childhood Development (196)*. The *Thinking Healthy* manual *(197)* outlines an evidence-based approach describing how community health workers can reduce perinatal depression through evidence-based cognitive-behavioural techniques recommended by WHO's mhGAP programme.

In Kenya, Mozambique and the United Republic of Tanzania, WHO is collaborating with governments to support planning managers and health-care providers in integrating perinatal mental health into maternal and child health services based on the *WHO Guide (23)*. Webinars and workshops have engaged key stakeholders in different countries to plan actively for the integration.

Further work is currently underway to develop an implementation package of tools and resources to provide practical advice on how to integrate perinatal mental health into maternal and child health services (e.g. job aids for screening and managing different mental health conditions; templates for mapping stakeholders, intake, referral and follow-up forms; and a monitoring framework to assess the implementation process).

A lab technologist conducting a WHO training on laboratory diagnosis in Afghanistan.
Afghanistan, 2025. © WHO / Zakarya Safari

Chapter 6

Research and health information system strengthening

> **“The patient voice must be included in all stages of research: from inception to the design of the research study, to recruitment and retention efforts of study participants to the dissemination of the results to the patient community.”**
>
> – Soania Mathur, Canada

KEY MESSAGES

Research

▶ Robust research is critical for informing national strategies to prevent, accurately diagnose, effectively treat and comprehensively manage neurological disorders. In 2022, neurological research accounted for 6.7% of overall health research output globally, with significant geographical disparities highlighting a major gap in low-income countries and in the WHO African Region.

▶ Global investment in neurological research remains limited and inequitable. Just over one in four (n=28) responding countries – and no low-income countries – reported dedicated research funding for brain health/neurological disorders.

▶ Achieving IGAP global target 4.2 – to double neurological research output by 2031 – requires equitable investment, strengthened South-South collaboration, and the promotion of locally driven innovations tailored to diverse health system contexts.

Health information systems

▶ At baseline, just over one third of WHO Member States (70% of responding countries) reported that they routinely collect and report on a core set of indicators for neurological disorders through their health data and information systems at least every three years (IGAP global target 4.1).

▶ Challenges exist with comprehensive integration of core neurological disorder indicators into health information systems. Of 61 responding countries reporting such integration, only half (52%) could fully disaggregate the collected data by International Classification of Diseases 11th Revision (ICD) codes, sex, and age. Additionally, while two thirds of responding countries collect neurological data, most use it for general health statistics, with few publishing dedicated reports to inform policy, planning and management.

▶ Countries must systematically collect disaggregated data and improve reporting mechanisms to identify service delivery gaps, enhance access to neurological care, and strengthen health systems through evidence-informed policy-making.

Investment in research

Context

The prevalence and impact of neurological disorders continue to grow globally. Addressing this challenge requires recognition of neurological research and innovation as a global priority. However, investment and prioritization in this field remain disproportionate to the impact associated with neurological disorders. Research in neurological disorders, particularly in LMICs, has received insufficient attention, while many countries have not prioritized brain health and neurological disorders *(3)*. This lack of prioritization can stem from insufficient awareness of the impact of neurological disorders and the benefit of promoting brain health, and from conflicting priorities and constrained resources. Nonetheless, this report highlights the urgent need to invest in research on neurological disorders in order to reduce their impact and burden and improve the lives of those affected.

A broad spectrum of research on neurological disorders is crucial for understanding disease mechanisms, developing tools, methods and interventions for measurement and treatment, optimizing care services and systems, and assessing disease burden, economic impact and benefits of investment *(14)*. Investigative approaches need harmonization, wider data-sharing without compromising safety, and reduced redundancies. Research should be rooted in person-centeredness, equity, diversity and inclusiveness from the outset, involving people with lived experience in study design, delivery, monitoring and dissemination *(8)*. Systemic and structural barriers still hinder research in LMICs and the development of collaborations between high-income countries and LMICs. For example, historically, funders based in high-income countries have not encouraged institutions in LMICs to lead on global health research grants. However, funding mechanisms are changing. As a result, the populations and institutions of high-income countries are over-represented in the scientific literature and clinical trials.

To mitigate global inequities and address needs where they are greatest, research must ensure adequate representation of affected populations and contexts. The data should be disaggregated for subpopulations (such as age, gender, ethnicity) and be developed or validated in the intended context of use, not just in controlled environments or developed health systems. This requires strengthening research capacity in low-income settings, increasing LMIC-led collaboration, and ensuring long-term investment. Globally, several noteworthy initiatives strengthen and drive efforts for better research. These include the G7 and G20 pledges to strengthen dementia research *(198)*, the Canadian Brain Research Strategy *(199)*, the European Partnership for Brain Health *(200)*, the Brain Research Africa Initiative *(201)* and the African Mental Health Research Initiative *(202)*. WHO has published guidance documents to support research prioritization for neurological disorders – including the *Blueprint for dementia research* *(203)* and technical briefs for epilepsy *(6)*, Parkinson disease and encephalitis *(11)*, and a global report on children with neurodevelopmental disabilities *(7)*.

> To mitigate global inequities and address needs where they are greatest, research must ensure adequate representation of affected populations and contexts.

Findings

This section reports on the key findings associated with the action area included under IGAP's *Strategic objective 4: Foster research and innovation and strengthen health information systems*. Specifically, the global target related to investment in research:

Global target 4.2

The output of global research on neurological disorders doubles by 2031.

The global research output for neurological disorders

The annual research output published in peer-reviewed and indexed journals serves as a proxy for the volume and quality of neurological disorders research conducted or related to a specific country. This indirectly assesses a country's commitment to neurological disorders research and has an impact on outcomes for individuals with these conditions.

A replicable and consistent methodology for searching peer-reviewed publications on neurological disorders research in PubMed was conducted, as described in Annex 2. To create a comparable indicator, research output on neurological disorders was standardized against overall general health research output at global and country levels. This methodology is intended to be repeated periodically to measure changes in research output over time to determine if countries are collectively approaching IGAP global target 4.2 of doubling neurological disorders research by 2031.

In 2022 (at baseline), 119 338 research papers on neurological disorders were published globally, representing 6.7% of the total general health research output (Table 6.1). The percentage of neurological disorders research varied significantly between WHO regions, with the highest in the European Region (7.7%) and the lowest in the African Region (3.8%). The percentage of country-level neurological disorders research output increased with income levels, being nearly twice as high in high-income countries (7.6%) compared to low-income countries (4.1%) (Table 6.1).

Table 6.1

IGAP global target 4.2: Doubling of global research output on neurological disorders by 2031 (2022)

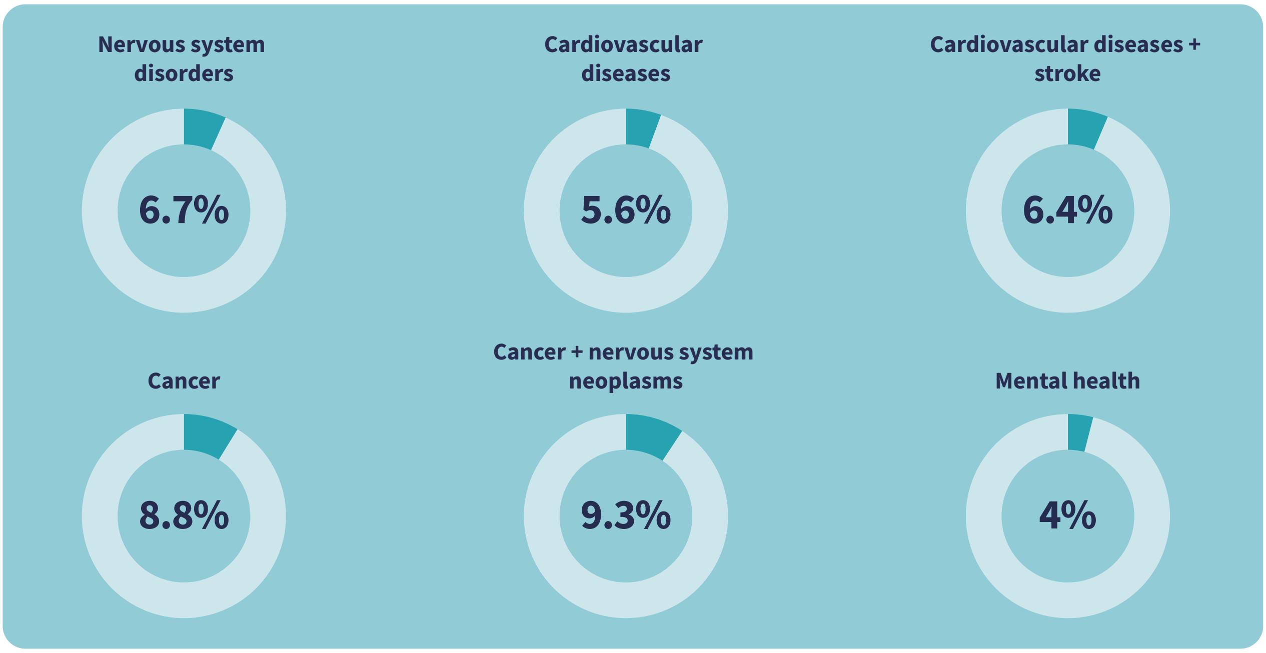
	Percentage of neurological disorders research output in overall health research output (2022)
Global (n=194)	**6.7%**
WHO region	
African Region (n=47)	3.8%
Region of the Americas (n=35)	6.5%
South-East Asia Region (n=11)	5.0%
European Region (n=53)	7.7%
Eastern Mediterranean Region (n=21)	6.7%
Western Pacific Region (n=27)	6.6%
World Bank income group	
Low-income (n=26)	4.1%
Lower-middle-income (n=50)	5.0%
Upper-middle-income (n=52)	5.2%
High-income (n=63)	7.6%

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Comparisons with other disease categories indicate that, in 2022, neurological disorders accounted for a larger share of global research output than mental health (4.0%) and cardiovascular diseases (5.6%) but lagged behind cancer (8.8%) (Figure 6.1) (see Annex 2 for the search strategy).

Figure 6.1

Research output by disease category as a share of overall health research output (global, 2022)



Funding allocation for research

Increased research investment is an essential driver for achieving IGAP global target 4.2 of doubling research on neurological disorders by 2031. Globally, just over one in four responding countries (n=28) reported allocating government funding for research on neurological disorders or brain health, and only about one in nine (n=11) reported allocating such research funding across both categories (Figures 6.2 and 6.3). There was significant regional and income-level variation. While approximately half of the responding countries in the European and South-East Asia regions reported allocating dedicated research funding, only 17% in the Region of the Americas, 20% in the Eastern Mediterranean Region, and just a single responding country in the African Region reported doing so (Figure 6.2). In general, high-income countries allocated dedicated research funding more often than upper-middle-income and lower-middle-income countries, while no low-income countries reported any such funding (Figure 6.3).

1 in 4 responding countries reports allocating government funding for research on neurological disorders or brain heath

Figure 6.2

Dedicated government funding for research on neurological disorders or brain health (% of responding countries), by WHO region (2022)

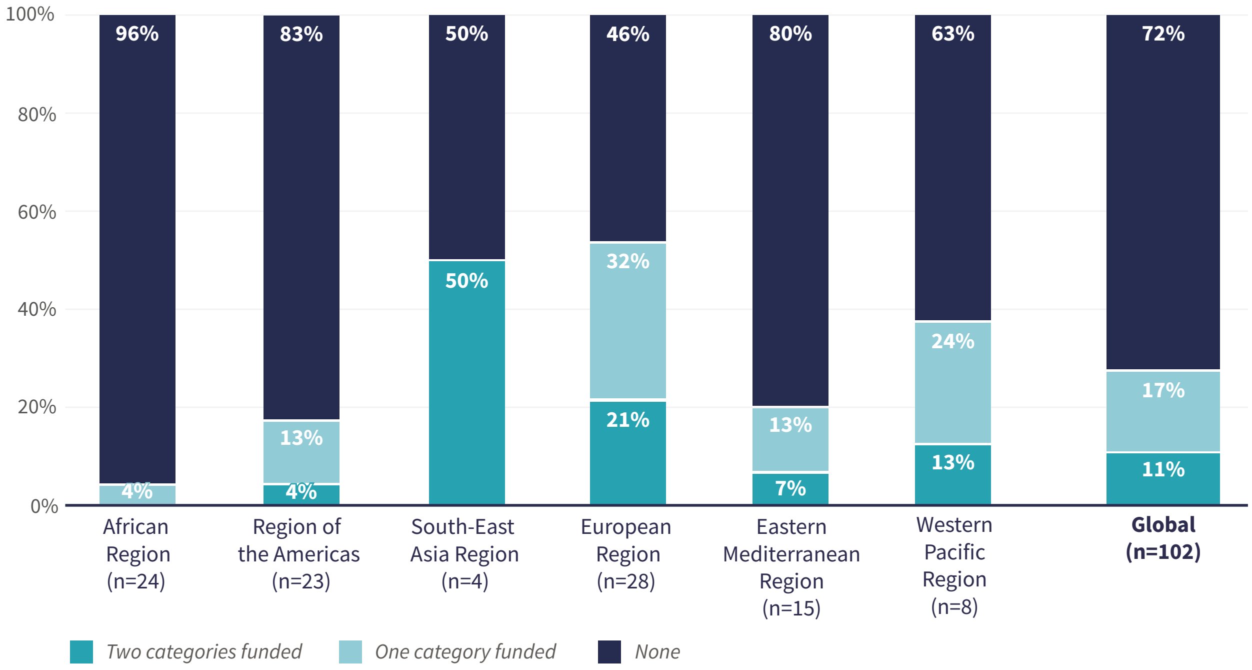
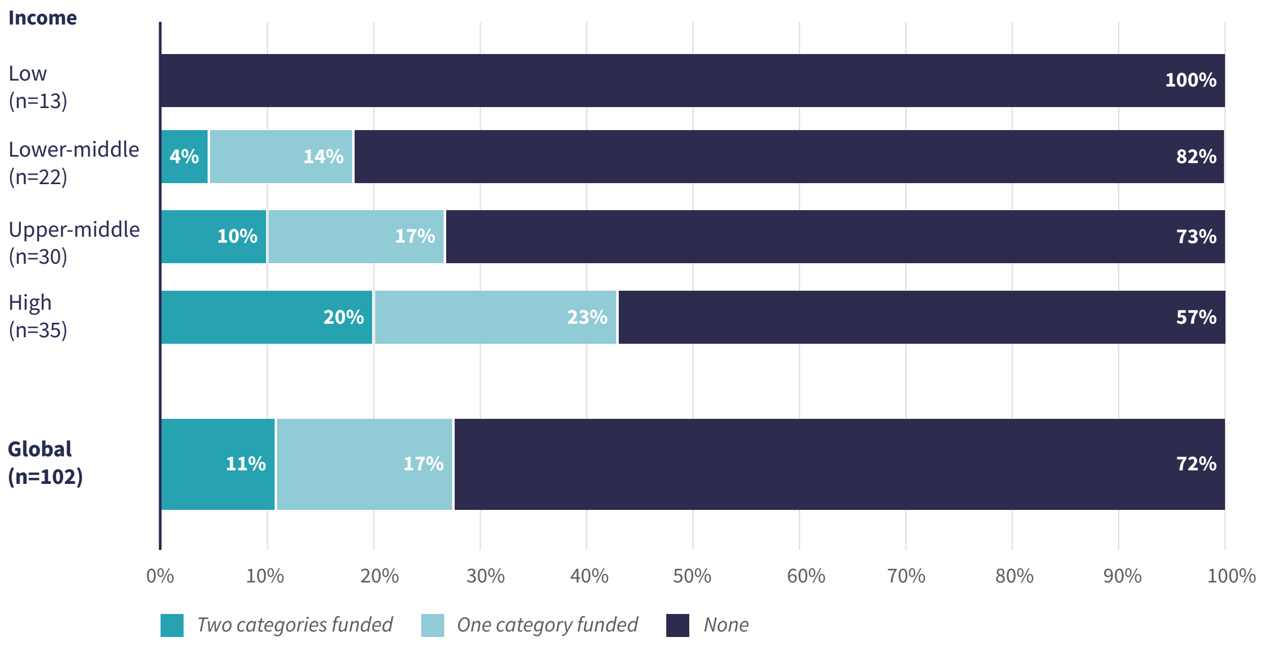


Figure 6.3

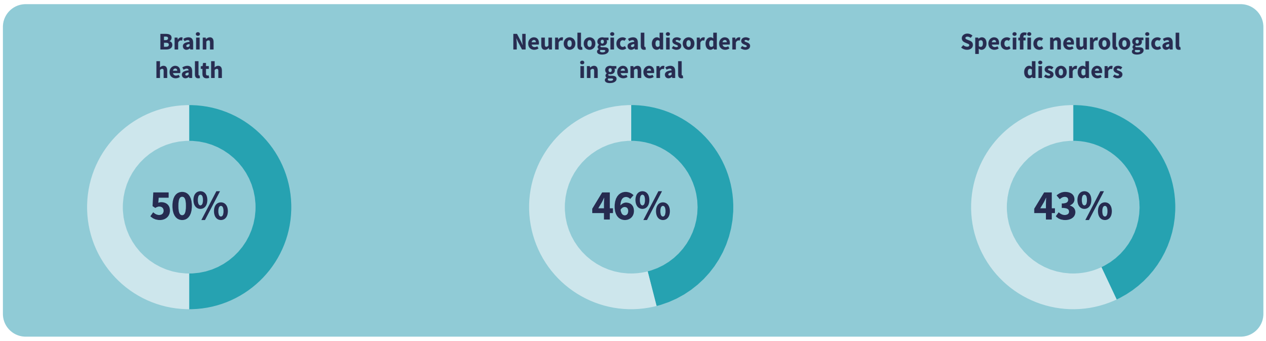
Dedicated government funding for research on neurological disorders or brain health (% of responding countries), by World Bank income group (2022)



Of the 28 responding countries reporting any research funding, about half (n=14) allocated it to brain health. Slightly fewer countries allocated it to neurological disorders in general (n=13) or to specific neurological disorders (n=12), with several countries funding two categories (Figure 6.4) (see Annex 4, Table A6.1, for a breakdown by WHO regions and World Bank income groups).

Figure 6.4

Breakdown of dedicated government funding allocated for research on neurological disorders/ brain health (% of countries with any funding, n=28) (2022)



Data are not available on the average amount and duration of allocated research funding, as few responding countries could provide this information in the IGAP survey. These would be important metrics given that many neurological disorders are chronic, requiring adequate and sustained funding for long-term studies that track individuals and outcomes over extended periods.

The WHO Global Observatory on Health Research and Development *(204)* data platform reports on relevant indicators for health research, including funding distribution and research collaboration resulting from grants for health research by major funders. Data from 2023 show that, among grants allocated to research on neurological disorders, most focus on Alzheimer disease and other dementias, followed by neurodevelopmental disorders, disorders of the nervous system (unspecified categories), Parkinson disease and epilepsy. However, all 50 organizations or institutions that received the largest number of grants in that year were from high-income countries. For instance, 42 recipients of grants awarded for neurodevelopmental disorders research were from the United States of America, four from the United Kingdom, three from Canada and one from Sweden. This discrepancy is also evident in the institutions' choice of research collaborators. For example, out of the 217 grants directed to epilepsy that included collaboration between different organizations or institutions, 201 (or 93%) collaborated with other institutions from high-income countries, and only 16 (7%) had collaborations established with institutions from LMICs.

Next steps for impact

The IGAP survey data presented here showcase that urgent and concerted action is needed to drive research on neurological disorders and brain health forward. At the time of reporting, Member States' investment in this research remains insufficient. Global inequities are profound, with minimal dedicated research funding allocated by lower-middle-income and low-income countries and comparatively lower research output in these parts of the world. Efforts to strengthen research are needed to inform prevention, diagnosis, treatment and care, and to create the potential to cure more neurological disorders. Catalysing neurological research and development, particularly in resource-limited countries, will require concerted action (Figure 6.5).

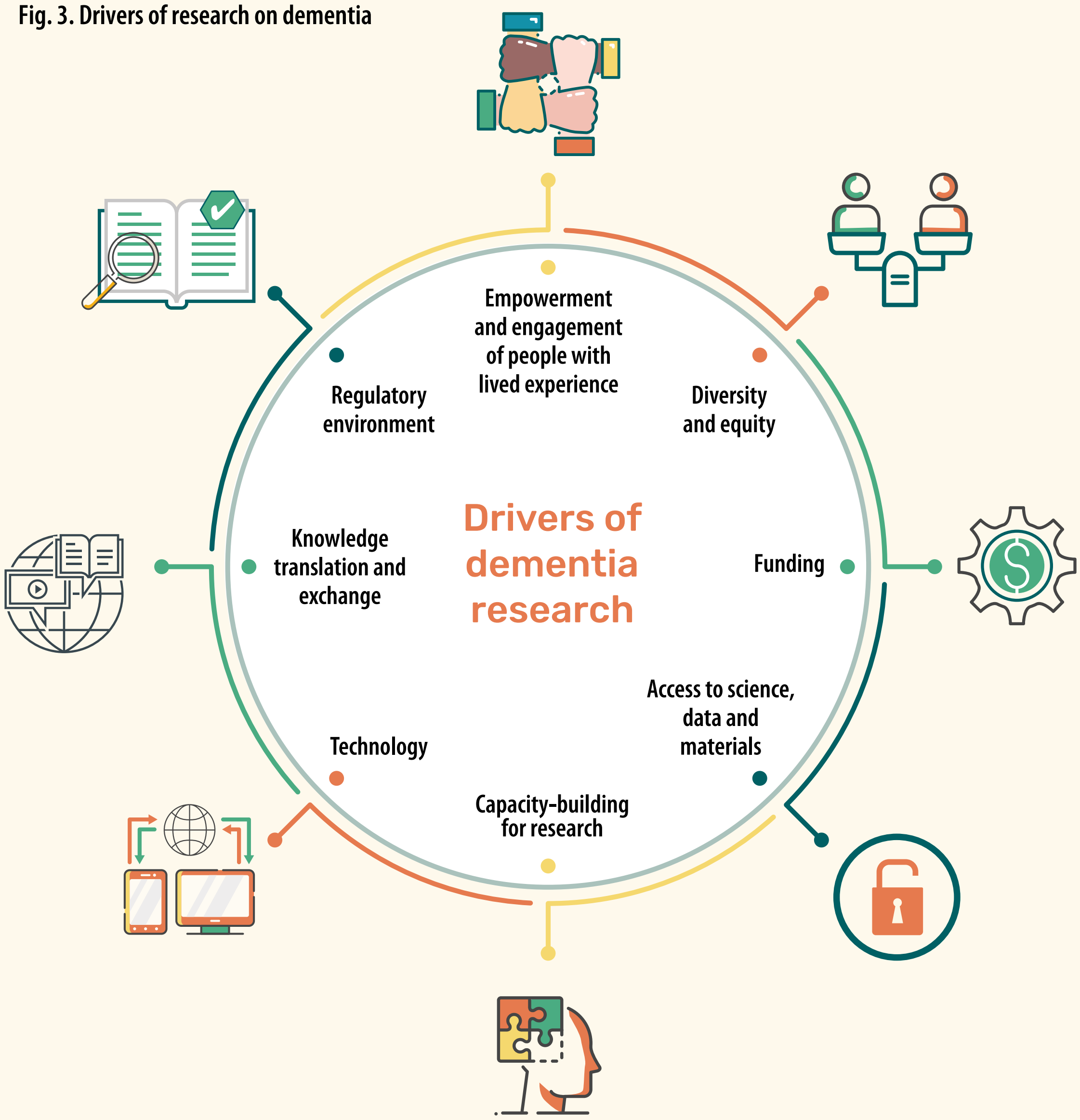
Countries are encouraged to apply the dementia blueprint to neurological disorders *(203)*. The blueprint is a global coordination mechanism for transformative change, fast-tracking innovation and addressing the barriers to research (Box 6.1). This can be achieved by aligning research agendas with the eight drivers of research, including ways to improve global research regulations, data sharing, sustainable funding, capacity-building, and the inclusion of researchers and institutions from LMICs and people with lived experience (Figure 6.6). WHO's recent publications on biomarker diagnostics for Alzheimer disease *(205)* and neurotechnology in global health *(206)* offer concrete examples that underscore the importance of these drivers in advancing safe, equitable and needs-based cutting-edge neurological research.

Box 6.1

WHO resource – Drivers of equitable, impactful and global research outcomes: a blueprint for dementia

The *blueprint for dementia research (203)*, published by WHO in 2022, proposes eight essential drivers of research that, if operationalized, can reshape the approach to neurological research and collectively ensure greater efficiency, equity and impact. These drivers, proposed specifically for dementia research, are also applicable to neurological research in general and should be embedded in national research plans. They should be used as a standard rather than only being highlighted as sporadic examples of good practice.

Fig. 3. Drivers of research on dementia



Box 6.1

WHO resource – Drivers of equitable, impactful and global research outcomes: a blueprint for dementia

The eight drivers of dementia research outlined here are considered essential for creating such an environment. The drivers support the realization of significant progress in the field *(203)*. Operationalizing these drivers of research requires the following:

1. **Include and empower people with lived experience** to participate in and be part of the decision-making process of research, ultimately driving greater impact.
2. **Address inequity and diversity by increasing the amount of research** that takes place in regions that are often under-represented and among minority populations, as well as increasing research that is truly led by LMIC researchers.
3. **Ensure sustainable, adequate and equitable funding** for neurological research – particularly for LMICs where capacity and infrastructure needs to be built – in order to support the continuing development and training of a research workforce. Sustained funding will also ensure that new approaches and innovations can be appropriately validated and developed to reach their implementation.
4. **Improve access to science, data and materials** to ensure that collaborations are fostered, international standards are created, and transparency is incentivized. It will also help to decrease the divide between high-income countries and LMICs, allowing research to be more global and have greater impact.
5. **Build research capacity** across different settings to enable better research outcomes, increasing the participation of researchers and the generation of data originating from historically under-represented regions, thereby facilitating the establishment of international collaboration.
6. **Leverage technology** to help collect large amounts of continuous real-time data from multiple regions and populations, drive better understanding of pathophysiological mechanisms and increase the reach of medical devices to underserved areas.
7. **Incentivize better knowledge translation and implementation** to decrease the time gap between generating evidence and implementing clinical action and policy.
8. **Strengthen regulatory frameworks** to decrease the complexity and lack of transparency in regulatory processes and to reach better alignment and standardization across countries.

IGAP 4

Figure 6.5
Priority actions, barriers and accelerators **to foster research and innovation**

Priority actions

Develop global, regional and national priority research agendas.

Setting clear and coordinated research agendas is essential to ensure that efforts to address neurological disorders are strategic, impactful and responsive to evolving needs. This involves systematically identifying research gaps, aligning priorities across global, regional, and national levels, and ensuring coherence with broader health and development goals. Effective agenda setting should be evidence-informed, regularly updated and guided by transparent criteria to ensure relevance, feasibility and equity in research investments.

Mobilize resources for research on neurological disorders.

Sustainable investment in research – including basic, clinical, and implementation science led by or in collaboration with LMICs – is essential to translate data into practice. Global health research funding schemes should support researchers, clinicians and institutions from LMICs to lead or co-lead research on neurological disorders. International research networks, open access research platforms and data-sharing mechanisms can facilitate knowledge exchange.

Foster multisectoral collaboration in all aspects of neurological research.

Advancing research on neurological disorders requires stronger collaboration across sectors. Multisectoral collaboration – linking health, education, social protection, and technology sectors – can drive more integrated and innovative research approaches. All aspects of research planning, implementation and uptake should involve policy-makers, health care providers, academics, civil society and people with lived experience.

Leverage research to strengthen national health information systems.

Collaborate with policy-makers to improve evidence-to-policy translation, including through data-driven decision-making, workforce planning and resource allocation. Integrate quality, multiaxial research data into national electronic health records, registries and surveillance systems. Catalyse knowledge exchange through routine data-sharing and improved data interoperability. Utilize research data for predictive analytics, disease monitoring and forecasting and disseminate findings.

Figure 6.5. Priority actions, barriers and accelerators

to foster research and innovation

Identified barriers

Insufficient prioritization of neurological research.

Neurological disorders contribute to the highest number of DALYs globally. However, prioritization and subsequent investment in all research disciplines remains disproportionate to this burden and its impact. Alongside basic and clinical research, strengthening implementation research is pivotal.

Concentration of research funding in high-income countries.

Neurological disorders are a global challenge. Their impact is felt the most in LMICs, yet funding remains centralized in high-income countries and led by researchers in those countries, with only a small portion dedicated to institutions and researchers from resource-limited countries. Further, there is a lack of data-sharing practices across borders – a situation that is complicated by variable or unclear regulatory frameworks and formal ethics codes.

Lack of diversity and equity in research.

Under-representation of certain populations, i.e. women, children and older populations, and people with rare neurological conditions in research and clinical trials, introduces inequities, causing data bias and neglecting global genetic diversity. Additionally, a lack of accessible information creates a disconnect between researchers and research participants: while researchers struggle to recruit participants for clinical trials, many eligible patients remain unaware that these studies exist.

Insufficient and inadequate involvement of people with lived experience.

Many countries lack structures for meaningful engagement of people with lived experience in research. Physical and financial barriers further limit participation, and engagement is often tokenistic and an afterthought (i.e. occurring too late in the process to enable shared decision making), reducing opportunities to genuinely shape the research agenda.

Lack of evidence-informed policy-making.

Without evidence-informed policies, decisions risk being misaligned with research findings, leading to underfunding of critical research, data gaps, poor stakeholder engagement, and the implementation of inadequately supported policies. This hinders patient care and the advancement of treatment and services for neurological disorders.

WHO resources to accelerate action

- WHO *IGAP implementation toolkit on epilepsy and other neurological disorders 2022–2031 (14)*.
- WHO *A blueprint for dementia research (203)*.
- WHO *Evidence, policy, impact: WHO guide for evidence-informed decision-making (207)*.
- WHO *Supporting the routine use of evidence during the policy-making progress (208)*.

Figure 6.6

The voice of people with lived experience

KEY MESSAGES TO POLICY-MAKERS

On research investment:

“As the global population ages, neurological conditions will become more prevalent, making investment in research even more crucial.”

“Money spent on research should be considered an investment, not a cost.”

On research priorities:

“I think there’s some real priority research areas where we could say, ‘let’s globally address these challenges: how do we diagnose people quickly or how do we get people the support they need? What are our standards for delivering evidence-based support? […]’ We know that perfect can be the enemy of the good, so let’s start by giving people some form of support.”

KEY MESSAGES TO RESEARCHERS

On the importance of patient and public involvement:

"Maybe some scientists don’t yet understand that research is more than what they discover in a lab or a sterile academic environment. We the people with a lived experience might be that missing link to make a breakthrough.”

“Meaningful engagement is only possible in a setting where power is shared.”

Include people with lived experience in your research and reward them for their time, expertise and contribution to your research.

On communication and relationship building:

“Focus on innovative solutions, ask us more often for suggestions on what really matters to us, and listen to our needs and our ideas.”

“Researchers need to instil confidence in people with lived experience and spend time developing meaningful relationships with them.”

Figure 6.6

The voice of people with lived experience

"Don't just focus on the 'main' neurological conditions – remember that various neurological conditions need to be researched."

On making research more equitable:

OPPORTUNITIES AND GOOD PRACTICES

- **Early and meaningful involvement**, including through participation in surveys, conducted by patient associations, and contributions to workshops, conferences, and educational and training materials.
- **Examples of involvement in clinical research:** consultation with research studies, clinical trials and patient registries, development of patient-reported outcome measures (PROMs), participation in data collection, evaluation and validation, co-authoring scientific publications, involvement in the peer-review process and dissemination work.
- **Promoting neurological research** via fundraising efforts, advocacy for research funding, promoting research participation in communities, including minorities and hard-to-reach groups.

Initiatives across different regions are leading action towards driving the research agenda and addressing the challenges and barriers outlined above in order to expedite IGAP global target 4.2. For example, the Canadian Brain Research Strategy is bringing together the diverse brain and mental health research ecosystem across the country in a collaborative and mobilizing unified voice to advance brain research as a national priority. Similarly, the Global Brain Health Institute (GBHI) brings together a powerful mix of disciplines, professions, backgrounds, skills, perspectives, and approaches to develop new science-based solutions. The Aga Khan University's Brain and Mind Institute based in Kenya is a multi-country initiative connecting academic entities, and facilitating interdisciplinary research, education and related clinical programming in mental health and neurosciences. The *Lancet Neurology* commissions on stroke *(41, 209)* and on neurorehabilitation *(210)* constitute additional global research initiatives directed at synthesizing evidence, harmonizing research efforts, and developing evidence-based pragmatic recommendations in order to reduce the global burden of stroke and improve neurorehabilitation services, respectively.

Other noteworthy initiatives include large-scale studies that take a disease specific approach to address long-standing challenges in the field, such as the FINGERS Brain Health Institute initiative *(211)*, to develop brain health strategies and interventions for dementia across 20 countries in Europe, Latin America and Africa. Holistic approaches combining basic, clinical and implementation research on neurological disorders are essential to address context-specific research gaps and derive actionable, evidence-informed solutions. An example of this is Epilepsy Pathway Innovation in Africa (EPInA), where epidemiological surveys were parallel to development of accessible innovative electroencephalogram methods and national policy workshops convening key stakeholders for IGAP implementation in three Sub-Saharan African countries *(212)*. Another example is the Transforming Parkinson's Care in Africa (TraPCAf) project *(213)*, a multi-country study which combines observational (qualitative and quantitative) approaches for epidemiological, clinical, risk factor and lived experience research components with an interventional approach through a clinical trial component (Box 6.2).

Box 6.2

IGAP in Action

Transforming Parkinson’s Care in Africa research group (TraPCAf)

TraPCAf is a United Kingdom-funded multi-method, multi-country research project with the aim of transforming diagnosis, treatment and care of Parkinson disease in Egypt, Ethiopia, Ghana, Kenya, Nigeria, South Africa and the United Republic of Tanzania (2022–2026). The development of research questions, study protocols and the undertaking of the data collection have been carried out in partnership with African researchers, people with lived experience and other stakeholders in order to determine priorities, challenges and solutions.

A key study activity is determining the prevalence of Parkinson disease in urban Nigeria and rural Ghana, Kenya and Tanzania – data which are essential in making Parkinson disease a public health priority. Prevalence data show that less than 25% of people in the community have been diagnosed previously. The project is exploring novel aids to diagnosis that could be utilized by nonspecialist clinicians to improve diagnosis and management in Africa, in view of limited workforce and resources. Another research objective is to identify potential risk factors for Parkinson disease – such as genetic mutations and environmental exposures (e.g. pesticides known to increase risk of developing Parkinson disease), which will be crucial to implementing interventions to reduce Parkinson disease incidence. A qualitative component of the study is exploring lived experience (e.g. investigating stigma) which is necessary to develop awareness campaigns and build advocacy. Surveys and reviews are helping the teams to determine current policies, practices and health-care worker knowledge about Parkinson disease across TraPCAf countries in order to identify avenues for intervention.

Challenges encountered include enabling people with Parkinson disease to access affordable and sustainable medication. Involving charity partners and establishing patient support groups have been crucial first steps in addressing this issue. While there are shared challenges, each country experiences its own unique difficulties in delivering Parkinson disease care and the specific interventions that it requires. This highlights the need to undertake similar research across the African continent in collaboration with policy-makers and stakeholders who are involved in the design and delivery of health services.

For more information, see:

- TraPCAf website: https://research.ncl.ac.uk/trapcaf/.
- Film about TraPCAf: https://uhurufilm.com/trapcaf.
- TraPCAf study protocol: https://doi.org/10.1186/s12883-023-03414-0 *(213)*.

Data and information systems

> **“Health information systems should be closely evaluated to ensure all neurological conditions are captured.”**
>
> – Person with lived experience

Context

The generation of data on neurological disorders through health information systems is key to evidence-informed policy-making and planning and evidence-based actions to improve service delivery *(214)*. A regular, secure, and timely flow of critical information is essential to inform the trends of indicators such as burden of neurological disorders, prevalence of risk factors, disease mortality and service provision and outcomes. Ideally, these findings should be supported by systematically integrating data collection into health information systems and monitoring of disorders in order to measure progress towards implementation of national programmes.

Nevertheless, there are global disparities in the collection, analysis, reporting and translation of data through health information systems. For instance, national health information systems rarely collect information on a defined set of indicators for neurological disorders, leading to a lack of clarity on burden and service use which affects planning. In many countries, routine health information systems for neurological disorders are fragmented, disease-specific and underdeveloped *(3)*, complicating data acquisition on the availability and utilization of neurological services, and on the needs of people with neurological disorders and their caregivers.

There are global disparities in the collection, analysis, reporting and translation of data through health information systems.

Further complexities in data collection and reporting arise from misalignments between international disease classification guidelines and the organization of health service delivery in LMICs. This misalignment creates challenges in allocating resources for neurological disorders and for subsequent reporting. For instance, the International Classification of Diseases 11th Revision (ICD-11) *(215)* categorizes neurological conditions in a unified manner. In practice, however, cerebrovascular diseases and peripheral nervous system disorders are often classified and funded under “internal medicine” while movement disorders are “noncommunicable diseases”, resulting in fragmentation of resources.

Effective routine monitoring of information on neurological disorders can support the formulation and implementation of evidence-based policy, service planning and delivery. It can also track and facilitate progress at national and subnational levels *(207)*. In this context, several components of the health system can be optimized and will function better if essential information is available when and where needed. For example, well-maintained individual electronic health records can support effective treatment across the life course for persons with neurological disorders – including the appropriate management of comorbidities. Information on the utilization and availability of medicine throughout the supply chain is essential to enable forecasting and avoid stockouts (see example in Box 6.3). Further, the integration of health and social care information systems can ensure that people living with neurological disorders and needing social and financial support to treat and manage their conditions are appropriately assisted.

Findings

This section reports on the key findings associated with the action area included under IGAP's *Strategic objective 4: Foster research and innovation and strengthen health information systems.* Specifically, the global target related to data and information systems, namely:

Global target 4.1

80% of countries routinely collect and report on a core set of indicators for neurological disorders through their national health data and information systems at least every three years by 2031.

Integration of neurological disorders in national health information systems

For the reporting on IGAP global target 4.1, IGAP survey response rates from countries were extrapolated as proxy measures to assess their ability to monitor and report on data associated with neurological disorders. The global target was met when countries were able to provide data for at least 6 out of 7 of a defined core set of indicators for the IGAP targets, including those related to: 1) awareness campaigns/advocacy programmes for neurological disorders; 2) dedicated policies for neurological disorders; 3) legislation protecting the rights of people with epilepsy; 4) inclusion of neurological disorders in UHC benefits packages; 5) epilepsy service coverage; 6) availability and accessibility of essential medicines and basic technologies for neurological disorders; and 7) promotion/prevention programmes.

At baseline, 71 countries (70% of responding countries, 37% of WHO Member States) stated that they were routinely collecting and reporting on a core set of indicators for neurological disorders through their national health data and information systems (Table 6.2). Across WHO regions, these rates were generally low, ranging between 26% in the Western Pacific Region and 43% in the Eastern Mediterranean Region, with few differences across World Bank income groups.

Health worker with a headset at a computer answering a call through the national Autism Help Line at its launch. Islamic Republic of Iran, 2023. © WHO

Table 6.2

IGAP global target 4.1: Routine data collection and reporting on neurological disorders (2022)

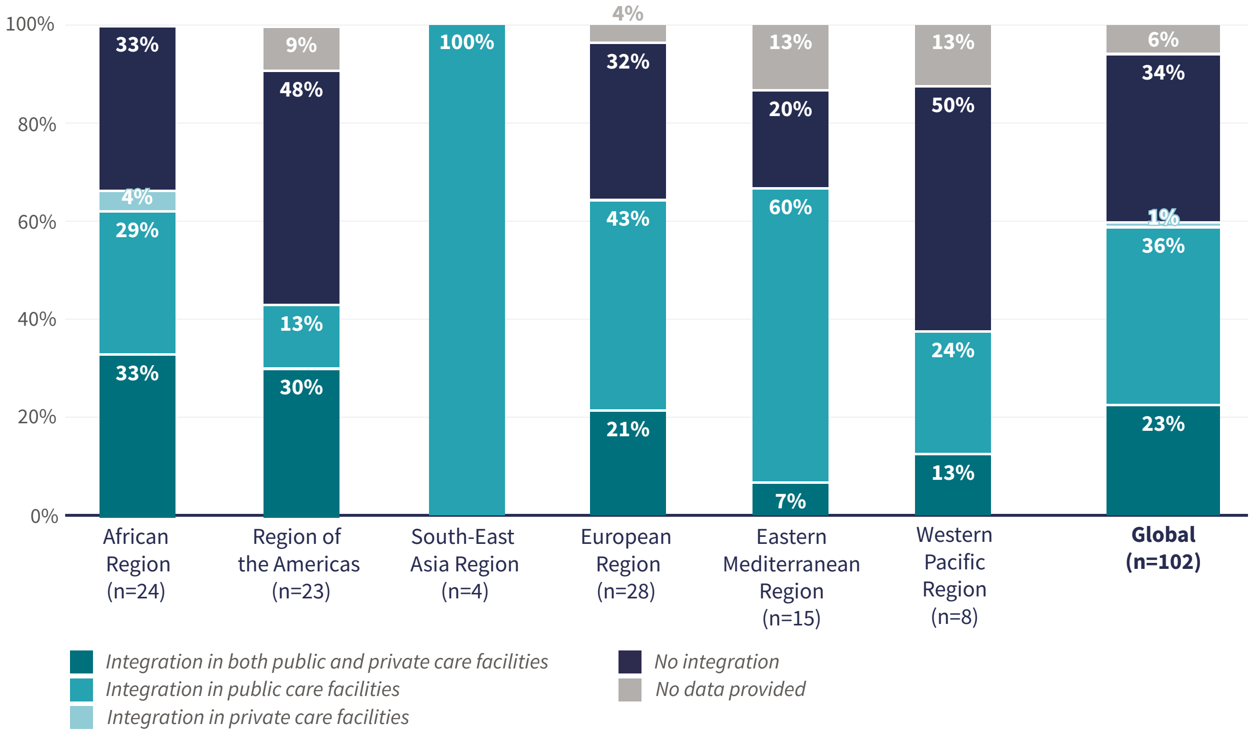
	Countries routinely collect *and* report on a core set of indicators for neurological disorders through their national health data and information systems	**Percentage of responding countries**	**Percentage of WHO Member States**
Global (n=102)	**71**	**70%**	**37%**
WHO region			
African Region (n=24)	18	75%	38%
Region of the Americas (n=23)	13	57%	37%
South-East Asia Region (n=4)	4	100%	36%
European Region (n=28)	20	71%	38%
Eastern Mediterranean Region (n=15)	9	60%	43%
Western Pacific Region (n=8)	7	88%	26%
World Bank income group			
Low-income (n=13)	10	77%	38%
Lower-middle-income (n=22)	17	77%	34%
Upper-middle-income (n=30)	20	67%	38%
High-income (n=35)	23	66%	37%

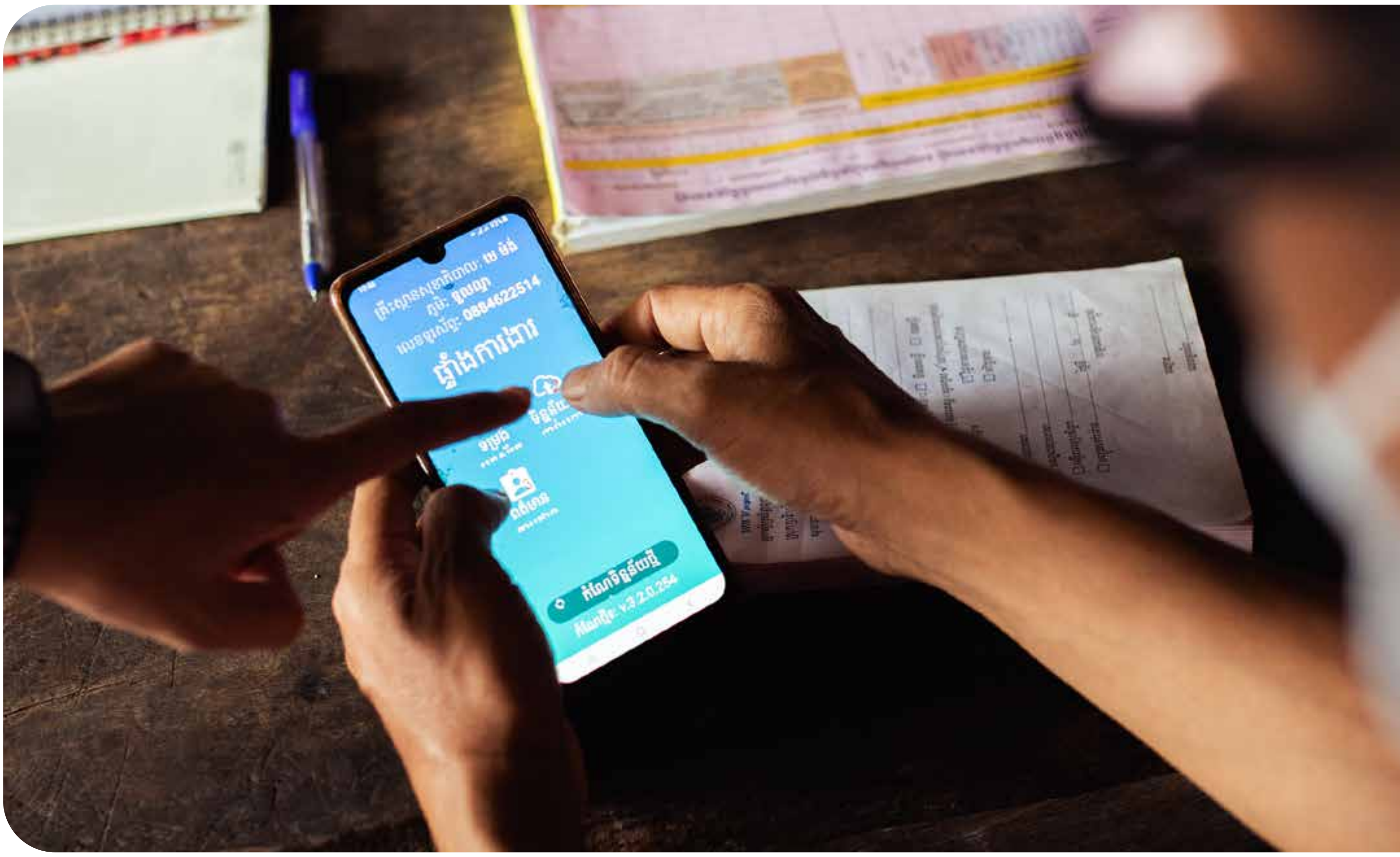
Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Globally, 61 out of 102 (60%) responding countries stated that they integrated a core set of indicators for one or more neurological disorders into their health information systems across all levels – primary, secondary and tertiary – of care (Figures 6.7 and 6.8). Regional variations were substantial, ranging from reported rates of 38% in the Western Pacific Region to 100% in the South-East Asia Region (Figure 6.7). Reported rates were slightly higher in low-income and lower-middle-income countries, as compared with upper-middle- and high-income countries (Figure 6.8). Regarding data integration across public and private health sectors, 37 responding countries (36%) reported inclusion of these indicators in public care facilities only, 23 countries (23%) included them in both public and private facilities, and one country (1%) included them in private care facilities only.

Figure 6.7

Integration of core indicators for ≥1 neurological disorder(s) into the health information system across all care levels (% of responding countries), by WHO region (2022)

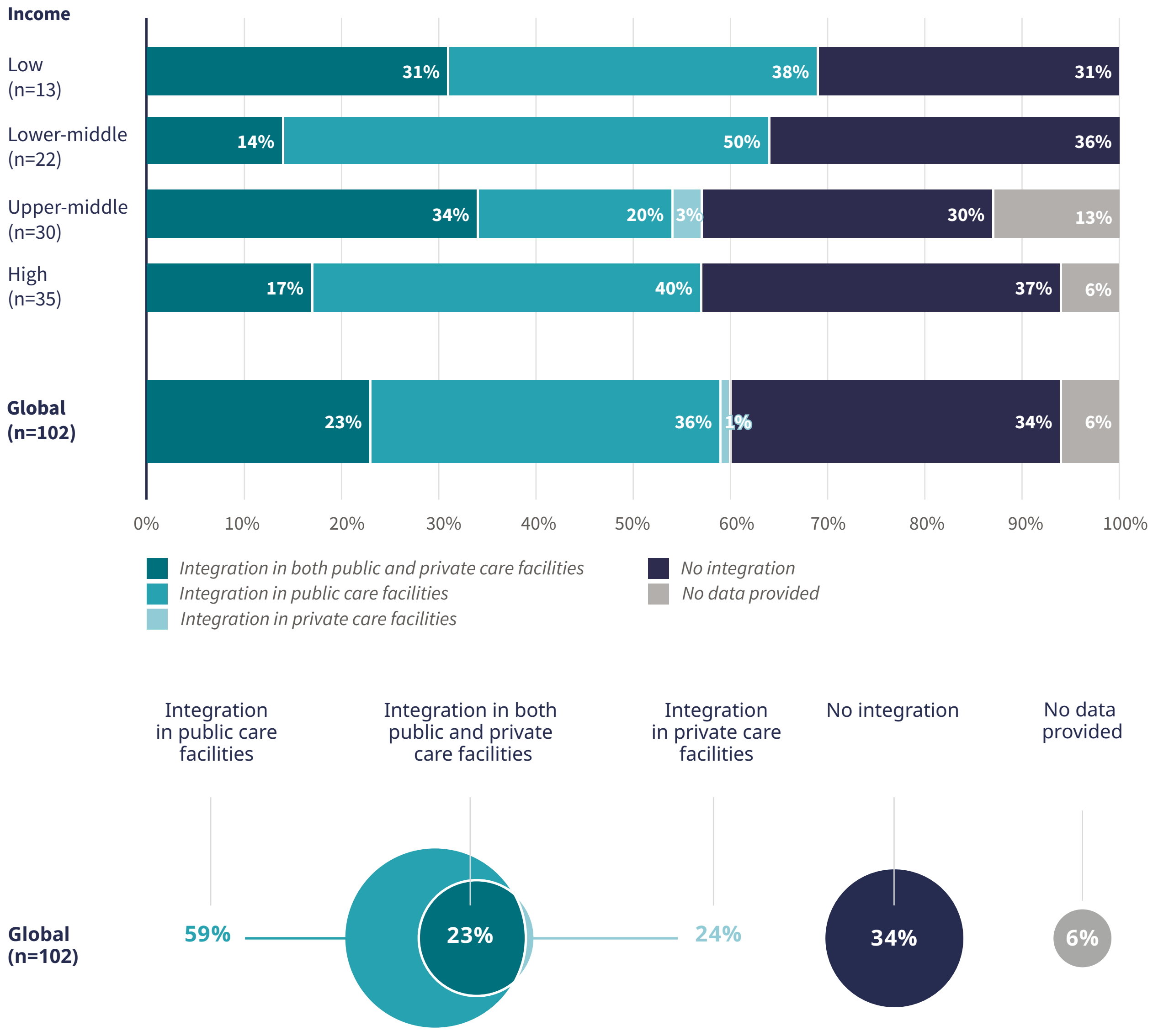




Staff demonstrate the digital health information system on a mobile phone at Toul Lvea Village health center, as part of a Field Epidemiology Training Program in Mondulkiri Province. Cambodia, 2022. © WHO / Tytaart

Figure 6.8

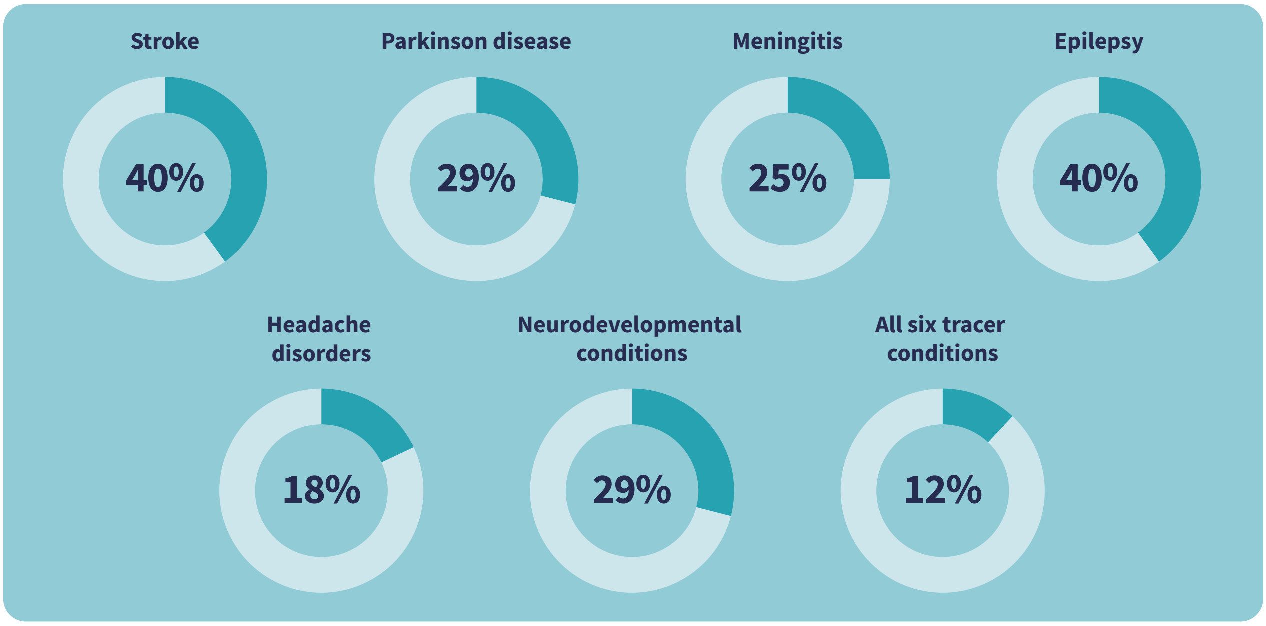
Integration of core indicators for ≥1 neurological disorder(s) into the health information system across all care levels (% of responding countries), by World Bank income group (2022)



Epilepsy and stroke were the neurological disorders most likely to be integrated into responding countries' health information systems through a core set of indicators, with fewer countries including headache disorders (Figure 6.9). There were differences across WHO regions and World Bank income groups (Annex 4, Table A6.2). Only 12 responding countries (12%) reported being able to integrate indicators for all six neurological tracer conditions listed in the IGAP survey, of which just four were low-income or lower-middle income countries.

Figure 6.9

Neurological disorders for which core indicators are integrated into the health information system and routinely collected (% of responding countries, n=102) (2022)



Regarding data disaggregation for neurological disorder indicators in health information systems, 40% of responding countries reported being able to disaggregate such data by ICD codes, 44% by sex, and 41% by age (Figure 6.10;). Only 32 responding countries (31%) reported data disaggregation across all dimensions, most of which (n=24) were high-income or upper-middle-income countries (Figure 6.11) (see Annex 4, Table A6.3 for a breakdown by WHO region and World Bank income group). Just two countries reported no disaggregation in any dimension (data not shown).

Figure 6.10

Disaggregation of indicators for neurological disorders in health information systems (% of responding countries, n=102) (2022)

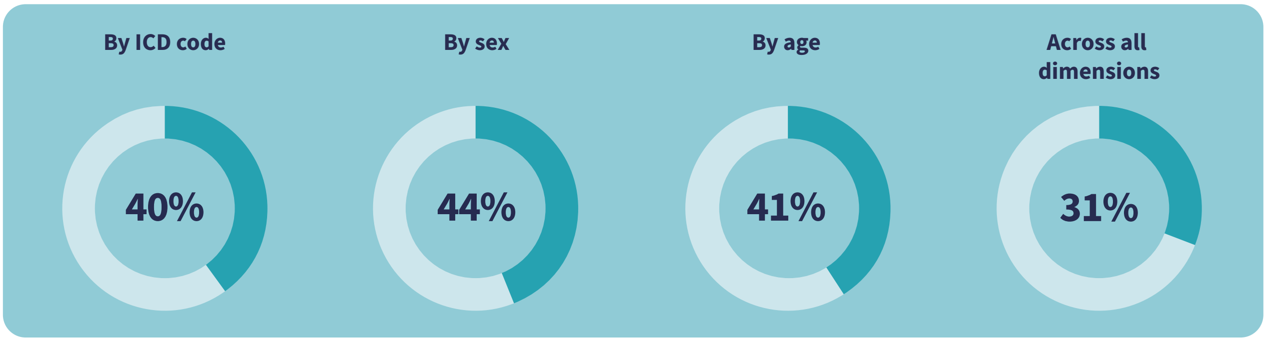
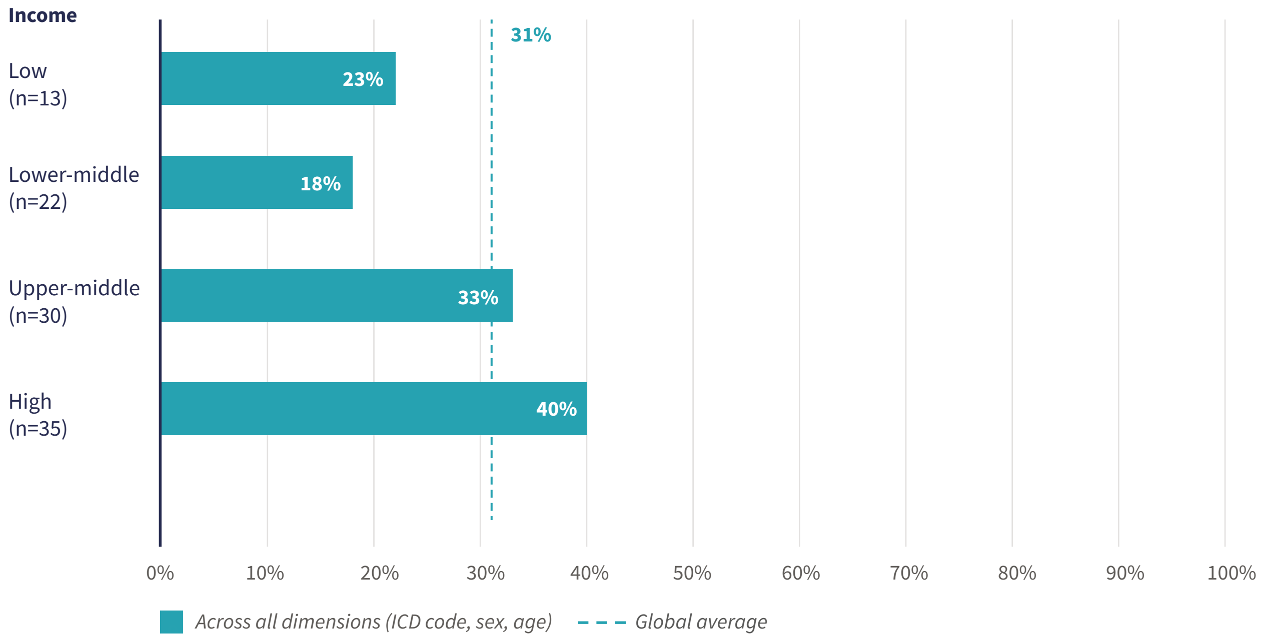


Figure 6.11

Disaggregation of indicators for neurological disorders in health information systems across all dimensions (% of responding countries), by World Bank income group (2022)



Data collection and reporting of neurological disorders

Globally, two thirds of responding countries (n=68; 67%) reported collecting and compiling data on neurological disorders/brain health in the last three years. Specifically, 52 responding countries (51%) compiled data from the public or private (or both) sectors but did not release a specific report, while 16 responding countries (16%) compiled data and published a specific report for policy, planning or management purposes in the past three years. Twenty-nine countries (28%) reported not compiling and publishing any such data (see Figure 6.12). The extent to which data were compiled and published varied across regions and World Bank income groups (Table 6.3). The share of countries not compiling any data was greater for low-income and lower-middle income countries (46% and 36%, respectively) than for upper-middle-income and high-income countries (17% and 29%, respectively) (see Table 6.3).

Figure 6.12

Extent of data collection and reporting for neurological disorders (% of responding countries, n=102) (2022)

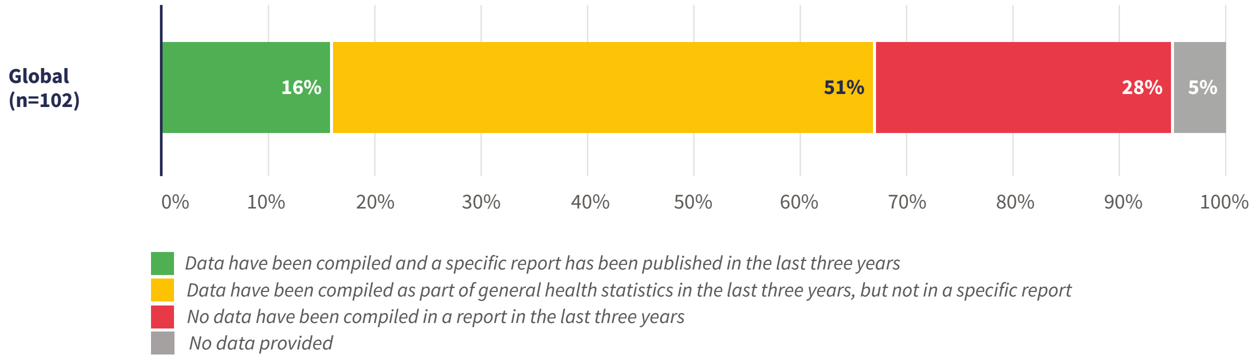


Table 6.3

Status of data collection and reporting for neurological disorders (% of responding countries, n=102) (2022)

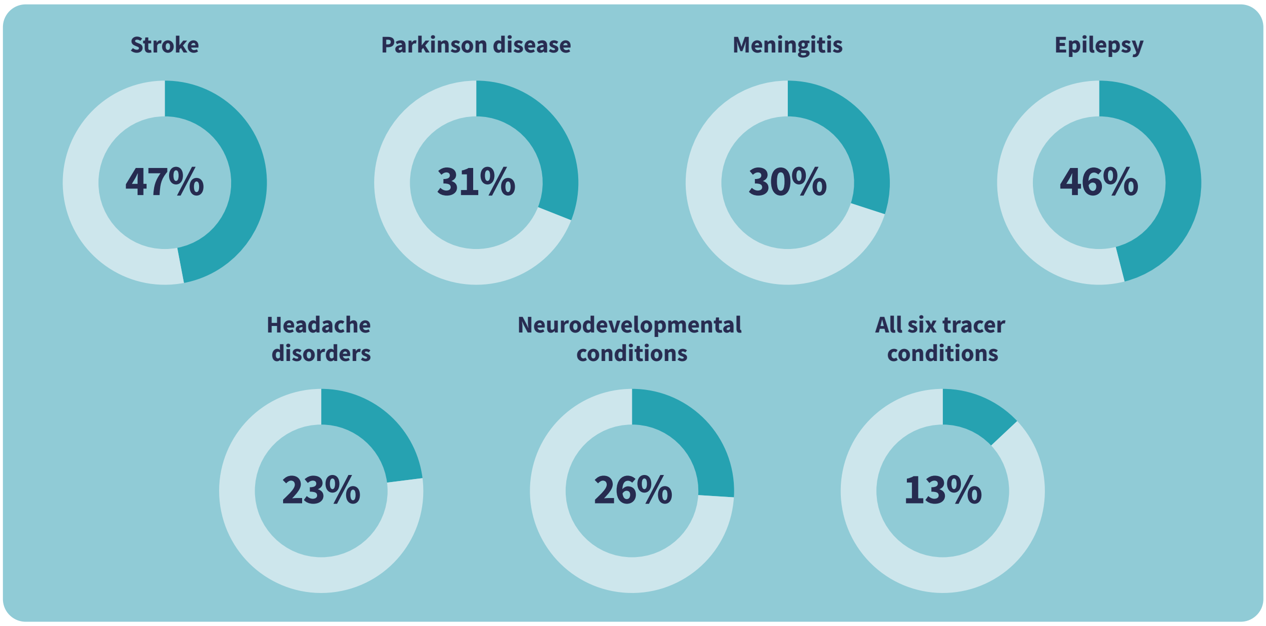
	Data have been compiled and a specific report has been published in the last three years	Data have been compiled as part of general health statistics in the last three years, but not in a specific report	No data have been compiled in a report in the last three years	No data provided	N (WHO Member States)
Global (n=102)	**16%**	**51%**	**28%**	**5%**	**194**
WHO region					
African Region (n=24)	4%	58%	38%	0%	47
Region of the Americas (n=23)	22%	35%	35%	9%	35
South-East Asia Region (n=4)	0%	100%	0%	0%	11
European Region (n=28)	14%	68%	11%	7%	53
Eastern Mediterranean Region (n=15)	20%	33%	47%	0%	21
Western Pacific Region (n=8)	38%	25%	25%	13%	27
World Bank income group					
Low-income (n=13)	8%	46%	46%	0%	26
Lower-middle-income (n=22)	5%	59%	36%	0%	50
Upper-middle-income (n=30)	20%	57%	17%	7%	52
High-income (n=35)	20%	46%	29%	6%	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Globally, stroke and epilepsy were the neurological tracer conditions for which responding countries most commonly compiled and reported data (n=48 or 47%, and n=47 or 46%, respectively) (see Figure 6.13). Data availability and reporting varied by WHO region and World Bank income groups (Annex 4, Table A6.4). Thirteen countries (13%) reported the collection and reporting of data on all six tracer conditions, of which nearly all were upper-middle-income or high-income countries and none were low-income countries (Annex 4, Table A6.4). Seven countries across three regions (Americas, Europe, Western Pacific) also reported that they compiled data on other neurological disorders – such as dementia, multiple sclerosis, cancers of the nervous system, tick-borne encephalitis, Guillain-Barré syndrome, motor neuron disease, head injuries and hydrocephalus (data not shown).

Figure 6.13

Neurological disorders for which data have been compiled and reported (% of responding countries, n=102) (2022)



Next steps for impact

Integrating neurological disorders into health information systems – including routine data collection and reporting on core indicators – is crucial for an evidence-based public health response. In the first round of IGAP reporting, only 53% of Member States (n=102/194) participated, highlighting the need for ongoing global awareness of monitoring and reporting as essential components of health systems. Governments must prioritize the strengthening of health information systems in order to identify service gaps, enhance care accessibility, monitor trends in population health, track progress, and ensure accountability on national targets for neurological disorders and brain health.

Globally, health information systems need significant improvement to enhance data quality and utilization for evidence-based policy, planning and management. Challenges appear to differ by income group: high-income and upper-middle-income countries often face issues of data integration and interoperability across care levels, while low-income and lower-middle-income countries more often report capacity constraints for neurological data collection, disaggregation and reporting. Compiling and publishing neurological data in a specific report is often overlooked but should become a priority in order to enhance evidence-based decision-making, transparency and accountability. Data collection and reporting should extend beyond specific neurological disorders, following a strategy that reflects their relative burden and incorporates a life course approach. Multistakeholder action and appropriate investment in health information infrastructure are essential to harness health data and translate insights into better outcomes for people with neurological disorders, their carers, and families (Figure 6.14). Increased demand for health services and the number of people diagnosed with neurological conditions are downstream effects of improved health information systems. Consequently, action in this sector should be parallel to strengthening of health services.

Globally, health information systems need significant improvement to enhance data quality and utilization for evidence-based policy, planning and management.

A patient at the surgical department of Radboud University Medical Center using a VR headset for relaxation, entertainment, and meditation. Netherlands, 2024. © WHO / Marie Oleinik

Figure 6.14

Priority actions, barriers and accelerators to strengthen health information systems

IGAP 4

Priority actions

Systematically strengthen health information systems for neurological disorders.

Begin by assessing health information systems specifically for neurological disorders, including reviewing and updating practical core indicators for use at country level. Develop a clear vision with actionable goals, formulate an improvement plan with quality improvement measures and monitor and evaluate progress regularly.

Capacitate health information systems for effective data collection and use.

Building system and workforce capacity for routine data collection, analysis, visualization and reporting on neurological disorders is essential to support high-quality care and sustainable health information systems. This includes leveraging electronic health records and disease surveillance systems to enable real-time data utilization and informed decision-making for neurological disorders.

Make efficient use of scalable new technologies and tools.

Leverage big data and artificial intelligence responsibly, ethically and equitably to strengthen health information systems. Ensure user-friendly interfaces and seamless integration into workflows, to support informed decision-making by health-care planners, providers and people with neurological conditions.

Figure 6.14. Priority actions, barriers and accelerators **to strengthen health information systems**

Identified barriers

Poor integration of indicators on neurological disorders.

Many countries are not collecting information on neurological disorders through their national health information systems with a defined set of indicators. This results in a lack of clarity about the burden and service use, thus affecting planning and service delivery. Where data are being collected, fragmentation across levels of care (in high-income and upper-middle-income countries) and lack of disaggregation (in low-income and lower-middle-income countries) pose major challenges.

Lack of routine reporting and evaluation of neurological data.

Data on neurological disorders are not regularly compiled for evidence-informed policy, planning or management purposes. This leads to missed opportunities for detection of trends and emerging concerns. Where data are collected and utilized in service design and delivery, insufficient monitoring and evaluation of both the quality of the data and the service outcomes hinder the ability to track progress and improve national strategies.

Poor system and workforce capacity for health information systems.

Lack of system and workforce capacity means that health systems, particularly those in low-income and lower-middle-income countries, face limitations in compiling and reporting on data and therefore cannot ensure the secure, sustainable and timely flow of information necessary to inform comprehensive neurology health care.

WHO resources to accelerate action

- WHO *IGAP implementation toolkit (14)*.
- WHO *Support tool to strengthen health information systems (214)*.
- WHO *Evidence, policy, impact: WHO guide for evidence-informed decision making (207)*.
- WHO *Supporting the routine use of evidence during the policy-making process (208)*.
- PAHO *Monitoring and evaluation framework on information systems for health (216)*.
- WHO *Ethics and governance of artificial intelligence for health: WHO guidance (217)*.

In pursuit of IGAP global target 4.1 (data and information systems), the implementation of new technologies and tools – such as big data, artificial intelligence and assistive digital technologies – is crucial for strengthening information systems while maintaining and safeguarding individuals' privacy and human rights. Leveraging such tools will require building the capacity of persons involved in research and embedding ethics and equity principles from the very beginning. This will help ensure that technologies which can and should be used to close the gap on access to medical advances are not instead driving greater disparity.

> Ensure that technologies which can and should be used to close the gap on access to medical advances are not instead driving greater disparity.

It is also important to develop tools and resources that are fit-for-purpose and that address the real needs of populations living with and affected by neurological disorders. To achieve this, it is essential that people with neurological disorders, their carers and families remain central to, and an integral part of, the research efforts from design and conceptualization through to implementation. WHO supports countries with efforts to build data systems *(218)*, including considerations for artificial intelligence *(219)*. WHO also supports the use of evidence in policy-making processes *(208)* to ensure evidence-informed decision-making *(207)*. The *IGAP implementation toolkit (14)* contains a set of actions for countries to build information systems.

Box 6.3

Strengthening health information systems to improve vaccine delivery in Malawi

In 2022, Malawi's Ministry of Health adopted DHIS2 Tracker to modernize the management of its vaccine cold chain equipment. With support from UNICEF Malawi, the Expanded Programme on Immunization (EPI) and the Digital Health Division developed the "eVax Cold Chain Guard" system within Malawi's One Health Surveillance Platform. The team digitized and standardized cold chain workflows, including equipment transactions, operational status and temperature monitoring.

In just four weeks, technicians registered over 300 pieces of equipment across 20 districts. This new system reduced inventory reporting time from five years to five minutes, allowing real-time access to data on equipment status and transactions via DHIS2 dashboards. Staff were trained on registering, monitoring and managing items of cold chain equipment using mobile devices and unique QR code labels.

During implementation, challenges such as mobile data entry issues and poor Internet connectivity were addressed through live troubleshooting and the DHIS2 Android Capture application, enabling offline data collection. Custom dashboards provide insights into equipment functionality, maintenance needs and resource allocation, thus supporting data-driven decisions. The system also enhances transparency by showing the funding sources for equipment which helps donors such as Gavi, UNICEF and USAID to assess their impact.

The Ministry of Health plans to expand the eVax Cold Chain Guard system to more districts and integrate additional data sources, including remote temperature monitoring. The initiative is part of a broader modernization road map from 2025 to 2027 which aims to improve cold chain management and which can potentially include other health-care equipment.

A mother with her children during a home visit in Benguet. One of the children has epilepsy. Philippines, 2017. © WHO / Yoshi Shimizu

Chapter 7

Strengthening the public health approach to epilepsy

> **"As a child, I had seizures very often, sometimes many in the same day. With access to tests, treatment and a neurologist…I was seizure-free by the age of 18."**
>
> – Valentina Kahn, Chile

KEY MESSAGES

- Epilepsy is among the most prevalent neurological conditions globally. Although 70% of people with epilepsy could have adequate seizure control with appropriate treatment and medication, the estimated median global epilepsy service coverage in 2022 (based on validated data from 18 responding countries) was just 49%. This underscores the need for a strong public health response to achieve IGAP global target 5.1 – i.e. a 50% increase in service coverage by 2031.
- By prioritizing access to diagnosis and treatment, this treatment gap – affecting more than 75% of people in LMICs – can be closed, through a better primary health care response, improved supply of medicines, capacity-building of health care workers and person-centred health policies.
- At baseline, only one fourth of WHO Member States (48% of responding countries) report the existence of legislation protecting the human rights of people with epilepsy, either as epilepsy-specific or general legislation (IGAP global target 5.2). Appropriate legislation is pivotal for addressing stigma and discrimination, ensuring the inclusion of people with epilepsy and guaranteeing their participation in all stages of decision-making, policy planning, evaluation and research.

Context

The epilepsy treatment gap can exceed **75%** in low-income countries

Epilepsy is one of the world's most prevalent neurological conditions, affecting about 51.7 million people in 2021 – 80% of them living in LMICs *(5)*. Epilepsy carries significant associated morbidity and mortality. Recent WHO Global Health Estimates data suggest that, in 2021, about 115 000 annual deaths and 14.4 million DALYs globally were attributed to idiopathic epilepsy. In economic terms, the global costs of treating epilepsy may be over US$ 100 billion *(220)*. This does not take into account the costs of untreated epilepsy and non-optimal treatment, as well as the loss of productivity and earnings – for instance, the lost GDP for a year in Australia due to epilepsy has been estimated at US$ 22.1 billion *(221)*.

The effects of the condition are compounded by a treatment gap which can exceed 75% in low-income countries *(222)*. Many factors, which vary by setting, contribute to the lack of access to epilepsy treatment and services. There is a significant shortage of neurological workforce and diagnostic technologies, especially in lower-middle-income and low-income countries (see Chapter 4). Treatment coverage is very unequally distributed around the world and within countries, where rural and hard-to-reach populations experience significant barriers to access. For instance, a systematic review of the worldwide epilepsy treatment gap reported 5.6% treatment gap for Norway and 100% in LMICs such as Tibet, Togo and Uganda. *(223)*. In addition, a lack of affordable and accessible medicines impedes treatment *(224, 225)*. Individuals with epilepsy may be constrained in seeking treatment by reasons of expense, geographical limitations (given specialist concentration in urban centres), social stigma and incorrect beliefs or insufficient knowledge about the causes and outcomes of epilepsy *(6)*. Moreover, groups that are traditionally excluded from health care for cultural and economic reasons – such as people of lower socioeconomic status, older people and children – are affected by inequity in epilepsy treatment *(226)*. People with epilepsy may also be particularly affected in emergency and humanitarian settings for multiple reasons, including lack of access to medical care and medicines *(227)*.

Epilepsy is also one of the most stigmatized neurological conditions. Existing prejudice and stigma are reified in outdated discriminatory legislation that prevents people with epilepsy from participating in society, including education, employment and marriage *(228)*. Comprehensive legal provisions should be in place to protect the rights of people with epilepsy, as shown in Figure 7.1. In social terms, missed life opportunities – including education, employment and family life – may have lifelong effects on individuals and communities. Stigma and discrimination persist against people with epilepsy, depriving them of social participation and having an impact on their mental health *(6, 229)*.

The prevalence and prominence of epilepsy, as well as its comorbidity with other neurological disorders, can serve to pave the way to better recognition and services for all neurological disorders. Improving service access through capacity-building of the health workforce and increasing access to anti-seizure medicines and other health products are fundamental parts of that process, as established by IGAP's Strategic objective 5 *(230, 231)*. Additionally, significant actions should be taken to raise public awareness, update policies and train professionals and gatekeepers in key sectors throughout society in identifying solutions and implementing measures. Stigma and discrimination continue to be a persistent obstacle to the demand for treatment which can provide support and realize the full potential of individuals with epilepsy *(6, 232)*.

Figure 7.1

Strengthening legislation to promote and protect the human rights of people with epilepsy

Protect persons with epilepsy against the use of coercive practices and involuntary admission and treatment, including seclusion and mechanical/ physical/ chemical restraints.

Allow persons with epilepsy to exercise their right to legal capacity on an equal basis with others, including the right to make decisions and choices for themselves on all issues affecting them, the right to informed consent to treatment, care and support, and to respect for their will and preferences.

Protect against discrimination, violence, exploitation, abuse, and other human rights violations of persons with epilepsy and provisions to file complaints to an independent legal body.

Provide a full range of services and supports to enable persons with epilepsy to live and be included in the community.

Provide reasonable accommodations to ensure that persons with epilepsy have equal rights within the workplace and in employment.

Ensure that persons with epilepsy have equal opportunities in education, marriage, health, employment, housing, transport services, social support, and social benefits.

Ensure that persons with epilepsy are able to participate in the design, development, implementation, and evaluation of policies, legislation, services, and research related to issues affecting them.

Findings

This section reports on the key findings associated with the action areas included under IGAP's *Strategic objective 5: Strengthen the public health approach to epilepsy*, and its two global targets:

Global target 5.1

By 2031, countries will have increased service coverage for epilepsy by **50% from the current coverage** in 2021.

Global target 5.2

80% of countries will have developed or updated their legislation with a view to promoting and protecting the human rights of people with epilepsy by 2031.

Access to services for people with epilepsy

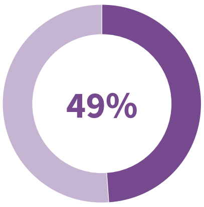
Global target 5.1. of the IGAP stipulates that by 2031 countries will have increased service coverage for epilepsy as a tracer condition at a rate that equals 150% of coverage in 2022. This requires that service coverage for epilepsy is measured at the national level. Service coverage as a percentage is calculated as "the number of people receiving defined services (numerator) by the population in need of the intervention (denominator)" (Table 7.1).

Table 7.1

Calculation of epilepsy service coverage

Definition numerator (IGAP survey)	Number of persons with a diagnosis of epilepsy for the most recent calendar year Examples of methods of calculating this include: a diagnosis of epilepsy (PDx or SDx fields) during a hospital admission; prescription for antiseizure medicines (benzodiazepines, including diazepam, lorazepam, clonazepam and others; carbamazepine; lamotrigine; levetiracetam; phenobarbital; phenytoin; valproic acid [sodium valproate]); a diagnosis of epilepsy recorded on their primary care record; a dedicated epilepsy register, an insurance register, or other register-type dataset; data recorded by the long-term care institution showing that the person has a diagnosis of epilepsy; reported in household survey data.
Definition denominator (adapted from GBD *(5)*)	2021 age-standardized prevalence rate (idiopathic and secondary epilepsy combined) from *(5)*, adjusted using 2022 UN population data to calculate the total number of people with epilepsy in each responding country for the reference year 2021 GBD study definition of epilepsy etiologies: "In GBD 2021, overall epilepsy was split into idiopathic epilepsy, in which the underlying cause is unknown or genetic in nature, and secondary epilepsy, in which the underlying cause is known (e.g. epilepsy due to abnormality of the brain structure or chemistry)" *(5)*. 2021 GBD study definition of an epilepsy case: "An epilepsy case was defined as someone with an active, recurring condition of epileptic seizures, at least two seizures, unprovoked by any immediate cause, and who has had at least one epileptic seizure in the past 5 years regardless of antiepileptic drug treatment *(5)*" *(233)*.

Based on 18 countries (18% of responding countries, 9% of WHO Member States) across all WHO regions and World Bank income groups reporting verifiable and validated data on this indicator, the estimated median global epilepsy service coverage for the reference year (2022) was 49% (range: 8-77; interquartile range: 19 [34-54]).



Estimated median global epilepsy service coverage for the reference year (2022) was 49%

Disaggregation and reporting by country, WHO region or World Bank income group was not reliably possible due to limitations in the data used to calculate both the numerator and denominator. Challenges with numerator data included under-reporting – e.g. when countries provided only inpatient or outpatient cases, only prevalent or incident cases, or only data from specific sectors (private or public) or (subnational) regions (e.g. due to decentralized or federated reporting systems). Over-reporting occurred in some cases due to double-counting (e.g. reporting care visits instead of individual cases), using multi-year data that extended beyond the reference year or misclassification based on prescription data of antiseizure medicines. For the denominator, GBD 2021 country-level estimates of age-standardized prevalence estimates were generated using prevalence data from the Global Health Data Exchange (GHDx, http://ghdx.healthdata.org/) and a Bayesian meta-regression tool (DisMod-MR 2.1). This method cascades estimates from a global fit to seven GBD super-region fits, 21 region fits, and 204 fits by country, giving 95% Uncertainty Intervals (UI) for each country-level estimate (see Supplementary material in *(5)*). These uncertainty intervals introduce the possibility of over- or underestimating a country's prevalence, which may affect the calculated service coverage.

These examples highlight the inherent challenges in calculating epilepsy service coverage – particularly concerns about countries' aggregate reporting of total epilepsy cases. Contributing factors include limitations in health information system infrastructure, decentralized data collection and reporting, and the absence of national epilepsy registries (see Chapter 6). This situation emphasizes the need for high-quality, nationally representative epilepsy prevalence studies to further improve the model accuracy and the robustness of prevalence estimates. As such, certain indicators for IGAP *Strategic objective 4* are also relevant to the measurement of epilepsy service coverage. As discussed in Chapter 6, only 40% of responding countries reported integration of a core set of indicators for epilepsy into their health information systems and only 46% stated that they had compiled and reported data on epilepsy (see Figures 6.9 and 6.13).

Legislation that protects the rights of people with epilepsy

To affirm the human rights of people with neurological disorders and to reduce the stigma and discrimination affecting their lives, IGAP sets out comprehensive actions to be taken in legislation at the national level. In this regard, epilepsy serves as a tracer condition to observe whether such legislation is enacted. IGAP global target 5.2. stipulates that by 2031, 80% of countries will have developed or updated their legislation with a view to promoting the human rights of people with epilepsy and protecting them against discrimination.

At baseline, 49 countries (48% of responding countries, 25% of WHO Member States) met global target 5.2 by reporting the existence of legislation protecting the rights of people with epilepsy, either as epilepsy-specific or general legislation (Table 7.2). Across WHO regions, rates among Member States were highest in the European Region (30%) and Eastern Mediterranean Region (29%). Disparities across income groups were substantial, with high-income and upper-middle-income countries (32% and 33%, respectively) exceeding the rates in lower-middle-income and low-income countries (16% and 12%) by more than twofold. Notably, fewer WHO Member States (20%, n=38/194) met a stricter definition of the target, requiring compliance with at least one of seven legal provisions (listed in Figure 7.1) (Annex 4, Table A7.1). Rates for this stricter target were below 20% across all WHO regions, except for the European Region (26%) and the Region of the Americas (23%), with rates at or below 10% in lower-middle-income and low-income countries.

Table 7.2

IGAP global target 5.2: Existing legislation promoting and protecting the human rights of people with epilepsy (2022)

	Countries that have developed or updated relevant existing legislation	Percentage of responding countries	Percentage of WHO Member States
Global (n=102)	**49**	**48%**	**25%**
WHO region			
African Region (n=24)	11	46%	23%
Region of the Americas (n=23)	8	35%	23%
South-East Asia Region (n=4)	2	50%	18%
European Region (n=28)	16	57%	30%
Eastern Mediterranean Region (n=15)	6	40%	29%
Western Pacific Region (n=8)	6	75%	22%
World Bank income group			
Low-income (n=13)	3	23%	12%
Lower-middle-income (n=22)	8	36%	16%
Upper-middle-income (n=30)	17	57%	33%
High-income (n=35)	20	57%	32%

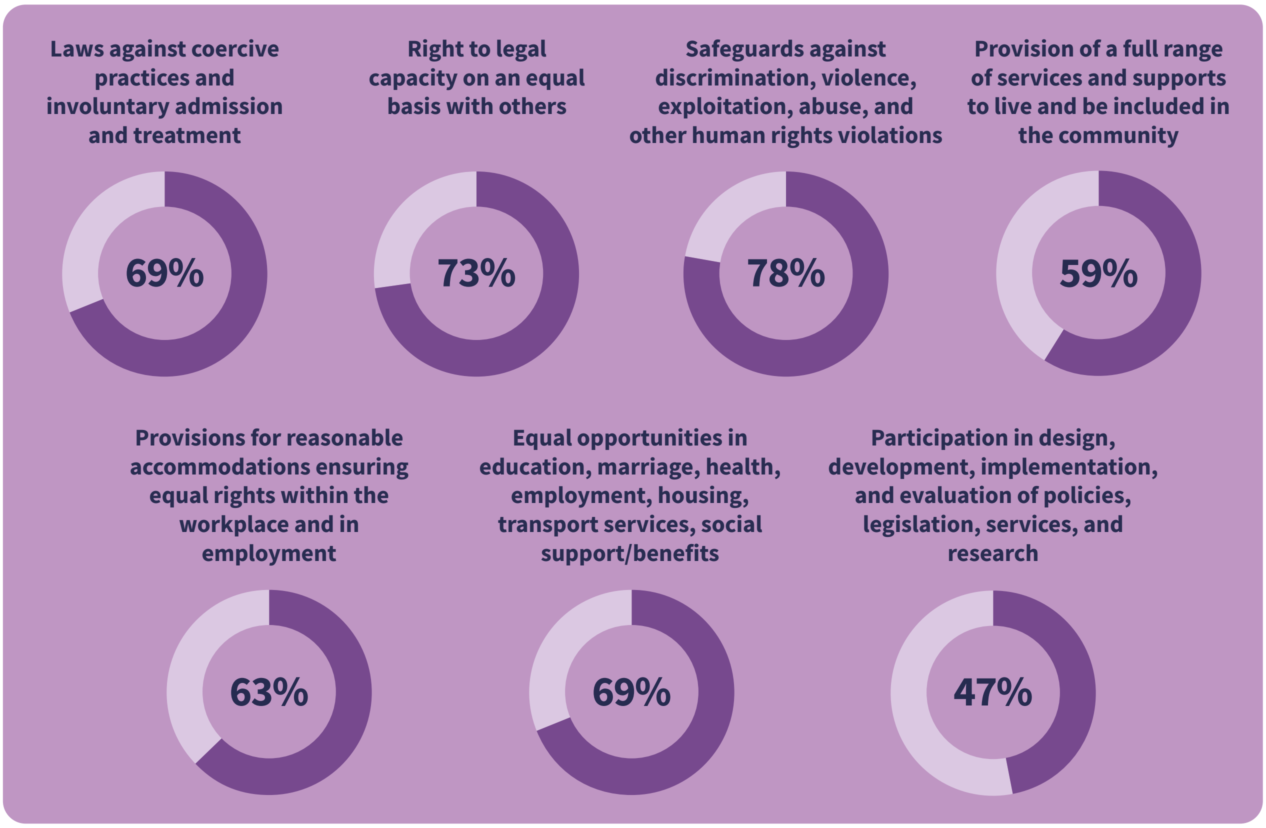
Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Among the 49 responding countries reporting the existence of legislation protecting the rights of people with epilepsy, nearly all (92%) stated that respective legal provisions were covered by their general legislation (universal law). Only four countries (two each from the Region of the Americas and the Eastern Mediterranean Region) reported coverage in epilepsy-specific legislation (Annex 4, Table A7.2).

Among countries with existing legislation, compliance with seven defined legal provisions ranged from 47% to 78% (Figure 7.2). Specifically, most (78%) reported having legal provisions against discrimination, exploitation and other human rights violations, including channels for independent complaints. Additionally, 73% stated applying a rights-based approach to decision-making for people with epilepsy, ensuring their right to legal capacity, informed consent and treatment. Over two thirds (69%) reported having legal provisions protecting persons with epilepsy from coercive practices and involuntary admission and treatment (including seclusion and restraints). Regarding societal inclusion, 59% stated they had legislation supporting independent living within communities, and 69% reported ensuring equal opportunities in education, marriage, health, employment, housing, transport, social support and benefits. To facilitate these opportunities, 63% reported providing reasonable accommodations, particularly in employment and education, as defined by the United Nations Convention on the Rights of Persons with Disabilities (CRPD). Notably, less than half (47%) reported legal provisions for the participation of people with epilepsy in policy development, evaluation and implementation. There were significant regional variations, and compliance rates were higher in high-income and upper-middle-income countries compared to lower-middle-income and low-income countries (Annex 4, Table A7.3).

Figure 7.2

Types of legal provisions included in the legislation (% of countries with existing legislation, n=49) (2022)



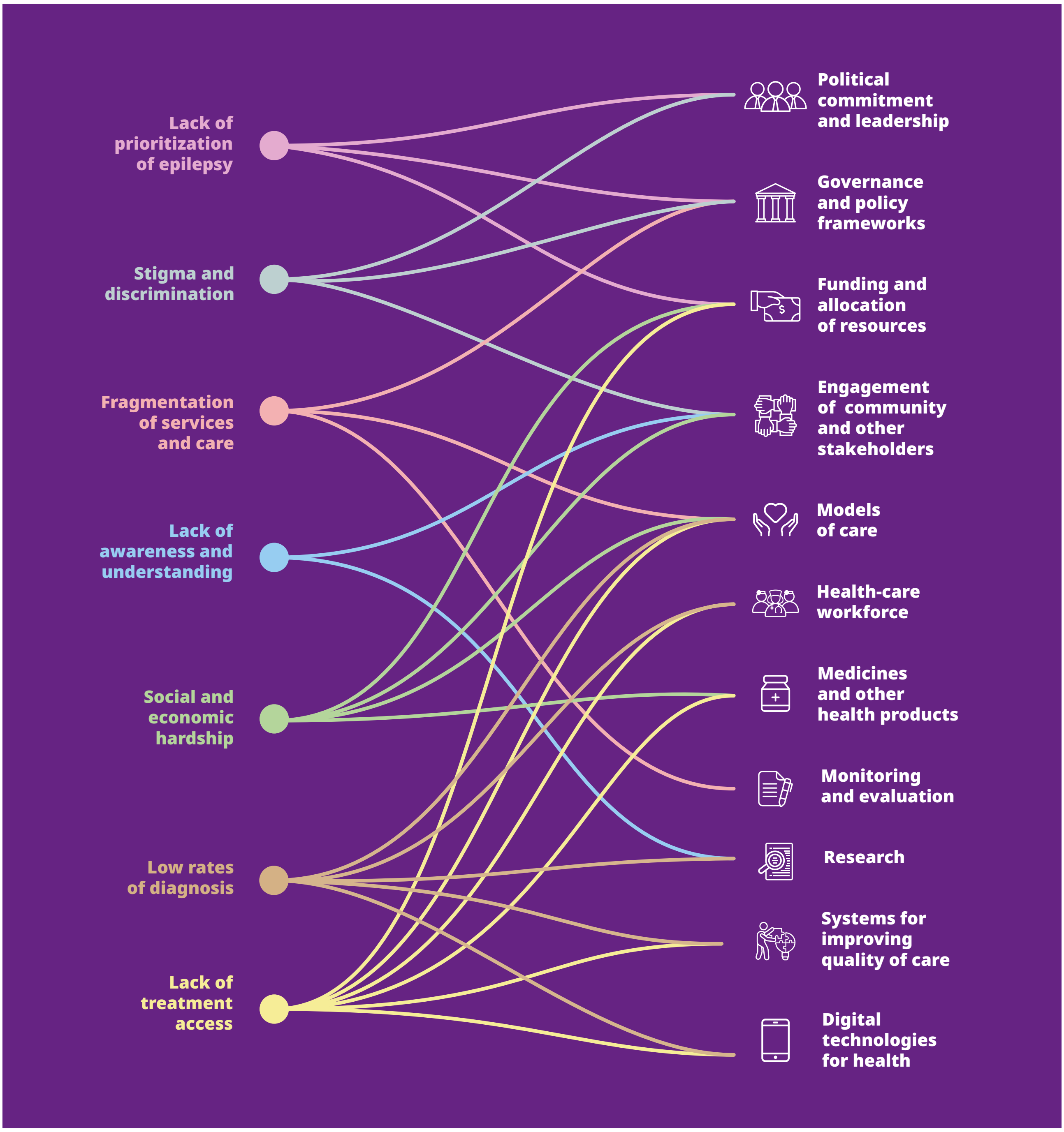
Next steps for impact

Data from the IGAP survey show the need to step up access to services and inclusive supports for people with epilepsy in all WHO regions (Figures 7.3 and 7.4). This should be complemented by improved reporting within health information systems to provide more robust and dependable estimates of epilepsy service coverage and to enable a dynamic assessment of how service access changes. Disaggregation by key characteristics is not operational in most countries, yet it is necessary to track how certain vulnerable groups – such as women and girls, older people and children – are affected by service coverage. Legislation specifically protecting the rights of people with epilepsy – historically subject to discrimination, abuse and exclusion – has yet to be developed and adopted by many countries, possibly due to the sweeping reforms required in a number of laws.

Figure 7.3

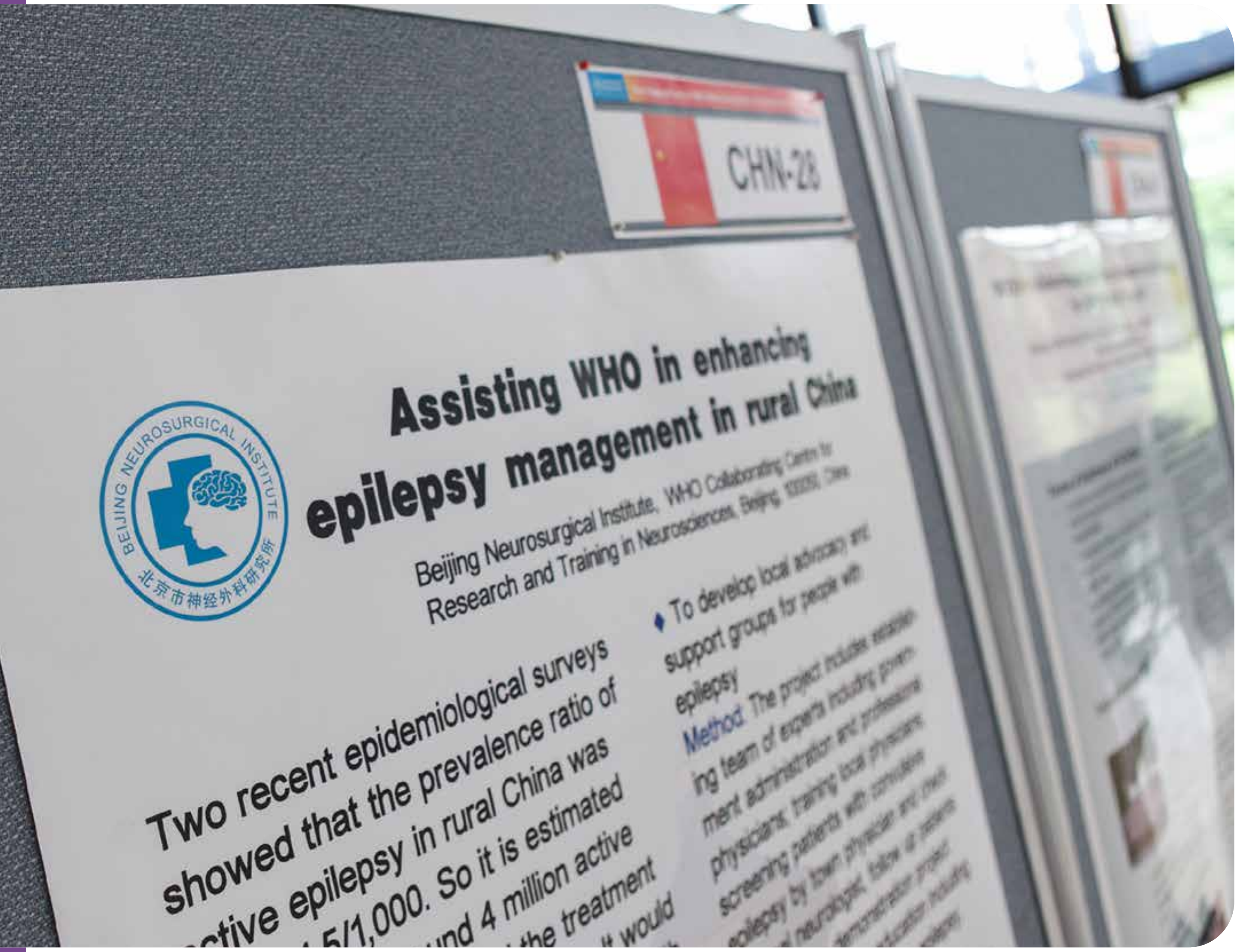
Levers for change

Adapted from the Epilepsy technical brief *(6)*



In these efforts, the guiding principles of IGAP – especially mainstreaming gender, equity and human rights perspective for a robust public health approach to an inclusive society – should be central. Legislation should be turned from a barrier to inclusion into a powerful instrument for guaranteeing fairness and equitable treatment. This involves dismantling prohibitive and restrictive legislation and adopting a rights-based approach that safeguards the rights of people with epilepsy to be included in societal life, to make decisions about their care and to be protected from discrimination, abuse, violence and exploitation.

Legislative reforms concerning people with epilepsy, as well as other neurological disorders, should always follow the principles of the CRPD and support people with lived experience to take part in policy, programme and practice planning. In turn, it is important to implement rigorous changes to governance to ensure that people with lived experience are empowered to join the decision-making process and to provide their perspective on matters that concern them, in concert with IGAP's guiding principles.



Poster on enhancing epilepsy management in rural China on display during the poster sessions at the First Regional Forum of WHO Collaborating Centres, at the Regional Office for the Western Pacific, Manila. Philippines, 2014. © WHO / Alfred Mendoza

IGAP 5

Figure 7.4

Priority actions, barriers and accelerators **to strengthen the public health approach to epilepsy**

Priority actions

Strengthen epilepsy care through primary healthcare integration.

To expand service coverage and reduce the burden of epilepsy, care must be integrated into primary healthcare systems. This requires equipping the health workforce (including doctors, nurses, and allied health professionals) with comprehensive pre-service and in-service training in the detection, diagnosis, and management of epilepsy. Ensuring consistent access to affordable anti-seizure medicines, including in emergency settings, and embedding specialist support and supervision within primary care will further enhance service delivery.

Revise outdated legislation to address stigma, mitigate human rights violations and promote societal inclusion.

To uphold the rights and dignity of people with epilepsy, countries must review and revise outdated laws that perpetuate stigma, discrimination or human rights violations. Legal reforms should be informed by the voices of people with lived experience, their families and caregivers, ensuring that new legislation supports autonomy, informed decision-making and equal access to services. In parallel, efforts must be made to raise community awareness and challenge misconceptions about epilepsy, fostering a more inclusive and supportive environment.

Address preventable causes of epilepsy through multisectoral involvement.

Strengthen public health collaborations to reduce head injuries across sectors, provide adequate perinatal care, manage NCD risk modification, support vaccination programmes, and control outbreaks of communicable diseases to prevent potential cases of epilepsy.

Strengthen epilepsy research, innovation and health information systems.

Incentivize inclusive research into epilepsy, innovate for diagnosis, treatment and care, and implement innovative solutions. Research should focus on setting ethical and data-sharing standards, enhancing the quality of care, conducting implementation research on effective interventions, and ensuring extensive dissemination of findings to incorporate lessons learned. Strengthening health information systems is essential to monitor service quality, track treatment coverage and outcomes, and support data-driven planning.

Figure 7.4. Priority actions, barriers and accelerators
to strengthen the public health approach to epilepsy

Identified barriers

Limited awareness and lack of clinical guidance delay timely diagnosis and treatment, hinder prevention efforts and perpetuate stigma.

Many people, including health-care workers, are unaware that epilepsy is a neurological condition that is often manageable through appropriate medication and that people with epilepsy can lead full lives. This lack of understanding reinforces stigma and limits inclusion and opportunities for people with epilepsy. In many parts of the world, clinical pathways and treatment guidelines for epilepsy are underdeveloped or absent, contributing to the treatment gap.

Limited healthcare workforce to diagnose and treat epilepsy.

The large treatment gap is aggravated by the lack of healthcare workers with the knowledge to diagnose and treat epilepsy, requiring the intervention of scarcely available neurological health workers.

Insufficient prioritization for supplying affordable, accessible and safe anti-seizure medicines.

Lack of leadership and expertise in governance and procurement of anti-seizure medicines impacts their availability, affordability, safety profile, prescription and use at the level of primary health care.

Lack of lived experience-informed policy-making, leading to exclusionary or impractical policies and practices.

Inclusion of people with epilepsy in the development of policies, strategies and practice guidance is not only their right, but also increases the feasibility and acceptability of these processes. This serves to close the treatment gap and improve the realization of their potential.

WHO resources to accelerate action

- WHO *Epilepsy: a public health imperative (234)*
- WHO *Improving the lives of people with epilepsy: a technical brief (6)*
- WHO *mhGAP guideline for mental, neurological and substance use disorders (17)* and *mhGAP e-learning course (235)*
- WHO *IGAP implementation toolkit (14)*
- WHO *Improving access to medicines for neurological disorders (25)*

Key steps towards bridging the treatment gap for epilepsy and achieving IGAP Global target 5.1 are capacity-building initiatives for non-specialist health-care professionals and increased access to essential anti-seizure medicines through regulation, procurement and resolution of supply issues. Although requiring an upfront investment in planning and implementing capacity-building, improved access to services can yield durable long-term benefits in reducing the burden of epilepsy. WHO's mhGAP initiative is a feasible intervention, constituting curricula and detailed guidance for training primary health care workers in diagnosing and treating epilepsy. The guidance covers the whole process of implementation, including the essential step of supervision to maintain skills and expand referral pathways. mhGAP interventions have been successfully implemented and scaled up in a number of countries *(236, 237, 238)* including as part of WHO's Special Initiative for Mental Health (SIMH) to expand epilepsy coverage (Box 7.1). mhGAP is also now available to everyone as a self-paced online e-learning course online via the WHO Academy *(235).* The experience generated through SIMH demonstrates the value of expanded access for the public health system and the importance of complementary training initiatives (whether mhGAP or other) for ongoing care of epilepsy.

Box 7.1

WHO's Special Initiative for Mental Health

In 2018, WHO's Director-General identified mental health as an area for accelerated implementation within WHO's work. The WHO Special Initiative for Mental Health (SIMH) aims to ensure universal health coverage that involves access to quality and affordable care for mental health, brain health and substance use conditions for 100 million more people. The SIMH advances policies, advocacy and human rights, as well as the scale-up of quality interventions and services. This includes a focus on epilepsy as a target condition.

Six countries were selected as "early adopter" countries for the SIMH, namely: Bangladesh, Jordan, Paraguay, Philippines, Ukraine and Zimbabwe joining in January 2020. Ghana and Nepal subsequently joined in late 2021, and Argentina began work in 2022. Each country where the SIMH is being implemented is working to deliver on country-specific objectives and outputs that were established after an in-country assessment and design process.

By the provision of training to health-care workers, 33 527 more people received epilepsy services in the period 2021–2024. The SIMH further demonstrates the benefits of an integrated approach to mental, neurological and substance use disorders, where epilepsy services could act as an entry point for access to services for other conditions, including psychosis, depression, anxiety and substance use disorders.

Increasing the demand side of epilepsy treatment is an important consideration in view of the historical misconceptions and prejudice surrounding the condition. Countries should plan and hold campaigns designed to inform, reduce stigma and raise awareness about epilepsy, targeting the general population as well as specific sectors where stigma can be especially detrimental – such as education, employment and social care. Addressing misconceptions – by spreading the key messages that epilepsy is treatable and non-contagious and that people with epilepsy can have high quality of life – should take place in parallel with expanding access to services in order to lead to higher service coverage. Awareness-raising and service provision are especially important for children, as most epilepsies begin in childhood and receiving appropriate and timely diagnosis and care would reduce the disease burden and associated health costs.

In implementing IGAP's Global target 5.2 on legislation that protects human rights, advocates can play significant roles to generate public interest and momentum as well as the resolve in government structures to enable legislative reviews. Outdated legislation is still used in many jurisdictions. However, legislative reforms should go further than excising prohibitive strictures and should institute positive and protective actions, including reasonable accommodations. Advice on advocacy and energizing people and public structures for change is offered by several resources including the Advocacy Toolkit developed jointly by the International Bureau for Epilepsy (IBE) and the Pan-American Health Organization *(239)* (Box 7.2). The best results will always be achieved by joining efforts in multistakeholder groups comprising people with lived experience and their families, community leaders, health-care professionals, academics and decision-makers. These multistakeholder groups should bring together perspectives on what changes need to be made to comply with the CRPD, to enhance legal protections and to put them into practice. Empowerment of people with lived experience should be a main tenet, and their perspectives should be placed at the centre of changes (see Box 7.3 as an example).

Empowerment of people with lived experience should be a main tenet, and their perspectives should be placed at the centre of changes.

Box 7.2

IGAP in Action

IBE-PAHO Advocate’s toolkit for making epilepsy a priority in the Americas

The *Advocate’s toolkit for making epilepsy a priority in the Americas (239)* was developed to help individuals and organizations to identify opportunities to provide full participation of people with epilepsy in the community. The toolkit is intended for organizations looking for guidance and inspiration as they develop advocacy projects relating to epilepsy. The toolkit contains key prompts for reflection and discussion, important advocacy pointers and essential tools to help civil society work through the various stages of an advocacy planning cycle. The modules can be used as a step-by-step guide to lead in the advocacy planning process, or as a set of stand-alone resources when encountering a problem or opportunity.

The toolkit was co-developed by the Pan American Health Organization and the International Bureau for Epilepsy with important input from key stakeholders, including persons with epilepsy and their families, and with health-care providers from the region. It recognizes that stigma is a major barrier preventing social inclusion and access to health care and treatment for people with epilepsy. The toolkit has been heavily influenced by the needs and experiences of people with epilepsy. It contains many resources, ideas and guidance for addressing and dismantling stigma and for monitoring and evaluating progress towards the implementation of IGAP.

Box 7.3

Initiatives by people with lived experience – Connecting and empowering epilepsy communities across Latin America

Fundación Espacio Epilepsia is a digital community and nonprofit organization founded by people with epilepsy, their families and health-care professionals. Its mission is to transform the way epilepsy is understood and addressed in Argentina and throughout Latin America by providing reliable information, reducing stigma, and promoting equitable access to resources and support. Through digital strategies, community engagement and strategic advocacy it seeks to address critical gaps in epilepsy awareness and treatment. As one of the largest epilepsy communities in Latin America, it reaches over 30 000 people and has impacts in 23 countries through partnerships with specialized institutions.

To strengthen the public health response to epilepsy, the organization works across four action areas, as follows:

- **Education and training:** Over 1 000 participants have been trained through educational activities, including an online learning platform, in-person workshops in schools and at sports events, and interactive expert-led community talks on epilepsy myths, prevention and first aid.
- **Policy advocacy:** Two national workshops have been organized under the WHO IGAP framework and strategic meetings were held with policy-makers to promote epilepsy first aid education in Argentina.
- **Research and innovation:** The organization participated in the International Bureau for Epilepsy Global Epilepsy Needs Study – a multi-country research project assessing the needs of people with epilepsy – and collaborated on research developing digital tools for epilepsy care.
- **Awareness and outreach:** Mass social media campaigns such as "You Can't Swallow Your Tongue" have reached 800 000 people; several online community exchange groups connect over 1 000 people, including people with epilepsy, caregivers and health-care providers; and Epifest, the Latin American Epilepsy Congress, gathers over 1 000 participants from 20 countries annually.

Through digital outreach, global partnerships and recognized advocacy, the organization has contributed to fostering epilepsy awareness and education across Latin America – engaging millions on social media and collaborating with national, regional and global public health institutions. Its achievements have been recognized with the IBE International Golden Light Award and official commendations from Ciudad Autónoma de Buenos Aires and Córdoba legislatures.

For more information, see:

- Website: www.espacioepilepsia.org

Physical therapists working with a young child with ataxic cerebral palsy at a Health Care Center in Armenia. Armenia, 2022. © WHO / Nazik Armenakyan

Chapter 8

The way forward

Neurological conditions are the leading cause of ill-health and disability worldwide, affecting over one in three people. The growing burden of neurological conditions falls disproportionately on LMICs, undermining the physical, social and economic well-being of individuals, communities and entire nations. Scalable, effective and sustainable solutions exist for promoting brain health and improving prevention, diagnosis, treatment, care, and rehabilitation for neurological disorders across the life course, but demand urgent and coordinated action to overcome critical systemic barriers.

As described in this report, countries face several common challenges in addressing brain health and neurological disorders holistically and effectively. These include limited policy prioritization, inadequate legislative frameworks and insufficient resource allocation. Significant treatment gaps persist, aggravated by weak neurology capacity in primary health care and limited integration of neurological disorders into UHC. Effective prevention and brain health promotion strategies exist but remain underutilized. National health information systems are often underdeveloped, hindering robust data collection and utilization in evidence-informed policy-making, planning and programming. Needs-based participatory approaches that place people with lived experience at the centre of the public health response are paramount but frequently overlooked.

During the recent IGAP reporting cycle, a total of 102 out of 194 WHO Member States responded to the survey, representing a participation rate of 53%. This highlights the need to strengthen national health information systems and enhance data collection and reporting capacities for neurological disorders. The IGAP survey data show that, in 2022, global baseline values for quantifiable IGAP targets ranged from 20% to 37% of WHO Member States (Figure 8.1). While this reporting cycle sets the baseline for IGAP's 10-year timeline, current levels of progress reveal the urgency for renewed, bold and concerted action to stay on track to reach the 2031 targets.

Renewed, bold and concerted action is needed to stay on track to reach IGAP's 2031 targets.

Figure 8.1

Baseline values for IGAP's 10 global targets, 2022

IGAP strategic objective	IGAP global target	Baseline value for 2022 (percentage of 102 responding countries)	Baseline value for 2022 (percentage of 194 WHO Member States)
PRIORITIZATION AND GOVERNANCE	1.1 **75% of countries** will have adapted or updated existing national policies, strategies, plans or frameworks to include neurological disorders by 2031.	**62%**	**32%**
	1.2 **100% of countries** will have at least one functioning awareness campaign or advocacy programme for neurological disorders by 2031.	**45%**	**24%**
DIAGNOSIS, TREATMENT AND CARE	2.1 **75% of countries** will have included neurological disorders in the UHC benefits package by 2031.	**48%**	**25%**
	2.2 **80% of countries** will provide the essential medicines and basic technologies required to manage neurological disorders in primary care by 2031.	**56%**	**29%**
PROMOTION AND PREVENTION	3.1 **80% of countries** will have at least one functioning intersectoral programme for brain health promotion and the prevention of neurological disorders across the life course by 2031.	**38%**	**20%**
	3.2 **The global targets** relevant to prevention of neurological disorders are achieved, as defined in: (1) the *NCD-GAP*; (2) *Defeating meningitis by 2030: a global road map*; and (3) *Every newborn: an action plan to end preventable deaths*.	Various baseline values (see Chapter 5)	
RESEARCH AND INFORMATION SYSTEMS	4.1 **80% of countries** routinely collect and report on a core set of indicators for neurological disorders through their national health data and information systems at least every three years by 2031.	**70%**	**37%**
	4.2 **The output** of global research on neurological disorders doubles by 2031.	**6.7%** Neurological disorders research share of overall health research output (2022 baseline)	
PUBLIC HEALTH APPROACH TO EPILEPSY	5.1 **By 2031**, countries will have increased service coverage for epilepsy by 50% from the current coverage in 2021.	**49%** Global median epilepsy service coverage (2022 baseline)	
	5.2 **80% of countries** will have developed or updated their legislation with a view to promoting and protecting the human rights of people with epilepsy by 2031.	**48%**	**25%**

To drive concerted and accelerated global progress, this report outlines four essential, timely and actionable recommendations for policy-makers and stakeholders involved in the public health response to neurological disorders. Collaborative implementation of these actions will support Member States in reaching IGAP's overarching goal by 2031 – to "reduce the stigma, impact and burden of neurological disorders, including their associated mortality, morbidity and disability, and to improve the quality of life of people with neurological disorders, their carers and families".

Recommendations for achieving IGAP targets

Recommendation 1: Make neurological disorders a policy priority through bold leadership and sustained investment.

Current levels of policy prioritization fall short of addressing the rising global epidemiological and economic burden of neurological disorders. Most countries lack dedicated policies and adequate financial resources for dealing with neurological disorders. Countries should develop and implement evidence-informed policies on neurological disorders (stand-alone and/or integrated into existing policies), tailored to local needs. In many regions, this should be accompanied by comprehensive legislative reform to reduce stigma, address discrimination and protect the rights of people with neurological conditions. Adequate and sustained financing is equally essential to translate plans into action, particularly in LMICs. This requires not only the mobilization of new resources but also the efficient and sustainable use of existing ones. These actions be complemented by continuous advocacy and awareness efforts that reflect priority needs, have clear implementation plans, and demonstrate reach and measurable impact. Meaningful involvement of people with neurological conditions and their families from the outset is essential to developing effective and inclusive policies and advocacy strategies. This can be achieved by: ensuring representation of people with lived experience in decision-making bodies; conducting consultations and focus groups early in the policy development process to gather insights and priorities; integrating feedback mechanisms that allow ongoing input throughout implementation and evaluation; and, providing capacity building opportunities to ensure individuals can participate meaningfully in all activities.

Recommendation 2: Expand access to neurological care by Universal Health Coverage and health system strengthening.

Access to neurological services remains unevenly distributed globally. Many countries face major challenges due to a lack of inclusion of neurological disorders in UHC and limited neurology capacity in primary care – including restricted access to clinical services, essential medicines and basic technologies in these settings. Countries need to reimagine service delivery to ensure that neurological care is accessible, continuous and person-centred across primary, secondary and tertiary care levels and in all communities, while also protecting individuals with neurological conditions and their families from financial hardship. This involves embedding neurological services into UHC benefits packages with clearly defined financial protection against healthcare costs. It also requires investing in a resilient, multidisciplinary workforce through comprehensive training, retention strategies, and adequate support for both health professionals and carers. Continuous access to safe, effective, and affordable medicines, diagnostics, and health products should be an integral part of UHC, ensuring that people with neurological disorders and their families can afford the services they need. In parallel, access to specialized services – such as rehabilitation and palliative care – must be expanded beyond urban centres to reach underserved populations in rural and remote areas. Telemedicine can facilitate access to neurological care in these settings by enabling timely consultations, continuity of care, and specialist support. Finally, it is essential to build integrated care pathways that connect all levels of care, spanning emergency to chronic care and relevant sectors to address the complex and long-term needs of people living with neurological conditions across all stages of life. Depending on each country's context, programmes and services, condition-specific entry points (e.g. epilepsy, dementia, stroke etc.) can be utilized to ensure that the most effective levers are used to drive broader, system-wide improvements in neurological service delivery. Rigorous implementation research should be pursued to build the evidence for effective interventions, scalable models, and best practices that can guide policy decisions and improve service delivery across diverse contexts.

Recommendation 3: Promote brain health across the life course with coordinated intersectoral action targeting key risk and protective factors.

A significant portion of neurological health loss is preventable by addressing modifiable risk factors with effective promotion and prevention strategies, yet such interventions remain largely underused by countries. Effective brain health optimization involves multipronged actions across the following determinants: physical health, healthy environments, safety and security, learning and social connection, and access to quality services. Countries should firmly embed brain health in all relevant policies and sectors, ensuring that prevention efforts address all determinants and are tailored to different life stages and community contexts. This requires establishing strong intersectoral governance mechanisms and aligning prevention and promotion strategies with relevant global health targets on NCDs, meningitis, and maternal and newborn health. Developing robust metrics for individual and population-level brain health measurement is equally important to guide monitoring, evaluation and data-driven optimization of interventions. Optimizing brain health and investing in promotion and prevention strategies will contribute to enhanced brain capital, thus creating positive social and economic impacts, maximize societal growth, resilience, and overall well-being.

Recommendation 4: Strengthen data systems and monitoring for evidence-informed decision-making and accountability.

To accelerate progress under IGAP, countries must prioritize the strengthening of health information systems and monitoring frameworks for neurological disorders. The first IGAP reporting cycle reveals critical gaps in the capacity to collect, analyze, and report on standardized neurological indicators. Establishing and maintaining routine health information systems with attention to clinical records for priority neurological conditions at all levels of care – primary, secondary and tertiary – will support surveillance, service planning, and research. Scalable digital tools and platforms should be leveraged to improve data collection, quality, and real-time use for decision-making. Building capacity for data collection and analysis by training health workers and policy-makers is vital. Data systems must also be designed to capture disaggregated data to identify and address disparities. Robust monitoring and evaluation frameworks should be embedded in national neurology strategies, aligned with IGAP indicators and global health targets, enabling countries to track progress, identify gaps, and continuously improve the effectiveness and responsiveness of neurological services.

Conclusions

This report presents the first comprehensive assessment of the global public health response to neurological disorders under IGAP, establishing a 2022 baseline to monitor progress toward the action plan's global targets by 2031. It outlines evidence-informed priority actions that can support countries in addressing the rising burden of neurological conditions through coordinated implementation of the action plan's strategic objectives. There are encouraging examples from countries which show that meaningful progress is possible. The report highlights persistent data gaps, systemic challenges, and the urgent need for stronger national commitment – particularly in data collection, reporting and inclusive policy development.

Central to this effort is the meaningful involvement of people with lived experience. Their voices must shape the design and delivery of policies, services and systems to ensure a truly person-centred and needs-based approach to neurology. By implementing the strategic recommendations outlined in this report, countries and stakeholders can accelerate progress, reduce the treatment gap, and deliver lasting impact for individuals, families and communities affected by neurological disorders.

Neurological disorders are shaped by a wide range of social, economic, environmental and structural determinants. Addressing these effectively requires collaboration across sectors – including education, employment, social protection, justice, housing, environment and finance. Anchored in IGAP's guiding principle of intersectoral collaboration, this approach aligns with and reinforces global health and development agendas – from UHC to NCD prevention, mental health, climate resilience, ageing and human rights.

As we move into the post-SDG era, brain health-directed policy-making offers a powerful lever to build forward-looking systems and cohesive societies. Strong international cooperation and agile governance will be essential to champion a brain health-in-all-policies approach – one that not only advances IGAP's goals but also secures a healthier, more resilient future for generations to come. Now is the time for countries to prioritize brain health, fully implement the IGAP framework, and invest in integrated, sustainable solutions. Together, we can realize IGAP's vision of a world in which brain health is valued, promoted and protected across the life course; neurological disorders are prevented, diagnosed and treated, and premature mortality and morbidity are avoided; and people affected by neurological disorders and their carers can attain the highest possible level of health, with equal rights, opportunities, respect and autonomy.

> Now is the time for countries to prioritize brain health, fully implement the IGAP framework, and invest in integrated, sustainable solutions.

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A WHO staff member inspecting a wheelchair at Hospital Augusta Vitoria. Occupied Palestinian territory, 2024. © WHO

Annexes

Annex 1

Glossary of terms

Term	Definition
Accessibility	In this context, accessibility refers to health-care resources being within reasonable reach of the people who should benefit from them, including the geographical proximity of health-care services and facilities.
Access to care	Access to a full range of quality health services, when and where an individual needs them, without financial hardship. Health services refer to any service (not limited to medical or clinical services) aimed at contributing to improved health or the prevention, diagnosis, treatment and rehabilitation of health conditions, including informal and social care (e.g. assistance with daily living, home or community care).
Access to medicines	Access to affordable, safe, effective and quality medicines for the treatment and care of neurological disorders, including medicines for neurological disorders included on the World Health Organization's Essential Medicines List (EML) *(1)*.
Affordability	In this context, affordability of medicines is considered as a situation in which persons are fully covered or reimbursed or pay less than 50% out-of-pocket towards the cost of medicines.
Awareness-raising campaign and advocacy programme	An organized effort implemented in the past year to augment public understanding of, and sensitization to, brain health and/or one or more neurological disorders, and/or to reduce stigma and discrimination towards people living with neurological disorders, their carers and/or families, and educate people about the human rights of individuals with neurological disorders and the United Nations Convention on the Rights of Persons with Disabilities. Examples may include brain health or anti-stigma awareness campaigns. These campaigns do not include programmes for brain health promotion and/or the prevention of one or more neurological disorders – such as activities focused on reducing risk factors associated with neurological disorders, promoting protective factors for good brain health, and/or delivering preventive services for neurological disorders. Advocacy programmes and/or awareness-raising campaigns may – and preferably should – cover both universal population-level strategies (e.g. mass media campaigns against stigmatization and discrimination of people living with neurological disorders) and those aimed at locally identified vulnerable groups (e.g. children and adolescents, women, people with low educational attainment and socioeconomic status, high-risk populations such as ethnic minorities).
Availability	In this context, availability refers to the existence of health-care services, supports and/or programmes located where needed for, and able to provide care to, people living with neurological disorders and their carers, including the existence of health-care facilities and infrastructure, human resources, medicines and products. *"Generally available" refers to medicines available in 50% or more of primary care facilities.* *"Generally not available" refers to medicines available in less than 50% of primary care facilities.* *"Never available" refers to medicines not available in any primary care facilities (0%).*
Basic technologies	Basic technologies include diagnostic and therapeutic technologies, medical devices, assistive technologies, digital health technologies, information and communication technologies, technology-assisted information and training, and other technologies required for the effective management of neurological disorders.

Term	Definition
Brain health	Brain health is the state of brain functioning across cognitive, sensory, social-emotional, behavioural and motor domains, allowing a person to realize their full potential over the life course, irrespective of the presence or absence of disorders.
Brain health promotion	The promotion and development of optimal brain health occurs across the life course. Brain health promotion starts with preconception, pregnancy, childhood and adolescence, is linked to healthy ageing and encourages healthy behaviour, adequate nutrition, infectious disease control, prevention of head and spinal trauma and reduction of exposure to violence and environmental pollutants.
Cadres receiving training	The group of generalist medical practitioners, specialist medical practitioners, nursing professionals, community health workers, paramedical practitioners, pharmacists and other health cadres such as neuropsychiatrists, neuropsychologists, psychologists, developmental paediatricians, speech therapists, occupational therapists, and physiotherapists in the country who are trained in providing prevention, diagnosis, assessment of comorbidities, risk reduction, palliative and/or rehabilitative care, and assessment and treatment of carer distress.
Carer	A person who provides care and support to a person living with a neurological disorder. Such support may include: helping with self-care, household and educational tasks, mobility, social participation and meaningful activities; offering information, advice and emotional support, as well as engaging in advocacy, providing support for decision-making and peer support, and helping with advance care planning; offering respite services; engaging in activities to foster intrinsic capacity. Carers may include relatives or extended family members as well as close friends, neighbours and paid lay persons or volunteers.
Carer services, supports or programmes	Availability and accessibility of existing carer support services, which aim to improve carer knowledge and caregiving skills to enable people living with neurological disorders to live in the community and to prevent carer stress and health problems. These services may include accessible, evidence-based information, training programmes, social protection, school-based health services, respite services and other resources tailored to carers' needs.
Community-based outpatient services	Public and/or private for-profit or non-profit outpatient services provided in community-based settings (such as primary health care or schools) for people living with neurological disorders. Examples include youth services, school-based health programmes, neurology day-care/treatment centres, primary health care and other community-based outpatient facilities (including those for specific neurological disorders, treatments and user groups, e.g. children and adolescents or older adults) offering services for persons with neurological disorders.
Community residential facilities	Public and/or private non-profit or for-profit non-hospital community-based facilities providing overnight residence for people living with neurological disorders (including those for specific neurological disorders, treatments and user groups, e.g. children and adolescents or older adults). Examples include staffed or unstaffed group homes or hostels for people living with neurological disorders, halfway houses, therapeutic communities, or other residential facilities where most residents have a diagnosable neurological disorder. Excluded are general or specialized neurology or neurosurgery hospitals.

Term	Definition
Core set of indicators	The core set of indicators for neurological disorders include those indicators relating to the specified global targets of the Intersectoral global action plan on epilepsy and other neurological disorders 2022–2031 *(2)*, together with other essential indicators of health and social system actions (e.g. training and human resource capacity, service availability and utilization). Under IGAP global target 4.1, compliance was defined as countries providing data for at least 6 of the 7 core indicators, including those related to: 1) awareness campaigns/advocacy programmes for neurological disorders; 2) dedicated policies for neurological disorders; 3) legislation protecting the rights of people with epilepsy; 4) inclusion of neurological disorders in UHC benefits packages; 5) epilepsy service coverage; 6) availability and accessibility of essential medicines and basic technologies for neurological disorders; and 7) promotion/prevention programmes.
Engagement and involvement of people with lived experience / neurological conditions	The respectful and meaningful, dignified and equitable inclusion of persons with lived experience (in this context neurological conditions) in a range of processes and activities within an enabling environment where power is transferred to people, valuing lived experience as a form of expertise and applying it to improve health outcomes.
Epilepsy-specific legislation	Please refer to “Legislation”
Essential medicines	Essential medicines are those that satisfy the priority health-care needs of the population. These medicines are intended to be available in functioning health systems at all times, in appropriate dosage forms, of assured quality, and at prices both individuals and the community can afford. They are selected with due regard to disease prevalence and public health relevance, evidence of efficacy and safety, and with consideration of comparative costs and cost-effectiveness. In this context, a basket of essential medicines for managing and treating neurological disorders was selected as a means of effectively and feasibly collecting, analysing and reporting data. The medicines included in the basket are meant to be indicative of the access to medicines for neurological disorders but do not serve as a complete or exhaustive list. The selected medicines include: antiseizure medicines (benzodiazepines, including diazepam, lorazepam, clonazepam and others; carbamazepine; lamotrigine; levetiracetam; phenobarbital; phenytoin; valproic acid (sodium valproate); antimigraine/headache medicine (acetylsalicylic acid, ibuprofen, paracetamol, propranolol, and sumatriptan); and antiparkinsonian medicines (biperiden and levodopa + carbidopa (or similar class).
Financial protection	Please refer to “Social protection mechanisms”
Functionality	The term “functionality” in this context describes the extent to which “policies, strategies, plans or frameworks”, awareness-raising campaigns or advocacy programmes”, and “promotion or prevention programmes” meet a set of defined criteria: A policy, strategy, plan or framework is considered “minimally functional” only if at least one of the following three criteria are fulfilled: 1) dedicated financial and human resources for policy implementation; 2) there is a mechanism to monitor the policy, and: 3) engagement and involvement of people with lived experience in this process. An awareness-raising campaign, or advocacy, prevention or promotion programme for neurological disorders and/or brain health is considered “minimally functional” only if at least one of the following three criteria are fulfilled: 1) dedicated financial/human resources; 2) there is a defined implementation plan; and 3) evidence of progress and/or impact (e.g. via a monitoring and evaluation plan).

Term	Definition
General hospital-based outpatient care facilities	Public and/or private for-profit or non-profit outpatient services for people living with neurological disorders provided in general hospital settings. Examples include neurology day-care/treatment services, neurology, neurosurgery or neurological rehabilitation departments (including those for specific neurological disorders, treatments and user groups, e.g. children and adolescents or older adults), and/or other outpatient services for persons with neurological disorders provided in general hospitals. Excluded are specialist neurology, neurosurgery or neurological rehabilitation hospitals and/or facilities, and facilities for neurodevelopmental disabilities only.
General hospital-based inpatient care facilities	A public and/or private non-profit or for-profit general hospital providing overnight residence and long-stay residential services for people living with neurological disorders (including those for specific neurological disorders, treatments and user groups, e.g. children and adolescents or older adults). Excluded are specialized neurology, neurosurgery or neurological rehabilitation hospitals, or community-based facilities providing overnight residence for people living with neurological disorders (e.g. staffed or unstaffed group homes or hostels for people living with neurological disorders, or other community-based residential facilities).
General legislation	Please refer to “Legislation”
Guidelines and standards for neurological disorders	A systematically developed statement, set of recommendations or protocols designed to assist practitioners and patients in making decisions about appropriate diagnosis and health care for neurological disorders, and to optimize patient care. These should be informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options. They can be general (i.e. for all health care professionals and multidisciplinary teams) or adopted by a specific professional body and apply to different settings but should be approved by a national authority. Guidelines and standards provide guidance on clinical elements such as prevention, diagnosis, assessment and treatment, as well as quality long-term care. They could also include guidance on any legal and ethical issues that could compromise quality care.
Health care and treatment	The diagnosis and treatment of diseases, in this context neurological disorders.
ICD codes	Refers to International Classification of Diseases (ICD), currently in its 11th revision. ICD serves a broad range of uses globally and provides critical knowledge on the extent, causes and consequences of human disease and death worldwide via data that are reported and coded with the ICD. Clinical terms coded with the ICD are the main basis for health records and statistics on disease in primary, secondary and tertiary care, as well as on cause-of-death certificates. These data and statistics support payment systems, service planning, administration of quality and safety, and health services research. Diagnostic guidance linked to categories of ICD also standardizes data collection and enables large scale research.
Inpatient care in community residential facilities	Public and/or private for-profit or non-profit inpatient services provided in community-based settings that offer overnight residence for, but are not necessarily specific to, people living with neurological disorders. These may include staffed or unstaffed group homes or hostels for people living with neurological disorders, halfway houses, therapeutic communities, or other residential facilities where most residents have a diagnosable neurological disorder. Excluded are specialized neurology, neurosurgery or neurological rehabilitation hospitals, and/or general hospitals providing either overnight residence or long-stay residential services for people living with neurological disorders, and/or community-based outpatient facilities.

Term	Definition
In-service training	Refers to continued education such as professional development training courses required for renewal of professional licensure or accreditation registration with national bodies. In-service training applies to health and social care cadres already enrolled in providing services and relates to care competencies of neurological disorders defined as prevention, diagnosis, assessment of comorbidities, risk reduction, brain health promotion, palliative and/or rehabilitative care, and assessment and treatment of carer distress.
Intersectoral	Involving different sectors, such as health, social services, education, environment, finance, employment, justice and housing.
Legal capacity	The United Nations Convention on the Rights of Persons with Disabilities (CRPD) *(3)* recognizes that people with disabilities, including long-term physical, mental, intellectual or sensory disabilities, have the right to exercise their legal capacity and make decisions and choices on all aspects of their lives, on an equal basis with others. The Convention promotes a supported decision-making model, which enables people with mental disabilities to nominate a trusted person or a network of people with whom they can consult and discuss issues affecting them.
Legislation	Applies to law or laws enacted by governing bodies in a country. In this context, legislation typically focuses on issues such as human and civil rights of people with epilepsy or include other human rights-based approaches. *Epilepsy-specific legislation* refers to stand-alone national legislation exclusively focusing on epilepsy. General legislation refers to legal provisions on epilepsy integrated into broader legislation, such as pertaining to disability or human rights.
Management	In this context, management generally refers to the diagnosis, treatment, rehabilitation and provision of palliative care for neurological disorders.
Mental Health Gap Action Programme (mhGAP)	mhGAP is the World Health Organization’s programme to scale up services for mental, neurological and substance use disorders in countries especially with low- and lower middle-incomes. Priority conditions addressed by mhGAP are: depression, schizophrenia and other psychotic disorders, suicide, **epilepsy**, **dementia**, disorders due to use of alcohol, disorders due to use of illicit drugs, and **child and adolescent mental and behavioural disorders**. The mhGAP package consists of interventions for prevention and management for each of these priority conditions.
National level /national	National level is defined as 50% or more of a country’s states, territories or provinces, or 50% or more of its population.
National essential medicines list	The core national essential medicines list presents a list of minimum medicine needs for a basic national health-care system, listing the most efficacious, safe and cost-effective medicines for priority conditions.
Neurodevelopmental conditions	In this report, the term “neurodevelopmental conditions” is used in lieu of “neurodevelopmental disorders”, reflecting terminology that is generally accepted in the field and perceived as non-stigmatizing. The latter are defined as behavioural and cognitive disorders that arise during the developmental period and result in significant changes in the acquisition and execution of specific intellectual, motor, language or social functions. The presumed etiology of neurodevelopmental disorders is complex and, in many cases, is unknown. The ICD-11 category of neurodevelopmental disorders includes the following diagnoses: disorders of intellectual development, developmental speech or language disorders, autism spectrum disorders, developmental learning disorder, developmental motor coordination disorder, attention deficit hyperactivity disorder and stereotyped movement disorder *(4)*.

Term	Definition
Neuro-intensive care unit	An intensive care unit is a ward in a public or private for-profit or non-profit general hospital or specialist neurology, neurosurgery or neurological rehabilitation hospital providing specialized inpatient treatment, monitoring and care for patients with immediate life-threatening neurological problems or injuries.
Neurological disorders	Conditions of the central and peripheral nervous systems that include epilepsy; headache disorders (including migraine); neurodegenerative disorders (including dementia and Parkinson disease); cerebrovascular diseases (including stroke); neuroinfectious disorders (including meningitis, neurocysticercosis, cerebral malaria); neuroimmunological disorders (including multiple sclerosis); neuromuscular disorders (including peripheral neuropathy, muscular dystrophies and myasthenia gravis); neurodevelopmental conditions (including autism spectrum disorder and congenital neurological disorders); traumatic brain, spinal cord and nerve injuries; cancers of the nervous system; and other diseases or conditions of, or affecting, the central and peripheral nervous systems as listed in the ICD-11 category *(5)*. For the purpose of the IGAP survey, the following neurological conditions were included as tracer conditions: epilepsy, headache disorders (including migraine), meningitis, Parkinson disease, and stroke, in addition to neurodevelopmental conditions (including disorders of intellectual development, developmental speech or language disorders, autism spectrum disorders, developmental learning disorder, developmental motor coordination disorder, attention deficit hyperactivity disorder and stereotyped movement disorder). Dementia is excluded from the IGAP survey given that data are being captured separately through WHO's Global Dementia Observatory (GDO) *(6)*.
Neurological services	Neurological services focused on the prevention, diagnosis, treatment and/or rehabilitation of neurological disorders provided as inpatient or outpatient services in public and/or private for-profit or non-profit general or specialist neurology or neurosurgery hospitals (including those for children and adolescents or other specific groups). Examples of services for neurological disorders may include neurology or neurosurgery wards, stroke units, epilepsy monitoring and/or surgery units, neuro-intensive units, neurological rehabilitation services, palliative care services, or general rehabilitation units offering neurological rehabilitation.
Non-specialized settings	Non-specialized public and/or private for-profit or non-profit health care settings offering specialized neurology inpatient and/or outpatient services for the prevention, diagnosis, treatment and rehabilitation of neurological disorders. Non-specialized settings may include general hospital-based inpatient and/or outpatient care facilities (including general hospitals for children and adolescents or other specific groups, and neurology or neurosurgery wards in general hospitals), community-based outpatient services, inpatient care in community residential facilities, neurology services provided in primary health care, and/or programmes for people living with neurological disorders provided in schools. Non-specialized settings exclude specialized neurology, neurosurgery or neurological rehabilitation hospitals.
One Health	One Health is an integrated, unifying approach to balance and optimize the health of people, animals and ecosystems. It uses the close, interdependent links among these fields to create new surveillance and disease control methods *(7)*.

Term	Definition
Out-of-pocket health expenditures	Any spending incurred by a household when any member uses a health good or service to receive any type of care (i.e. preventive, curative, rehabilitative or long-term care), provided by any type of provider, for any type of disease, illness or health condition, in any type of setting (e.g. outpatient, inpatient, at home). It includes formal and informal expenses directly related to the cost of seeking care. It excludes pre-payment (e.g. taxes, contributions, or premiums) and reimbursement of the household by a third party such as the government, a health insurance fund or a private insurance company. It also excludes indirect expenses (e.g. non-emergency transportation cost) and the opportunity cost of seeking care (e.g. lost income).
Outpatient neurological services	Public or private non-profit or for-profit outpatient services that provide care for people with neurological disorders who receive treatment on an ambulatory basis at a hospital, clinic or in a community-based facility.
Palliative care	Palliative care is an approach that improves the quality of life of patients (children and adults) and their families who are facing problems associated with life-threatening illness. It prevents and relieves suffering through the early identification, correct assessment and treatment of pain and other problems, whether physical, psychosocial or spiritual. Palliative care includes hospice services.
Primary care	Primary care is a key process in the health system that supports first contact, accessible, continued, comprehensive and coordinated patient-focused care.
People with lived experience	A person living with a neurological disorder who has knowledge or understanding that people who have only heard or learned about such experiences do not have. In some countries, patient associations may represent people with lived experience.
Policies, strategies, plans or frameworks	A written organized set of principles, objectives or actions for reducing the burden attributable to neurological disorders in a population and/or promoting brain health in a stand-alone national document specific to one or more neurological disorders, or integrated into other general policies (e.g. ageing, brain health, communicable diseases, disabilities, education, emergency preparedness and response, employment/labour/workplace, general health, maternal, child and adolescent health, mental health, neurology, noncommunicable diseases, or other relevant policy areas). They are considered valid if they have been approved/published by the Ministry of Health (or equivalent) or a national body with legislative or political authority (e.g. Parliament, Senate, Congress).
Pre-service education	Refers to formal education for health and social care cadres required for initial professional licensure or accreditation registration with national bodies. Pre-service education should adhere to international standards but be adapted to local and cultural contexts. More specifically, pre-service education relates to competencies which may include basic knowledge about neurological disorders, including social and biological determinants, stigma; clinical skills to diagnose, treat and refer people with neurological disorders; knowledge about brain health and how to use strategies for brain health promotion and the prevention of neurological disorders; and health literacy regarding neurological disorders.

Term	Definition
Promotion and prevention programme	Programmes and activities implemented in the past year focused on reducing risk factors associated with one or more neurological disorders, and identifying their causes, early signs and symptoms, treatment options, and available support services promoting protective factors for good brain health, and/or delivering preventive services for one or more neurological disorders. These programmes may also include evidence-based interventions and training for health professionals, and do not include awareness-raising or advocacy campaigns, including anti-stigma campaigns. These do not include awareness-raising and/or advocacy programmes, including those aimed at augmenting public understanding of, and sensitization to, brain health and/or one or more neurological disorders; and/or reducing stigma and discrimination towards people living with neurological disorders, their carers and/or families; and educating people about the human rights of people with neurological disorders and the United Nations Convention on the Rights of Persons with Disabilities. Programmes should be national and should preferably cover both universal, population-level strategies (e.g. mass media campaigns) and those aimed at locally identified vulnerable groups (e.g. socioeconomically disadvantaged individuals, children, older people, people affected by domestic and gender-based violence, people with low educational attainment, ethnic minorities) across the life course.
Primary care facility	A public or private non-profit or for-profit facility that often offers the first point of entry into the health-care system. Primary health care facilities usually provide the initial assessment and treatment for common health conditions and refer people requiring more specialized diagnosis and treatment to facilities that have human resources with a higher level of training.
Priority assistive products list	WHO‘s Priority assistive products list includes hearing aids, wheelchairs, communication aids, spectacles, artificial limbs, pill organizers, memory aids, and other essential items for many older people and people with disability to be able to live a healthy, productive and dignified life *(8)*.
Private sector	Privately funded health care sector, including private for-profit and private non-profit (e.g. nongovernmental and not-for-profit organizations).
Public sector	Publicly funded health-care sector, namely by the national and/or subnational government.
Reasonable accommodation	Necessary and appropriate modification and adjustments not imposing a disproportionate or undue burden, when needed in a particular case, to ensure to persons with disabilities the enjoyment or exercise on an equal basis with others of all human rights and fundamental freedoms.
Rehabilitation	A set of measures that assist individuals who experience, or are likely to experience, disability to achieve and maintain optimal functioning in interaction with their environments. Neurorehabilitation services are those dedicated to helping people to regain skills or abilities lost due to a neurological disorder or injury, and to optimize recovery and health outcomes. These may include rehabilitation medicine, therapy and assistive technology and may be provided in hospital or community-based settings.
Rehabilitation units	In this context, these are rehabilitation units providing neurorehabilitation services aimed at helping people regain skills or abilities lost due to a neurological disorder or injury, and optimizing recovery and health outcomes. These may include rehabilitation medicine, therapy and assistive technology and may be provided in hospital or community-based settings.

Term	Definition
School-based programmes	In this context, programmes providing specialized neurological services, such as the prevention, diagnosis, treatment and/or rehabilitation of neurological and/or neurodevelopmental disorders to children, adolescents and youth in school-based and other educational settings.
Seclusion and restraints	"Seclusion" means the involuntary placement of an individual alone in a locked room or secured area from which he or she is physically prevented from leaving. "Restraint" means the use of a mechanical device or medication to prevent a person from moving his or her body. "Alternatives to seclusion" include prompt assessment and rapid intervention in potential crises, using problem-solving methods and/or stress management techniques such as breathing exercises.
Service coverage	Coverage of services for people living with neurological disorders, as measured using epilepsy as a tracer condition. Service coverage is defined as the proportion of people living with epilepsy contacting a public or private for-profit or non-profit health service (from service utilization data) during a 12-month period. Health services may include inpatient services (e.g. at an epilepsy unit in a general hospital or at a specialized neurology or epilepsy hospital) and outpatient services (e.g. specialized care at a neurology outpatient facility, or primary care facilities offering services for persons with epilepsy and other neurology outpatient services, or day care or treatment). For further detail on epilepsy service coverage, see Chapter 7, Table 7.1.
Social protection mechanisms	Availability of protection for people living with neurological disorders and/or their carers. For people living with neurological disorders this may include access to national health insurance plans, disability or social security benefits to address the direct and indirect costs related to accessing health-care services. For carers of people living with neurological disorders, this may include employment protection, carers' benefit, paid or unpaid leave, credited social contributions, respite care, training or price subsidies such as tax allowances, duty rebates, discount transportation fares, free companion fares. **Financial risk protection** is one type of social protection and represents a core component of UHC. Financial protection is achieved when: 1) there are no financial barriers to access; and 2) direct payments required to obtain health services (out-of-pocket costs) are not a source of financial hardship.
Specialist neurology and neurosurgery clinics	Public or private for-profit or non-profit outpatient clinics providing specialized care for people living with neurological disorders. These may include specialist clinics for epilepsy, movement or other neurological disorders.
Specialist neurology and neurosurgery wards	Wards in a public or private for-profit or non-profit specialized hospital-based facility that provide inpatient care and long-stay residential services for people living with neurological disorders. These include epilepsy monitoring and surgery units, neurology, neurosurgery or neurological rehabilitation hospital wards for children and adolescents and other specific groups (e.g. older adults). Excluded are community-based psychiatric or neurology inpatient units or residential facilities, facilities that treat only people with alcohol and substance use problems or intellectual disability, and neurology, neurosurgery or neurological rehabilitation units in general hospitals.
Specialized services	Please refer to "Neurological services"

Term	Definition
Specialized settings	Specialized public and/or private for-profit or non-profit health care settings offering specialized neurology inpatient and/or outpatient services for the prevention, diagnosis, treatment and rehabilitation of neurological disorders. Specialized settings may include neurology, neurosurgery and/or neurology rehabilitation hospitals, hospital departments or clinics (including specialized hospitals for children and adolescents or other specific groups), specialized community-based outpatient and/or inpatient facilities with staff specialized in neurology, neurosurgery or neurorehabilitation. Specialized settings exclude general hospitals, neurology services provided in general primary health care facilities, programmes for people living with neurological disorders provided in schools or other non-specialized settings.
Stroke unit	An inpatient unit in a public or private for-profit or non-profit general or specialist neurology, neurosurgery or neurological rehabilitation hospital monitored setting (i.e. where vital and/or neurological signs are regularly checked) providing care for people who had a stroke. These units are usually staffed by a multidisciplinary team of stroke health-care professionals who provide diagnosis, emergency treatments, prevention of complications, rehabilitation and secondary prevention.
Universal Health Coverage (UHC)	UHC means that all people have access to the full range of quality health services they need, when and where they need them, without financial hardship throughout the life-course. It covers the full continuum of essential health services, from health promotion to prevention, treatment, rehabilitation and palliative care. Progress on UHC is measured using two indicators: coverage of essential health services (SDG 3.8.1) and catastrophic health spending (SDG 3.8.2) and related indicators. Social protection mechanisms, including financial protection such as access to national health insurance plans, represent a core component of UHC.
Universal Health Coverage (UHC) - Priority Benefits Package (PBP)	A UHC priority benefits package (PBP) is a set of evidence-informed prioritized health interventions, services and programmes, including intersectoral actions and fiscal policies, defined through a deliberative process that accounts for economic realities and social preferences. It explicitly defines which programmes, services and interventions should be provided, and financially covered, for the population. Services and supports for neurological disorders include financial risk protection and promotive, preventive, treatment, rehabilitative and palliative care across the life course. A UHC-PBP should offer services of optimized quality that are effective, efficient, accessible, patient-centred, equitable and safe, and supported by fair and sustainable financing arrangements. Interventions must be delivered by qualified providers who are able to provide standard services in a timely manner at the appropriate level of a regulated health system and must target specified groups.
WHO Model List of Essential In Vitro Diagnostics (EDL)	WHO develops and updates the WHO Model List of Essential in vitro Diagnostics (EDL), a list of recommended in vitro diagnostic tests for point of care in the community and for the laboratory that should be available in every country. The EDL provides guidance based on the latest evidence, to countries for creating or updating their national lists of essential in vitro diagnostics *(9)*. In vitro diagnostics are tests that can detect disease, conditions and infections. “In vitro” simply means “in glass”, indicating that these tests are typically conducted in test tubes and similar equipment, as opposed to “in vivo“ tests, which are conducted in the body itself. In vitro tests may be done in laboratories, health-care facilities or even in the home. The tests themselves can be performed on a variety of instruments ranging from small, handheld tests to complex laboratory instruments. They allow doctors to diagnose patients effectively and provide appropriate treatments.

References Annex 1

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Annex 2

Detailed methodology

This annex outlines the methods and procedures used in the development of the *Global status report on neurology*. The methodological steps undertaken to collect, analyse and report on data included in this report, and the report's conceptualization, drafting, technical review (and limitations) are described.

A WHO internal steering group consisting of staff members from across WHO's three organizational levels and various relevant units of the WHO secretariat was convened to inform the conceptualization, development and technical review of the report (Table A2.1). Additionally, various external stakeholders were involved in the data collection, analysis and reporting processes, providing feedback to the IGAP survey, contributing country spotlights and case studies, and providing technical review and feedback on draft versions of this report. People with lived experience – including individuals with neurological disorders, their carers and families – were actively engaged throughout the process, contributing unique perspectives and insights to the report.

Table A2.1

Composition of the WHO internal steering group for the Global status report on neurology

WHO secretariat	Department of Mental Health, Brain Health and Substance Use Global Coordination Mechanism Secretariat for NCDs Department of Noncommunicable Diseases Division of UHC/Life Course Primary Health Care Special Programme Department of Immunization, Vaccines and Biologicals Data and Analytics Department Department of Health Promotion Department of Environment, Climate Change and Health Division of Access to Medicines and Health Products Department of Social Determinants of Health Department of Integrated Health Services
WHO regions	WHO regional representatives (mental health regional advisors) for the African, Americas, Eastern Mediterranean, European, South-East Asia and Western Pacific regions.
WHO country offices	Representatives from WHO country offices in Moldova and South Africa

WHO's IGAP global status monitoring questionnaire (IGAP survey)

The IGAP survey baseline aggregated, national-level data were collected in a phased approach across countries in WHO's six regions. WHO worked closely across its three organizational levels (headquarters, regional and country level) to reach out to Member States to invite participation in the monitoring process.

IGAP survey development

Questions included in the questionnaire were developed in line with the IGAP target indicators and other complementary sets of indicators. They were based on consultations with WHO Member States and WHO

Regional Offices, as well as experts in the measurement of the public health response to neurological disorders and brain health. The questionnaire was drafted in English and translated into French, Portuguese, Russian and Spanish. In addition to the questionnaire, a completion guide and glossary (see Annex 1) were developed and integrated into the online data collection platform. These resources provided general tips, explanations and recommendations to help facilitate the collection and completion of data and to ensure the standardization of definitions and descriptions of services. WHO's standard data collection platform (LimeSurvey) was used to host the questionnaire and to collect the data.

IGAP survey data collection, analysis, clarification and reporting

WHO asked ministries of health or other responsible ministries in each country to nominate a focal point to complete the IGAP survey. The focal point was encouraged to establish a team of national multidisciplinary experts on brain health and neurological disorders who were well informed about key data and information sources in the country to obtain relevant information to answer the survey questions. For a list of countries that participated in the IGAP survey, see Annex 3.

Close contact with focal points was maintained during their nomination and throughout the questionnaire submission process. A WHO staff member was available to respond to enquiries, provide further advice and assist focal points to complete the IGAP survey. The questionnaire was available online, and countries were strongly encouraged to use this method for submission. However, an offline Microsoft Word version of the questionnaire was available whenever preferred. Additionally, a series of region-specific online workshops were held, offering technical guidance to focal points and resolving any queries related to IGAP survey data collection and reporting.

Once a completed questionnaire was received, it was screened for incomplete and inconsistent answers. To ensure data quality, respondents were (re)contacted and asked for clarification or correction of their responses as appropriate. The majority of countries that submitted completed questionnaires responded actively and engaged in the quality-checking process, ensuring optimal data quality. Upon receipt of the final questionnaires, data were aggregated according to WHO regions and World Bank income groups for 2022 *(1)*. Of note, the estimates for Indonesia were included in the WHO South-East Asia Region. In accordance with resolution WHA78.25 (2025), Indonesia was reassigned to the WHO Western Pacific Region as of 27 May 2025. Low-income economies are defined as those with a gross national income (GNI) per capita of US$ 1135 or less as of 2022, calculated using the World Bank Atlas method for 2022; lower-middle-income economies are those with a GNI per capita of between US$ 1 136 and US$ 4 465; upper-middle-income economies are those with a GNI per capita of between US$ 4 466 and US$ 13 845; and high-income economies are those with a GNI per capita of US$ 13 845 or more. It should be noted that two of the responding countries did not have a World Bank income group classification in 2022 and were therefore omitted from the disaggregated reporting by income group.

Frequency distributions and measures of central tendency (e.g. means, medians) were calculated as appropriate for these country groupings. Rates per 100 000 population were calculated for a range of data points and for specific age groups (e.g. children and adolescents) using the official United Nations population estimates revision for 2022 *(2)*. Along with the text, results are presented in tables and graphs.

Data for IGAP global target 3.2: global targets relevant for prevention of neurological disorders

Data for IGAP global target 3.2 on achieving the global targets relevant for the prevention of neurological disorders – as defined in the NCD-GAP (3), the *Every newborn: an action plan to end preventable deaths* (4) (reported through the Every Woman Every Newborn Everywhere dashboard (5)) and *Defeating meningitis by 2030: a global road map* (6) – were collected centrally by extracting data for relevant indicators from WHO's Global Health Observatory (GHO) data repository (7), WHO's Global Health Estimates (GHE) (8), WHO's Immunization Data Portal (9), WHO's Global Nutrition Targets Tracking Tool (10), and from various relevant global status reports published by WHO, among other sources, for the index year. Central data collection and reporting were closely coordinated with, and reviewed by, relevant technical units within the WHO secretariat.

Data for IGAP global target 4.2: global research output on neurological disorders

In collaboration with WHO's Library and Digital Information Networks, a replicable search strategy was developed to produce country-level estimates for IGAP global target 4.2 on global research output on neurological disorders. Searches were designed using MeSH-based search strings (see definition below) and were conducted in the PubMed database for each country for the index year 2022. Additionally, to enable comparisons of global research output across different disease categories, separate MeSH-based search strings were built for diseases of the circulatory system, neoplasms, and mental health conditions. The PubMed database was searched, comparing publication volumes for the index year across these categories and as a percentage of the overall health research output indexed in PubMed for that year.

Search methodology for country-level estimates for research output on neurological disorders

The goal of the search strategy was to create a methodology for replicable, consistent searches of countries' published peer-reviewed publication output of research on neurological disorders. This search methodology will need to be repeated at regular intervals in order to measure differences in output over time. This will determine whether countries are collectively approaching IGAP global target 4.2 of doubling research on neurological disorders by 2031.

The National Library of Medicine (NLM) indexes research articles using specific vocabulary known as medical subject headings terms (MeSH terms). These MeSH terms are used to search for biomedical literature in NLM's databases which include PubMed and MEDLINE. For more details on the MeSH indexing process see details on the NLM website *(11)*.

In alignment with ICD-11, the umbrella MeSH term "Nervous System Diseases" was supplemented with several additional neurology-specific MeSH terms, yielding the following comprehensive search strand:

- ("Nervous System Diseases"[MeSH terms] OR "Autism Spectrum Disorder"[MeSH terms] OR "Motor Skills Disorders"[MeSH terms] OR "Attention Deficit Disorder with Hyperactivity"[MeSH terms] OR "Stereotypic Movement Disorder"[MeSH terms] OR "Developmental Disabilities"[MeSH terms] OR "Cognitive Dysfunction"[MeSH terms]) NOT "Muscular Diseases"[MeSH terms]) AND "country name"[MeSH terms] AND ("2022/01/01"[PDAT] : "2022/12/31"[PDAT]).

A detailed breakdown of neurological conditions captured under the "Nervous System Diseases" umbrella MeSH is given in Table A2.2 and Supplementary Table 1.

Table A2.2

Disorders covered by the “Nervous System Diseases” MeSH in PubMed

Terms under Nervous System Diseases MeSH term	Entry terms for Nervous System Diseases
Autoimmune Diseases of the Nervous System	Nervous System Diseases
Autonomic Nervous System Diseases	Nervous System Disorders
Central Nervous System Diseases	Neurologic Disorders
Chronobiology Disorders	Neurological Disorders
Cranial Nerve Diseases	
Demyelinating Diseases	
Nervous System Malformations	
Nervous System Neoplasms	
Neurocutaneous Syndromes	
Neurodegenerative Diseases	
Neuroinflammatory Diseases	
Neurologic Manifestations	
Neuromuscular Diseases	
Neurotoxicity Syndromes	
Restless Legs Syndrome	
Sleep Wake Disorders	
Trauma, Nervous System	

The reasons for excluding one unrelated MeSH term and adding six neurology-specific MeSH terms not covered under the “Nervous System Diseases” MeSH are given in Table A2.3.

Table A2.3

List of specific MeSH terms excluded/included in the search strategy

MeSH Terms excluded	**Reasons for exclusion**
Muscular Diseases	This MeSH term, listed under the broader MeSH term "Neuromuscular Diseases" was excluded from the search given that it captures non-neurological muscular diseases. Notably, the broader MeSH term "Neuromuscular Diseases" was retained, with a revised list covering Fatigue Syndrome, Chronic; Locked-In Syndrome; Motor Neuron Disease; Neuromuscular Junction Diseases; Peripheral Nervous System Diseases; Poliomyelitis; and Stiff-Person Syndrome.
MeSH terms included	**Reasons for inclusion**
Autism Spectrum Disorder	In PubMed, this MeSH term is indexed under the broader MeSH term "Mental Disorders" but not "Nervous System Diseases". In alignment with the ICD-11 category on neurodevelopmental disorders, this term was included in the search strategy.
Motor Skills Disorders	In PubMed, this MeSH term is indexed under the broader MeSH term "Mental Disorders" but not "Nervous System Diseases". In alignment with the ICD-11 category on neurodevelopmental disorders, this term was included in the search strategy.
Attention Deficit Disorder with Hyperactivity	In PubMed, this MeSH term is indexed under the broader MeSH term "Mental Disorders" but not "Nervous System Diseases". In alignment with the ICD-11 category on neurodevelopmental disorders, this term was included in the search strategy.
Stereotypic Movement Disorder	In PubMed, this MeSH term is indexed under the broader MeSH term "Mental Disorders" but not "Nervous System Diseases". In alignment with the ICD-11 category on neurodevelopmental disorders, this term was included in the search strategy.
Developmental Disabilities	In PubMed, this MeSH term is indexed under the broader MeSH term "Mental Disorders" but not "Nervous System Diseases". In alignment with the ICD-11 category on neurodevelopmental disorders, this term was included in the search strategy.
Cognitive Dysfunction	In PubMed, this MeSH term is captured under the broader MeSH term "Mental Disorders" but not "Nervous System Diseases". It was therefore included in the search strategy to capture the neurocognitive disorders "Chemotherapy-Related Cognitive Impairment" and "Postoperative Cognitive Complications".

It is worth noting that the term "brain health" was not included in this search because it is not indexed as a stand-alone MeSH term. Additionally, research output quantification focuses specifically on neurological disorders, in alignment with IGAP global target 4.2.

To focus the research on the country of interest, "AND "country name"[MeSH Terms]" was added to the search string. Similarly, to limit results to the index year, the MeSH terms were combined with "2022/01/01"[PDAT] : "2022/12/31"[PDAT] (PDAT: publication date) using the Boolean operator AND.

To produce a comparable indicator, search results for each country were standardized to the overall research output produced by that country as indexed in PubMed for the year of interest (see Box A2.1).

Box A2.1

Producing a comparable indicator (standardized on the overall global research output)

$$\text{comparable indicator} = \frac{\text{neurological disorders research output(Country X AND Year x)}}{\text{overall research output(Country X AND Year x)}}$$

Numerator: ((“Nervous System Diseases”[MeSH Terms] OR “Autism Spectrum Disorder”[MeSH Terms] OR “Motor Skills Disorders”[MeSH Terms] OR “Attention Deficit Disorder with Hyperactivity”[MeSH Terms] OR “Stereotypic Movement Disorder”[MeSH Terms] OR “Developmental Disabilities”[MeSH Terms] OR “Cognitive Dysfunction”[MeSH Terms]) NOT “Muscular Diseases”[MeSH Terms]) AND “country name”[MeSH Terms] AND (“2022/01/01”[PDAT] : “2022/12/31”[PDAT])

Denominator: “country name”[MeSH Terms] (“2022/01/01”[PDAT] : “2022/12/31”[PDAT])

Search methodology for comparative searches across different disease categories

Using the same approach as outlined for “neurological disorders”, MeSH-based search strands for “diseases of the circulatory system” and “neoplasms” were developed in accordance with ICD-11. Table A2.4 presents the searches conducted for each disease category, showing the total global research output for 2022 both in the absolute number of publications and as a percentage of the overall global health research output indexed in PubMed for that year. Results for “diseases of the circulatory system” are presented with stroke either included or excluded; similarly, the results for “neoplasms” are shown both with and without the inclusion of nervous system neoplasms.

Table A2.4

PubMed MeSH strings for comparative searches across different disease categories

Date run: 26.06.2024

Database: PubMed

Search variables: timeframe 2022-01-01 to 2022-12-31

#	Searches	Global results for 2022	% of total general health research output in 2022
Neurological disorders	((“Nervous System Diseases”[MeSH Terms] OR “Autism Spectrum Disorder”[MeSH Terms] OR “Motor Skills Disorders”[MeSH Terms] OR “Attention Deficit Disorder with Hyperactivity”[MeSH Terms] OR “Stereotypic Movement Disorder”[MeSH Terms] OR “Developmental Disabilities”[MeSH Terms] OR “Cognitive Dysfunction”[MeSH Terms]) NOT “Muscular Diseases”[MeSH Terms]) AND (“2022/01/01”[PDAT] : “2022/12/31”[PDAT])	119 338	6.7%

Date run: 26.06.2024

Database: PubMed

Search variables: timeframe 2022-01-01 to 2022-12-31

#	Searches	Global results for 2022	% of total general health research output in 2022
Diseases of the circulatory system, including stroke	Cardiovascular Diseases[MeSH Terms] OR Rheumatic Heart Disease[MeSH Terms] OR Lymphatic Diseases[MeSH Terms] OR “Hypertension, Pulmonary”[MeSH Terms] OR Vascular Neoplasms[MeSH Terms] OR “Heart Neoplasms”[MeSH Terms] OR Spinal Cord Vascular Diseases[MeSH Terms] AND (“2022/01/01”[PDAT] : “2022/12/31”[PDAT])	114 041	6.4%
Diseases of the circulatory system, excluding stroke	(“Cardiovascular Diseases”[MeSH Terms] OR Rheumatic Heart Disease[MeSH Terms] OR Lymphatic Diseases[MeSH Terms] OR “Hypertension, Pulmonary”[MeSH Terms] OR Vascular Neoplasms[MeSH Terms] OR “Heart Neoplasms”[MeSH Terms] OR Spinal Cord Vascular Diseases[MeSH Terms]) NOT (Intracranial Embolism and Thrombosis[MeSH Terms] OR Brain Ischemia[MeSH Terms] OR Stroke[MeSH Terms]) AND (“2022/01/01”[PDAT] : “2022/12/31”[PDAT])	99 142	5.6%
Neoplasms, including nervous system neoplasms	“Neoplasms”[MeSH Terms] AND (“2022/01/01”[PDAT] : “2022/12/31”[PDAT])	165 959	9.3%
Neoplasms, excluding nervous system neoplasms	“Neoplasms”[MeSH Terms] NOT “Nervous System Neoplasms”[MeSH Terms] AND (“2022/01/01”[PDAT] : “2022/12/31”[PDAT])	157 191	8.8%
Mental health conditions	“Mental Health”[MeSH Terms] OR “Mental Disorders”[MeSH Terms]) AND (“2022/01/01”[PDAT] : “2022/12/31”[PDAT])	70 759	4.0%

Limitations of the search methodology

The use of MeSH terms limits the retrieval of articles to the MEDLINE database, which contains citations from more than 5 600 scholarly journals published worldwide *(12)*. However, these are predominantly English language journals, and therefore have the potential to introduce bias in the findings, with a greater representation of research from English-speaking countries. Moreover, the publications will be more reflective of countries with robust publication processes and may not capture publications from low- and middle-income countries which may be publishing journals that do not meet the stricter criteria of MEDLINE for indexing. Nevertheless, PubMed provides one of the most extensive collections of literature; it is a stable database, allowing for comparability year over year and for consistent trend analysis.

Supplementary data

Supplementary Table 1

Terms under Nervous System Diseases MeSH term*

*Note that only the first two levels of the MeSH tree structures are shown. Further (sub-)levels can be accessed via the respective hyperlinks.

		Entry terms for Nervous System Diseases
Autoimmune Diseases of the Nervous System	Demyelinating Autoimmune Diseases, CNS Myasthenia Gravis Nervous System Autoimmune Disease, Experimental Polyradiculoneuropathy Stiff-Person Syndrome Uveomeningoencephalitic Syndrome Vasculitis, Central Nervous System	Antibody-Mediated Encephalitis Autoimmune Diseases, Nervous System Autoimmune Diseases, Neurologic Autoimmune Disorders of the Nervous System Autoimmune Disorders, Nervous System Autoimmune Encephalitis Autoimmune Nervous System Diseases Immune Diseases, Nervous System Immune Disorders, Nervous System Nervous System Autoimmune Diseases Nervous System Immune Diseases Nervous System Immune Disorders Neurologic Autoimmune Diseases
Autonomic Nervous System Diseases	Adie Syndrome Autonomic Dysreflexia Complex Regional Pain Syndromes Horner Syndrome Primary Dysautonomias Sweating, Gustatory	ANS (Autonomic Nervous System) Diseases ANS Diseases Autonomic Central Nervous System Diseases Autonomic Diseases Autonomic Disorders Autonomic Nervous System Disorders Autonomic Peripheral Nervous System Diseases Central Autonomic Nervous System Diseases Disorders of the Autonomic Nervous System Dysautonomia Nervous System Diseases, Autonomic Nervous System Diseases, Parasympathetic Nervous System Diseases, Sympathetic Non-Familial Dysautonomia Parasympathetic Nervous System Diseases Peripheral Autonomic Nervous System Diseases Segmental Autonomic Dysfunction Sympathetic Nervous System Diseases

Supplementary Table 1

*Note that only the first two levels of the MeSH tree structures are shown. Further (sub-)levels can be accessed via the respective hyperlinks.

Terms under Nervous System Diseases MeSH term*		Entry terms for Nervous System Diseases
Central Nervous System Diseases	Brain Diseases	CNS Disease
	Central Nervous System	CNS Diseases
	High Pressure Neurological Syndrome	Central Nervous System Disease
	Hyperekplexia	Central Nervous System Disorder
	Movement Disorders	Central Nervous System Disorders
	Ocular Motility Disorders	
	Pneumocephalus	
	Spinal Cord Diseases	
Chronobiology Disorders	Jet Lag Syndrome	Biological Clock Disturbances
	Sleep Disorders, Circadian Rhythm	Circadian Dysregulation
	Smith-Magenis Syndrome	Circadian Rhythm Disorders
		Inversion of Circadian Rhythm, Psychogenic
		Psychogenic Inversion of Circadian Rhythm
Cranial Nerve Diseases	Abducens Nerve Diseases	Cranial Nerve Disorders
	Accessory Nerve Diseases	Cranial Nerve Palsies
	Cranial Nerve Injuries	Cranial Neuropathies
	Cranial Nerve Neoplasms	Cranial Neuropathies, Multiple
	Facial Nerve Diseases	Nervus Cranialis Disorders
	Glossopharyngeal Nerve Diseases	Neuropathies, Cranial
	Hypoglossal Nerve Diseases	
	Ocular Motility Disorders	
	Olfactory Nerve Diseases	
	Ophthalmoplegic Migraine	
	Optic Nerve Diseases	
	Trochlear Nerve Diseases	
	Vagus Nerve Diseases	
	Vestibulocochlear Nerve Diseases	

Supplementary Table 1

Terms under Nervous System Diseases MeSH term* *Note that only the first two levels of the MeSH tree structures are shown. Further (sub-)levels can be accessed via the respective hyperlinks.		Entry terms for Nervous System Diseases
Demyelinating Diseases	Demyelinating Autoimmune Diseases, CNS	Clinically Isolated CNS Demyelinating Syndrome
	Hereditary Central Nervous System Demyelinating Diseases	Clinically Isolated Syndrome, CNS Demyelinating
	Leukoencephalopathy, Progressive Multifocal	Demyelinating Disorders
	Marchiafava-Bignami Disease	Demyelination
	Myelinolysis, Central Pontine	
	Ophthalmoplegic Migraine	
	Polyradiculoneuropathy	
	Subacute Combined Degeneration	
Nervous System Malformations	Agenesis of Corpus Callosum	Abnormalities, Congenital, Nervous System
	Central Nervous System Cysts	Abnormalities, Nervous System
	Central Nervous System Vascular Malformations	Anomalies, Nervous System
	Congenital Cranial Dysinnervation Disorders	Congenital Abnormalities, Nervous System
	Dandy-Walker Syndrome	Congenital Anomalies, Nervous System
	Hereditary Sensory and Autonomic Neuropathies	Congenital Malformations, Nervous System
	Hereditary Sensory and Motor Neuropathy	Cranioschisis
	Hydranencephaly	Malformations, Nervous System, Congenital
	Malformations of Cortical Development	Nervous System Abnormalities
	Neural Tube Defects	Nervous System Anomalies
	Optic Nerve Hypoplasia	Nervous System Congenital Abnormalities
		Nervous System Congenital Malformations
		Nervous System Malformations, Congenital
Nervous System Neoplasms	Central Nervous System Neoplasms	Neoplasms, Nervous System
	Cranial Nerve Neoplasms	Nervous System Tumors
	Neurolymphomatosis	Tumors of the Nervous System
	Peripheral Nervous System Neoplasms	
Neurocutaneous Syndromes	Ataxia Telangiectasia	Neurocutaneous Disorders
	Neurofibromatoses	Neuroectodermal Dysplasia Syndromes
	Nevus, Sebaceous of Jadassohn	Phacomatoses
	Sturge-Weber Syndrome	Phacomatosis
	Tuberous Sclerosis	Phakomatoses
	von Hippel-Lindau Disease	Phakomatosis

Supplementary Table 1

*Note that only the first two levels of the MeSH tree structures are shown. Further (sub-)levels can be accessed via the respective hyperlinks.

Terms under Nervous System Diseases MeSH term*		**Entry terms for Nervous System Diseases**
Neurodegenerative Diseases	Chronic Traumatic Encephalopathy	Degenerative Diseases, Central Nervous System
	Heredodegenerative Disorders, Nervous System	Degenerative Diseases, Nervous System
	Motor Neuron Disease	Degenerative Diseases, Neurologic
	Olivary Degeneration	Degenerative Diseases, Spinal Cord
	Paraneoplastic Syndromes, Nervous System	Degenerative Neurologic Diseases
	Postpoliomyelitis Syndrome	Degenerative Neurologic Disorders
	Prion Diseases	Nervous System Degenerative Diseases
	Subacute Combined Degeneration	Neurodegenerative Disorders
	Synucleinopathies	Neurologic Degenerative Conditions
	Tauopathies	Neurologic Degenerative Diseases
	TDP-43 Proteinopathies	Neurologic Diseases, Degenerative
Neuroinflammatory Diseases	Encephalitis	Neuroinflammation
	Encephalomyelitis	Neuroinflammatory Disorders
	Meningitis	
	Myelitis	

Supplementary Table 1

*Note that only the first two levels of the MeSH tree structures are shown. Further (sub-)levels can be accessed via the respective hyperlinks.

Terms under Nervous System Diseases MeSH term*		Entry terms for Nervous System Diseases
Neurologic Manifestations	Bilateral Vestibulopathy	Focal Neurologic Deficits
	Cerebrospinal Fluid Leak	Manifestations, Neurologic
	Cerebral Cortical Thinning	Manifestations, Neurological
	Decerebrate State	Neurologic Deficits
	Dyskinesias	Neurologic Dysfunction
	Gait Disorders, Neurologic	Neurologic Findings
	Meningism	Neurologic Manifestation
	Neurobehavioral Manifestations	Neurologic Signs
	Neurogenic Inflammation	Neurologic Signs and Symptoms
	Neuromuscular Manifestations	Neurologic Symptoms
	Paralysis	Neurological Manifestations
	Paresis	
	Pupil Disorders	
	Reflex, Abnormal	
	Seizures	
	Sensation Disorders	
	Susac Syndrome	
	Urinary Bladder, Neurogenic	
	Vertigo	
	Voice Disorders	
Neuromuscular Diseases	Fatigue Syndrome, Chronic	Amyotonia Congenita
	Locked-In Syndrome	Cramp-Fasciculation Syndrome
	Motor Neuron Disease	Fasciculation-Cramp Syndrome, Benign
	Muscular Diseases	Foley-Denny-Brown Syndrome
	Neuromuscular Junction Diseases	Oppenheim Disease
	Peripheral Nervous System Diseases	Oppenheim‘s Disease
	Poliomyelitis	
	Stiff-Person Syndrome	

Supplementary Table 1

Terms under Nervous System Diseases MeSH term*

*Note that only the first two levels of the MeSH tree structures are shown. Further (sub-)levels can be accessed via the respective hyperlinks.

		Entry terms for Nervous System Diseases
Neurotoxicity Syndromes	Akathisia, Drug-Induced	Encephalopathy, Toxic
	Alcohol-Induced Disorders, Nervous System	Nervous System Poisoning
	Botulism	Neurotoxic Disorders
	Dyskinesia, Drug-Induced	Neurotoxin Diseases
	Heavy Metal Poisoning, Nervous System	Neurotoxin Disorders
	MPTP Poisoning	Poisoning, Nervous System
	Neuroleptic Malignant Syndrome	Toxic Encephalitis
Restless Legs Syndrome	N/A	Restless Leg Syndrome
		Restless Legs
		Willis Ekbom Disease
		Willis Ekbom Syndrome
		Willis-Ekbom Disease
		Willis-Ekbom Syndrome
		Wittmaack Ekbom Syndrome
		Wittmaack-Ekbom Syndrome
Sleep Wake Disorders	Dyssomnias	Long Sleeper Syndrome
	Parasomnias	Short Sleep Phenotype
		Short Sleeper Syndrome
		Sleep Disorders
		Sleep-Related Neurogenic Tachypnea
		Subwakefullness Syndrome
Trauma, Nervous System	Cerebrovascular Trauma	Axonotmesis
	Craniocerebral Trauma	Craniocervical Injuries
	Peripheral Nerve Injuries	Injuries, Nervous System
	Spinal Cord Injuries	Nervous System Injuries
		Neurotmesis

Data from other sources

This report utilizes the most recent epidemiological data as reported in the Global Burden of Disease (GBD) Study, which quantified health loss for 37 unique neurological conditions in 204 countries and territories for the reference year 2021 *(13, 14)*. GBD data were converted to United Nations population estimates released in 2024 for the calendar year 2021.

Country spotlights / case studies

IGAP data analyses in this report are complemented by a selection of country spotlights and case studies. Aimed at one of IGAP's ten global targets and/or six cross-cutting principles, these elements of the report feature good practices including policies, plans, programmes, interventions or technical products related to IGAP implementation.

Country spotlights and case studies included in this report were co-created with contributions from diverse external experts, including people with lived experience of neurological conditions. A balanced selection process was pursued – aligned with the IGAP guiding principles and an integrated, person-centred, human rights and life course approach to neurological disorders and brain health. Specifically, the final selection of case studies was made on the basis of: 1) their potential to illustrate good practice in one of the IGAP global targets; 2) their relevance to IGAP guiding principles and/or key messages identified in each of the chapters; 3) representation across population (i.e. age, gender, neurological condition), income levels and geographical location; and 4) existence of a formal impact evaluation of the good practice, whenever applicable.

The voice of people with lived experience

Throughout this report, boxes titled "The voice of people with lived experience" highlight the unique perspectives of individuals with neurological conditions, their carers and families. Informed by a series of written and online consultations held with people with lived experiences, these sections outline the key messages and priority actions related to IGAP implementation as identified by this stakeholder group. Additionally, good practices and opportunities for meaningful engagement of people with neurological conditions, their carers and families in IGAP-related activities are presented. Participants included individuals with lived experience of various neurological conditions – e.g. epilepsy, migraine and headache disorders, traumatic brain injury, neurodevelopmental conditions including cerebral palsy and autism spectrum disorder, neurodegenerative conditions including dementia and Huntington disease, movement disorders including Parkinson disease, neuroimmunological conditions including multiple sclerosis, and neuromuscular conditions including myasthenia – along with carers and family members. Efforts were made to ensure balanced representation across age, gender, neurological conditions, income levels and geographical locations.

Limitations of this report

A number of limitations should be taken into consideration when reading this report. The information presented here represents the first wave of IGAP data collection. Between 2023 and 2025, 102 countries formally submitted IGAP survey data to WHO. While these countries account for approximately 71% of the world's population, this represents a response rate of only 53% (102 of 194 WHO Member States) globally, with large regional variation and comparatively lower response rates in the South-East Asia and Western Pacific regions. Although a report primarily based on survey data from a subset of Member States has its limitations, the fact that these countries represent a significant share of the global population strengthens confidence in the global findings presented.

Another limitation is that the data included in this report are self-reported by the appointed representatives in WHO Member States. Additionally, the extended time gap between the earliest and latest country submissions of IGAP survey data highlights the need for periodic repetitions of the data collection effort to ensure data accuracy and recency.

To establish baseline values for the IGAP global targets as a proportion of all WHO Member States, non-responding countries were treated as having responded negatively. This approach may have resulted in an underestimation of the actual baseline values. Throughout the report, data displayed in tables and graphs may not sum up to the total number of responding countries because not all countries were able to provide data for all indicators or sub-indicators.

Monitoring of IGAP implementation activities will continue globally. As countries engage in future rounds of IGAP data collection, more comprehensive analyses of trends in the global public health response to neurological disorders and brain health promotion will be explored in future reports. Future data collection efforts will aim to enhance response rates across all WHO regions and World Bank income groups, with attention focused on strengthening representation from the South-East Asia and Western Pacific regions and in lower-middle-income and low-income countries, in order to improve global and regional accuracy.

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Annex 3

Participation results

Included countries by WHO region

African Region

Botswana
Burkina Faso
Cabo Verde
Cameroon
Comoros
Eswatini
Ethiopia
Gabon
Ghana
Kenya
Liberia
Madagascar
Malawi
Mozambique
Rwanda
Senegal
Seychelles
Sierra Leone
South Africa
South Sudan
Uganda
United Republic of Tanzania
Zambia
Zimbabwe

Region of the Americas

Antigua and Barbuda
Argentina
Bolivia, Plurinational State of
Brazil
Canada
Chile
Colombia
Costa Rica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Mexico
Nicaragua
Paraguay
Peru
Suriname
Trinidad and Tobago
Uruguay
Venezuela, Bolivarian Republic of

Eastern Mediterranean Region

Afghanistan
Bahrain
Iran, Islamic Republic of
Iraq
Kuwait
Lebanon
Libya
Morocco
Oman
Pakistan
Qatar
Somalia
Tunisia
United Arab Emirates
Yemen

European Region

Albania
Armenia
Austria
Belarus
Bulgaria
Croatia
Czechia

Finland
Germany
Iceland
Italy
Latvia
Lithuania
Luxembourg
Malta
Montenegro
North Macedonia
Norway
Poland
Republic of Moldova
Romania
Russian Federation
Serbia
Slovak Republic
Slovenia
Spain
Ukraine
United Kingdom of Great Britain and Northern Ireland
South-East Asia Region
Bhutan
India
Myanmar
Thailand
Western Pacific Region
Australia
Brunei Darussalam
China
Cook Islands
Japan
Malaysia
Papua New Guinea
Philippines

Annex 4

Supplementary data

Chapter 3

Policy, advocacy and health system financing

Table A3.1

IGAP global target 1.1: Dedicated policies for neurological disorders, and extent of functionality (number of countries) (2022)

	Countries with at least one verified dedicated policy (global target 1.1_A)	Countries with at least one verified dedicated policy meeting at least one functionality criterion (global target 1.1_B)	Countries with at least one verified dedicated policy meeting all functionality criteria (global target 1.1_C)	Number of responding countries	Number of WHO Member States
Global	**63**	**55**	**17**	**102**	**194**
WHO region					
African Region	20	16	5	24	47
Region of the Americas	8	8	3	23	35
South-East Asia Region	4	4	2	4	11
European Region	18	17	6	28	53
Eastern Mediterranean Region	7	4	0	15	21
Western Pacific Region	6	6	1	8	27
World Bank income group					
Low-income	10	7	2	13	26
Lower-middle-income	15	12	2	22	50
Upper-middle-income	16	15	7	30	52
High-income	21	20	6	35	63

Global target 1.1_A: At least one stand-alone or integrated plan that could be verified.

Global target 1.1_B: At least one stand-alone or integrated plan that could be verified and meets at least one of three functionality criteria (i.e. dedicated financial and human resources to implement the policy; a mechanism to monitor the policy; engagement and involvement of people with lived experience in this process).

Global target 1.1_C: At least one stand-alone or integrated plan that could be verified and meets all three functionality criteria.

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A3.2

Distribution of standalone policies for selected neurological disorders (number of countries) (2022)

	Neurological disorders in general	Neurodevelopmental conditions	Epilepsy	Headache disorders	Meningitis	Parkinson disease	Stroke	Others	Number of countries with verified policies	Number of responding countries	Number of WHO Member States
Global	**4**	**4**	**5**	**0**	**0**	**3**	**6**	**10**	**63**	**102**	**194**
WHO region											
African Region	0	0	0	0	0	0	0	0	20	24	47
Region of the Americas	1	1	3	0	0	0	0	3	8	23	35
South-East Asia Region	0	0	0	0	0	0	0	0	4	4	11
European Region	2	3	1	0	0	3	3	5	18	28	53
Eastern Mediterranean Region	0	0	1	0	0	0	1	1	7	15	21
Western Pacific Region	1	0	0	0	0	0	2	1	6	8	27
World Bank income group											
Low-income	0	0	0	0	0	0	0	0	10	13	26
Lower-middle-income	0	0	0	0	0	0	1	1	15	22	50
Upper-middle-income	1	1	2	0	0	0	1	1	16	30	52
High-income	3	3	3	0	0	3	4	8	21	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A3.3

Functionality of dedicated policies (number of countries), by WHO region (2022)

	Dedicated financial/human resources for implementation	Monitoring of the policy	Engagement and involvement of people with lived experience	Mean functionality rating (0–3)	Number of countries with dedicated policies	Number of responding countries	Number of WHO Member States
Global	**41**	**41**	**33**	**1.9**	**63**	**102**	**194**
WHO region							
African Region	9	11	9	1.5	20	24	47
Region of the Americas	7	7	5	2.4	8	23	35
South-East Asia Region	4	4	2	2.5	4	4	11
European Region	14	11	12	2.2	18	28	53
Eastern Mediterranean Region	2	3	2	1.2	7	15	21
Western Pacific Region	5	5	3	2.2	6	8	27

Table A3.4

IGAP global target 1.2: Functioning awareness campaigns/advocacy programmes for brain health and/or neurological disorders (number of countries) (2022)

	Countries with at least one minimally functioning campaign/ programme (global target 1.2_A)	Countries with at least one fully functioning campaign/ programme (global target 1.2_B)	Number of responding countries	Number of WHO Member States
Global	**46**	**17**	**102**	**194**
WHO region				
African Region	11	3	24	47
Region of the Americas	9	3	23	35
South-East Asia Region	3	2	4	11
European Region	16	5	28	53
Eastern Mediterranean Region	3	3	15	21
Western Pacific Region	4	1	8	27
World Bank income group				
Low-income	4	1	13	26
Lower-middle-income	8	3	22	50
Upper-middle-income	14	5	30	52
High-income	19	7	35	63

Global target 1.2_A: At least one awareness-raising campaign meeting one of three functionality criteria (i.e. dedicated financial/human resources; a defined implementation plan; evidence of progress and/or impact).

Global target 1.2_B: At least one awareness-raising campaign meeting all three functionality criteria.

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A3.5

Neurological disorder(s) covered by awareness-raising campaigns or advocacy programmes (number of countries) (2022)

	Brain health	Neurological disorders in general	Stroke	Parkinson diease	Meningitis	Epilepsy	Headaches disorders	Neurodevelopmental conditions	Number of countries with campaigns/ programmes	Number of responding countries	Number of WHO Member States
Global	**27**	**24**	**35**	**20**	**8**	**36**	**13**	**21**	**61**	**102**	**194**
WHO region											
African Region	7	7	8	5	2	12	2	7	15	24	47
Region of the Americas	2	3	3	1	1	4	1	2	10	23	35
South-East Asia Region	2	2	3	2	2	3	2	3	3	4	11
European Region	10	7	12	8	1	9	3	3	19	28	53
Eastern Mediterranean Region	3	1	4	2	1	4	3	3	8	15	21
Western Pacific Region	3	4	5	2	1	4	2	3	6	8	27
World Bank income group											
Low-income	2	3	2	1	0	5	0	3	5	13	26
Lower-middle-income	5	4	7	4	3	10	2	6	12	22	50
Upper-middle-income	8	6	11	8	4	12	6	7	18	30	52
High-income	12	9	15	7	1	9	5	5	24	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A3.6

Functionality of awareness-raising campaigns or advocacy programmes (number of countries) (2022)

	Dedicated financial/human resources	Defined implementation plan	Evidence of progress/impact	Mean functionality rating (0-3)	Number of countries with campaigns/ programmes	Number of responding countries	Number of WHO Member States
Global	**41**	**35**	**23**	**1.7**	**61**	**102**	**194**
WHO region							
African Region	9	8	4	1.4	15	24	47
Region of the Americas	8	8	5	2.1	10	23	35
South-East Asia Region	3	2	2	2.3	3	4	11
European Region	15	10	7	1.7	19	28	53
Eastern Mediterranean Region	3	3	3	1.8	8	15	21
Western Pacific Region	3	4	2	1.5	6	8	27
World Bank income group							
Low-income	3	3	2	1.6	5	13	26
Lower-middle-income	7	6	3	1.3	12	22	50
Upper-middle-income	12	10	6	1.75	18	30	52
High-income	18	15	11	1.9	24	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A3.7

Stakeholders targeted by awareness-raising campaigns or advocacy programmes (number of countries) (2022)

	General public	Health/ social care professionals	Informal carers	Employers	Teachers	Others	Number of countries with campaigns/ programmes	Number of responding countries	Number of WHO Member States
Global	**48**	**44**	**28**	**15**	**18**	**12**	**61**	**102**	**194**
WHO region									
African Region	13	12	7	3	5	2	15	24	47
Region of the Americas	7	6	6	1	1	2	10	23	35
South-East Asia Region	3	3	3	2	2	1	3	4	11
European Region	15	15	9	7	8	5	19	28	53
Eastern Mediterranean Region	4	3	1	1	1	1	8	15	21
Western Pacific Region	6	5	2	1	1	1	6	8	27
World Bank income group									
Low-income	3	4	2	2	3	1	5	13	26
Lower-middle-income	11	9	6	2	4	2	12	22	50
Upper-middle-income	13	15	8	6	5	5	18	30	52
High-income	20	15	11	5	6	4	24	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A3.8

Areas to which dedicated funding for brain health/neurological disorders is allocated (number of countries), by World Bank income group (2022)

	Brain health promotion	Prevention of neurological disorders	Inclusion of people with neurological disorders	Health care and treatment	Surveillance, monitoring and evaluation	Workforce capacity building	Rehabilitation	Palliative care	Number of responding countries	Number of WHO Member States
Global	**13**	**15**	**9**	**29**	**20**	**17**	**21**	**17**	**102**	**194**
World Bank income group										
Low-income	2	2	2	3	3	3	1	1	13	26
Lower-middle-income	2	4	3	6	3	4	4	3	22	50
Upper-middle-income	6	7	3	9	7	6	8	7	30	52
High-income	3	2	1	11	7	4	8	6	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Chapter 4
Effective, timely and responsive diagnosis, treatment and care

Table A4.1

Inclusion of neurological disorders in national UHC priority benefits packages (number of countries) (2022)

	No UHC priority benefits package	UHC priority benefits package, but neurological disorders not included	UHC priority benefits package and neurological disorders included	No data provided	Number of responding countries	Number of WHO Member States
Global	**33**	**13**	**49**	**7**	**102**	**194**
WHO region						
African Region	9	4	11	0	24	47
Region of the Americas	9	3	8	3	23	35
South-East Asia Region	1	1	2	0	4	11
European Region	7	3	15	3	28	53
Eastern Mediterranean Region	3	2	9	1	15	21
Western Pacific Region	4	0	4	0	8	27
World Bank income group						
Low-income	5	3	5	0	13	26
Lower-middle-income	7	5	9	1	22	50
Upper-middle-income	14	2	12	2	30	52
High-income	6	2	23	4	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.2

Types of neurological disorders included in UHC benefits packages (number of countries) (2022)

	Stroke	Parkinson disease	Meningitis	Epilepsy	Headache disorders	Neurodevelopmental conditions	Others	Number of countries meeting global target 2.1	Number of responding countries	Number of WHO Member States
Global	**25**	**22**	**19**	**30**	**18**	**22**	**0**	**49**	**102**	**194**
WHO region										
African Region	5	2	5	7	2	4	0	11	24	47
Region of the Americas	6	7	5	7	5	5	0	8	23	35
South-East Asia Region	2	1	2	2	1	2	0	2	4	11
European Region	6	7	3	7	6	6	0	15	28	53
Eastern Mediterranean Region	3	2	1	4	1	2	0	9	15	21
Western Pacific Region	3	3	3	3	3	3	0	4	8	27
World Bank income group										
Low-income	2	1	2	2	1	2	0	5	13	26
Lower-middle-income	5	1	3	7	0	2	0	9	22	50
Upper-middle-income	7	8	6	9	7	8	0	12	30	52
High-income	11	12	8	12	10	10	0	23	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.3

Neurological disorders for which social protection mechanisms are available (number of countries) (2022)

	Stroke	Parkinson disease	Meningitis	Epilepsy	Headache disorders	Neurodevelopmental conditions	Other	Number of responding countries	Number of WHO Member States
Global	**57**	**49**	**31**	**51**	**23**	**55**	**0**	**102**	**194**
WHO region									
African Region	10	7	4	10	3	10	0	24	47
Region of the Americas	13	13	8	12	5	13	0	23	35
South-East Asia Region	2	2	2	2	1	2	0	4	11
European Region	21	19	12	21	10	20	0	28	53
Eastern Mediterranean Region	7	5	3	6	2	7	0	15	21
Western Pacific Region	4	3	2	4	2	3	0	8	27
World Bank income group									
Low-income	1	1	1	1	1	1	0	13	26
Lower-middle-income	9	5	2	9	1	10	0	22	50
Upper-middle-income	21	21	12	21	8	22	0	30	52
High-income	25	22	16	24	13	22	0	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.4

Neurological disorders included in existing guidelines or standards (number of countries) (2022)

	Stroke	Parkinson disease	Meningitis	Epilepsy	Headache disorders	Neurodevelopmental conditions	Others	Number of responding countries	Number of WHO Member States
Global	**51**	**35**	**25**	**50**	**29**	**37**	**35**	**102**	**194**
WHO region									
African Region	11	7	9	13	9	8	7	24	47
Region of the Americas	9	7	5	13	4	9	9	23	35
South-East Asia Region	4	2	2	3	1	3	4	4	11
European Region	19	14	6	13	11	10	10	28	53
Eastern Mediterranean Region	4	2	2	5	2	4	1	15	21
Western Pacific Region	4	3	1	3	2	3	4	8	27
World Bank income group									
Low-income	4	4	3	5	4	3	1	13	26
Lower-middle-income	9	3	6	11	4	8	8	22	50
Upper-middle-income	17	13	11	21	14	15	12	30	52
High-income	21	15	5	13	7	10	13	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.5

Availability of neurological services in specialized settings (number of countries) (2022)

	No	Yes	Number of responding countries	Number of WHO Member States
Global	**16**	**86**	**102**	**194**
WHO region				
African Region	5	19	24	47
Region of the Americas	4	19	23	35
South-East Asia Region	0	4	4	11
European Region	2	26	28	53
Eastern Mediterranean Region	3	12	15	21
Western Pacific Region	2	6	8	27
World Bank income group				
Low-income	5	8	13	26
Lower-middle-income	4	18	22	50
Upper-middle-income	3	27	30	52
High-income	3	32	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.6

Availability of neurological services in non-specialized settings (number of countries) (2022)

	No	Yes	Number of responding countries	Number of WHO Member States
Global	**45**	**57**	**102**	**194**
WHO region				
African Region	11	13	24	47
Region of the Americas	10	13	23	35
South-East Asia Region	2	2	4	11
European Region	9	19	28	53
Eastern Mediterranean Region	10	5	15	21
Western Pacific Region	3	5	8	27
World Bank income group				
Low-income	6	7	13	26
Lower-middle-income	13	9	22	50
Upper-middle-income	12	18	30	52
High-income	12	23	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.7

Types of neurological services for children available in specialized settings (number of countries) (2022)

	Specialist wards	Specialist clinics	Stroke units	Neuro-intensive care units	Rehabilitation units	Palliative care	Other specialized settings	Number of responding countries	Number of WHO Member States
Global	**17**	**12**	**5**	**8**	**12**	**7**	**6**	**102**	**194**
WHO region									
African Region	5	4	2	2	4	3	1	24	47
Region of the Americas	3	2	0	0	0	0	1	23	35
South-East Asia Region	0	0	0	0	0	0	1	4	11
European Region	8	5	2	5	7	3	2	28	53
Eastern Mediterranean Region	1	1	1	1	1	1	1	15	21
Western Pacific Region	0	0	0	0	0	0	0	8	27
World Bank income group									
Low-income	3	3	1	1	2	2	1	22	50
Lower-middle-income	2	1	1	1	1	1	1	30	52
Upper-middle-income	5	4	1	2	3	1	2	34	63
High-income	7	4	2	4	6	3	2	14	26

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.8

Types of neurological services available in non-specialized settings (number of countries) (2022)

	General hospital-based outpatient care facilities	Community-based outpatient services	School-based programmes	General hospital-based inpatient care facilities	Inpatient care in community residential facilities	Other non-specialized settings	Number of responding countries	Number of WHO Member States
Global	**50**	**34**	**13**	**49**	**22**	**4**	**102**	**194**
WHO region								
African Region	13	7	3	10	2	0	24	47
Region of the Americas	12	9	5	12	6	0	23	35
South-East Asia Region	2	2	2	2	2	1	4	11
European Region	15	12	1	16	10	3	28	53
Eastern Mediterranean Region	4	2	1	5	2	0	15	21
Western Pacific Region	4	2	1	4	0	0	8	27
World Bank income group								
Low-income	7	5	1	5	1	0	13	26
Lower-middle-income	8	2	3	8	2	0	22	50
Upper-middle-income	15	11	6	15	8	2	30	52
High-income	20	16	3	21	11	2	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.9

Accessibility of neurological services in non-specialized settings (number of countries) (2022)

	Capital only	Urban areas only	Urban and rural areas	Not applicable or no data provided	Number of responding countries	Number of WHO Member States
Global	**4**	**25**	**37**	**36**	**102**	**194**
WHO region						
African Region	1	6	9	8	24	47
Region of the Americas	2	6	6	9	23	35
South-East Asia Region	0	2	1	1	4	11
European Region	0	8	13	7	28	53
Eastern Mediterranean Region	1	3	4	7	15	21
Western Pacific Region	0	0	4	4	8	27
World Bank income group						
Low-income	2	3	3	5	13	26
Lower-middle-income	0	6	6	10	22	50
Upper-middle-income	1	10	11	8	30	52
High-income	1	5	17	12	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.10

Majority provider of neurological services in specialized settings (number of countries) (2022)

	Private sector	Public sector	Private and public sectors	Not applicable or no data provided	Number of responding countries	Number of WHO Member States
Global	**11**	**42**	**29**	**20**	**102**	**194**
WHO region						
African Region	2	8	9	5	24	47
Region of the Americas	3	9	6	5	23	35
South-East Asia Region	1	1	2	0	4	11
European Region	0	17	9	2	28	53
Eastern Mediterranean Region	4	5	2	4	15	21
Western Pacific Region	1	2	1	4	8	27
World Bank income group						
Low-income	2	2	3	6	13	26
Lower-middle-income	5	7	6	4	22	50
Upper-middle-income	4	15	7	4	30	52
High-income	0	18	12	5	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.11

Majority provider of neurological services in non-specialized settings (number of countries) (2022)

	Private sector	Public sector	Private and public sectors	Not applicable or no data provided	Number of responding countries	Number of WHO Member States
Global	**3**	**40**	**31**	**28**	**102**	**194**
WHO region						
African Region	0	9	7	8	24	47
Region of the Americas	1	10	7	5	23	35
South-East Asia Region	0	1	2	1	4	11
European Region	0	16	7	5	28	53
Eastern Mediterranean Region	2	2	6	5	15	21
Western Pacific Region	0	2	2	4	8	27
World Bank income group						
Low-income	1	3	4	5	13	26
Lower-middle-income	0	5	8	9	22	50
Upper-middle-income	0	16	7	7	30	52
High-income	2	16	11	6	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.12

Accessibility of services, supports or programmes for carers of people with neurological disorders (number of countries) (2022)

	Capital only	Urban areas only	Urban and rural areas	Not applicable or no data provided	Number of responding countries	Number of WHO Member States
Global	**4**	**15**	**26**	**57**	**102**	**194**
WHO region						
African Region	0	5	5	14	24	47
Region of the Americas	2	3	4	14	23	35
South-East Asia Region	0	1	1	2	4	11
European Region	2	4	13	9	28	53
Eastern Mediterranean Region	0	1	2	12	15	21
Western Pacific Region	0	1	1	6	8	27
World bank income group						
Low-income	0	1	1	11	13	26
Lower-middle-income	0	4	2	16	22	50
Upper-middle-income	1	6	5	18	30	52
High-income	2	4	18	11	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.13

Types of neurological disorders covered by social/financial protection mechanisms for carers (number of countries) (2022)

	Stroke	Parkinson disease	Meningitis	Epilepsy	Headache disorders	Neurodevelopmental conditions	Others	Number of responding countries	Number of WHO Member States
Global	**30**	**27**	**21**	**34**	**13**	**30**	**17**	**102**	**194**
WHO region									
African Region	6	3	2	6	1	6	2	24	47
Region of the Americas	4	4	3	5	3	4	2	23	35
South-East Asia Region	1	1	1	1	1	1	0	4	11
European Region	12	13	10	14	5	13	9	28	53
Eastern Mediterranean Region	5	4	3	5	1	4	3	15	21
Western Pacific Region	2	2	2	3	2	2	1	8	27
World Bank income group									
Low-income	0	0	0	0	0	0	0	13	26
Lower-middle-income	4	2	1	3	0	3	0	22	50
Upper-middle-income	9	8	7	11	4	9	5	30	52
High-income	16	16	12	19	8	16	12	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.14

IGAP global target 2.2: Provision of essential medicines and basic technologies for neurological disorders in primary care (number of countries) (2022)

	Countries with universal accessibility (global target 2.2_A)	Countries with universal accessibility + medicines affordability (global target 2.2_B)	Number of responding countries	Number of WHO Member States
Global	**57**	**45**	**102**	**194**
WHO region				
African Region	18	9	24	47
Region of the Americas	10	9	23	35
South-East Asia Region	2	2	4	11
European Region	19	19	28	53
Eastern Mediterranean Region	4	2	15	21
Western Pacific Region	4	4	8	27
World Bank income group				
Low-income	6	4	13	26
Lower-middle-income	12	3	22	50
Upper-middle-income	15	14	30	52
High-income	24	24	35	63

Global target 2.2_A: Essential medicines and basic technologies to manage neurological disorders in primary care are available and universally accessible (i.e. in urban and rural areas).

Global target 2.2_B: Essential medicines and basic technologies to manage neurological disorders in primary care are available and universally accessible (i.e. in urban and rural areas) + essential medicines are affordable (i.e. persons pay less than 50% out of pocket or are fully covered).

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.15

List of medicines for neurological disorders generally available* in public health sector primary care facilities (number of countries) (2022)

	Benzodiazipines	Carbamazepine	Lamotrigine	Levetiracetam	Phenobarbital	Phenytoin	Valproic acid	Acetylsalicylic acid	Ibuprofen	Paracetamol	Propranolol	Sumatriptan	Biperiden	Levodopa + Carbidopa (or similar)	Number of responding countries	Number of WHO Member States
Global	**89**	**81**	**48**	**49**	**78**	**69**	**71**	**88**	**92**	**97**	**76**	**35**	**35**	**61**	**102**	**194**
WHO region																
African Region	22	21	7	6	22	14	15	23	24	24	17	4	6	12	24	47
Region of the Americas	19	17	7	8	17	19	17	21	20	21	16	3	8	14	23	35
South-East Asia Region	4	4	1	2	3	3	4	4	3	4	4	1	0	2	4	11
European Region	25	23	22	22	21	20	22	24	26	27	23	21	16	22	28	53
Eastern Mediterranean Region	11	11	6	6	10	7	8	11	11	13	10	4	3	6	15	21
Western Pacific Region	8	5	5	5	5	6	5	5	8	8	6	2	2	5	8	27
World Bank income group																
Low-income	12	11	1	2	12	7	5	11	12	13	7	0	3	4	13	26
Lower-middle-income	18	17	7	7	15	12	16	18	19	21	15	3	7	11	22	50
Upper-middle-income	28	24	15	14	23	22	22	29	28	29	24	11	10	18	30	52
High-income	29	28	23	24	26	26	27	29	31	32	28	21	14	27	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

*"Generally available" refers to medicines available in 50% or more of primary care facilities

Table A4.16

Provision of neurology training to health-care workers at primary care level (number of countries) (2022)

	No	Yes	No data provided	Number of responding countries	Number of WHO Member States
Global	**17**	**78**	**7**	**102**	**194**
WHO region					
African Region	4	20	0	24	47
Region of the Americas	7	13	3	23	35
South-East Asia Region	0	4	0	4	11
European Region	3	24	1	28	53
Eastern Mediterranean Region	2	11	2	15	21
Western Pacific Region	1	6	1	8	27
World Bank income group					
Low-income	2	11	0	13	26
Lower-middle-income	4	16	2	22	50
Upper-middle-income	7	20	3	30	52
High-income	3	30	2	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.17

Cadres of health-care workers receiving neurology training at primary care level (number of countries) (2022)

	Community health worker	Generalist medical practitioners	Specialist medical practitioners	Nursing staff	Pharmacists	Others	Number of responding countries	Number of WHO Member States
Global	**39**	**75**	**59**	**62**	**29**	**9**	**102**	**194**
WHO region								
African Region	13	20	10	19	7	3	24	47
Region of the Americas	7	12	9	9	4	2	23	35
South-East Asia Region	3	4	4	4	3	1	4	11
European Region	9	22	23	18	10	1	28	53
Eastern Mediterranean Region	3	11	7	6	2	1	15	21
Western Pacific Region	4	6	6	6	3	1	8	27
World Bank income group								
Low-income	7	11	7	8	3	2	13	26
Lower-middle-income	6	16	9	15	4	3	22	50
Upper-middle-income	13	20	16	14	11	2	30	52
High-income	12	27	26	24	11	2	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.18

Extent of mhGAP modules for neurological disorders used for training (number of countries) (2022)

	None used	One module used	Two modules used	Three modules used	Number of responding countries	Number of WHO Member States
Global	**53**	**14**	**9**	**26**	**102**	**194**
WHO region						
African Region	7	6	3	8	24	47
Region of the Americas	13	2	1	7	23	35
South-East Asia Region	1	2	0	1	4	11
European Region	22	2	1	3	28	53
Eastern Mediterranean Region	4	2	3	6	15	21
Western Pacific Region	6	0	1	1	8	27
World Bank income group						
Low-income	1	2	2	8	13	26
Lower-middle-income	5	6	3	8	22	50
Upper-middle-income	18	3	2	7	30	52
High-income	28	3	2	2	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A4.19

Types of mhGAP modules for neurological disorders used for training (number of countries) (2022)

	mhGAP module on epilepsy	mhGAP module on child and adolescent mental and behavioural disorders	mhGAP module on dementia	None used	No data provided	Number of responding countries	Number of WHO Member States
Global	**43**	**36**	**31**	**40**	**13**	**102**	**194**
WHO region							
African Region	15	12	9	7	0	24	47
Region of the Americas	10	7	8	8	5	23	35
South-East Asia Region	2	2	1	1	0	4	11
European Region	4	6	3	17	5	28	53
Eastern Mediterranean Region	10	8	8	2	2	15	21
Western Pacific Region	2	1	2	5	1	8	27
World Bank income group							
Low-income	12	10	8	1	0	13	26
Lower-middle-income	15	10	11	4	1	22	50
Upper-middle-income	11	9	8	14	4	30	52
High-income	4	6	3	20	8	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Chapter 5

Brain health promotion and prevention of neurological disorders

Table A5.1

IGAP global target 3.1: Functioning programmes for brain health promotion and/or prevention of neurological disorders, and extent of functionality (number of countries) (2022)

	Countries with at least one minimally functioning programme (global target 3.1_A)	Countries with at least one fully functioning programme (global target 3.1_B)	Countries with at least one fully functioning, intersectoral, life course programme (global target 3.1_C)	Number of responding countries	Number of WHO Member States
Global	**39**	**27**	**21**	**102**	**194**
WHO region					
African Region	11	7	6	24	47
Region of the Americas	5	4	4	23	35
South-East Asia Region	4	2	2	4	11
European Region	12	8	5	28	53
Eastern Mediterranean Region	4	3	2	15	21
Western Pacific Region	3	3	2	8	27
World Bank income group					
Low-income	4	4	3	13	26
Lower-middle-income	10	5	4	22	50
Upper-middle-income	12	10	8	30	52
High-income	13	8	6	35	63

Global target 3.1_A: At least one programme for promotion and prevention of neurological disorders meeting one of three functionality criteria (i.e. dedicated financial/human resources; a defined implementation plan; evidence of progress and/or impact).

Global target 3.1_B: At least one programme for promotion and prevention of neurological disorders meeting all three functionality criteria.

Global target 3.1_C: At least one programme for promotion and prevention of neurological disorders meeting all three functionality criteria + incorporates an intersectoral and life-course approach.

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A5.2

Types of existing programmes for brain health promotion and/or prevention of neurological disorders (number of countries) (2022)

	Brain health promotion / prevention of neurological disorders	Epilepsy	Headaches disorders	Meningitis	Neurodevelopmental conditions	Parkinson disease	Stroke	Any other	Number of countries with any programme	Number of responding countries	Number of WHO Member States
Global	**26**	**27**	**12**	**13**	**21**	**17**	**28**	**12**	**47**	**102**	**194**
WHO region											
African Region	8	10	2	4	7	3	8	2	14	24	47
Region of the Americas	1	4	2	1	1	2	3	0	6	23	35
South-East Asia Region	3	2	3	1	3	2	3	0	4	4	11
European Region	9	4	2	4	4	5	7	4	12	28	53
Eastern Mediterranean Region	2	4	2	2	4	3	3	2	5	15	21
Western Pacific Region	3	3	1	1	2	2	4	4	6	8	27
Word Bank income group											
Low-income	5	6	3	4	5	3	4	0	6	13	26
Lower-middle-income	7	8	3	3	7	3	6	2	14	22	50
Upper-middle-income	5	9	4	3	5	6	8	5	12	30	52
High-income	9	4	2	3	4	5	10	4	14	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A5.3

Global progress on prevention and control of infectious diseases as relevant to brain health (non-exhaustive list)

Framework	Target	Indicator (metric)	2010	2016	2022
WHO's road map for neglected tropical diseases 2021–2030	75% percentage reduction in number of deaths from vector-borne NTDs (relative to 2016) – to achieve WHO's global vector control response goal	Reported number of people requiring interventions against NTDs (billions)	2.19	1.76	1.62
	Number of countries having achieved zero human deaths from rabies	Reported number of human rabies deaths	2 983	3 466	795
	Number of countries with intensified control in hyperendemic areas (taeniasis and cysticercosis)	Status of endemicity of Taenia solium (number of countries)	No data	57 (2018)	51
UN 2030 Agenda	SDG Target 3.3 Communicable diseases: By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases	Estimated malaria incidence (per 1000 population at risk)	69.30	59.25	58.43
		New HIV infections (per 1 000 uninfected population)	0.31	0.25 (2015)	0.18 (2021)
		Tuberculosis – new and relapse cases globally (millions)	5.79	6.36	7.47
		Poliomyelitis - number of reported cases	1 412	42	30
Global Health Sector Strategies on, HIV, viral hepatitis and sexually transmitted infections 2022–2030 (GHSS)		Syphilis – Incident cases of active syphilis in 15–49-year-old males and females (in thousands; m / f)	No data	3 062 / 2 943	4 062 / 3 938

Source: The Global Health Observatory. Geneva: World Health Organization (https://www.who.int/data/gho).

Table A5.4

Progress on the global nutrition targets 2025

Target for 2025	Indicator	2015	2022	2025 target (value)
Achieve a 40% reduction in the number of children under-5 who are stunted	Number (million) of children under-5 who are stunted	169	154 (2020)	107
Achieve a 50% reduction of anaemia in women of reproductive age	Prevalence (%) of anaemia in women of reproductive age	28.8	29.9 (2019)	14.25
Achieve a 30% reduction in low birth weight	Prevalence (%) of low birth weight	14.8	14.7 (2020)	10.5
Ensure that there is no increase in childhood overweight	Prevalence (%) of childhood overweight	5.5	5.6	5.6
Increase the rate of exclusive breastfeeding in the first 6 months up to at least 50%	Prevalence (%) of exclusive breastfeeding in the first 6 months	37 (2012)	47.7 (2021)	50
Reduce and maintain childhood wasting to less than 5%	Prevalence (%) of childhood wasting	7.2	6.8	5

Source: WHO Global Nutrition Targets Tracking Tool – Global progress report 2025. Geneva: World Health Organization; 2025 (https://www.who.int/data/nutrition/tracking-tool/global-progress-report).

Table A5.5

Global policy frameworks relevant to the promotion of optimal brain development in children and adolescents (non-exhaustive list)

Framework	Target/rationale	WHO reporting mechanism
Every Woman Every Newborn Everywhere (ENEWE)	ENEWE 2025 coverage targets (see Chapter 5, Figure 5.7)	Improving maternal and newborn health and survival and reducing stillbirth – progress report 2023 *(1)*.
Comprehensive implementation plan on maternal, infant and young child nutrition	Global nutrition targets 2025 (see Table A5.4)	Global Nutrition Targets Tracking Tool *(2)*.
Global alcohol action plan 2022–2030	Reduce harmful use of alcohol during pregnancy in order to reduce complications such as fetal alcohol spectrum disorder	Global status report on alcohol and health and treatment of substance use disorders (2024) *(3)*.
Global Strategy for Women's, Children's and Adolescents' Health 2016–2030	Promote adolescent access to the recommended interventions in the Global Strategy for Women's, Children's and Adolescents' Health, including in humanitarian and fragile settings	Protect the promise: 2022 progress report on the every woman every child global strategy for women's, children's and adolescents' health (2016–2030) *(4)*.
United Nations SDG Agenda	UN SDG 16.2: End abuse, exploitation, trafficking and all forms of violence and torture against children	Global status report on preventing violence against children 2020 *(5)*.
Global action plan on physical activity 2018–2030	Implement WHO guidelines on physical activity and sedentary behaviour, including the recommendations on recreational screen time	Global Status Report on Physical Activity 2022 *(6)*.
WHO Framework Convention on Tobacco Control	Reduce fetal exposure, childhood second-hand smoke exposure and adolescent smoking	2023 Global Progress Report on Implementation of the WHO Framework Convention on TobaccoControl *(7)*.

Table A5.6

Instruments for driving sustainable progress on the five action areas for brain health promotion and prevention of neurological disorders

Action areas	Relevant global policy mandates and frameworks (list non-exhaustive)	Relevant WHO guidelines and guidance (list non-exhaustive)
Promoting healthy behaviour across the life course	Global action plan for the prevention and control of NCDs 2013–2030 (NCD-GAP) Global alcohol action plan 2022–2030 Global action plan on physical activity 2018–2030 WHO Framework Convention on Tobacco Control Comprehensive implementation plan on maternal, infant and young child nutrition United Nations 2030 Agenda	Tackling NCDs: best buys and other recommended interventions for the prevention and control of noncommunicable diseases *(8)*. Guidelines on physical activity and sedentary behaviour *(9)*. Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age *(10)*. Guidelines on risk reduction of cognitive decline and dementia *(11)*. Essential nutrition actions: mainstreaming nutrition through the life-course *(12)*.
Infectious disease control	Global road map on defeating meningitis by 2030 WHO's road map for neglected tropical diseases 2021–2030 Global Health Sector Strategies (GHSS) on HIV, viral hepatitis and sexually transmitted infections 2022–2030 One Health joint plan of action (2022–2026): working together for the health of humans, animals, plants and the environment United Nations 2030 Agenda	Guidelines on meningitis diagnosis, treatment and care *(13)*. Guidelines on management of Taenia solium neurocysticercosis *(14)*. Guidance on preventing disease through healthy environments *(15)*. Toolkit for the care and support of people affected by complications associated with Zika virus *(16)*. Neurology and COVID-19: scientific brief *(17)*. Guidelines for malaria vector control *(18)*.
Preventing head/ spinal trauma and associated disabilities	Global Plan for the Decade of Action for Road Safety 2021-2030 Global strategy and action plan on ageing and health Global alcohol action plan 2022-2030 UN 2030 Agenda	Make Roads Safe: A New Priority for Sustainable Development. Commission for Global Road Safety *(19)*. Helmets: a road safety manual for decision-makers and practitioners *(20)*. The SAFER Initiative *(21)*. Step safely: strategies for preventing and managing falls across the life-course *(22)*. INSPIRE: Seven strategies for ending violence against children *(23)*. Rehabilitation in health systems: guide for action *(24)*.
Reducing environmental risks	The Paris Agreement The Strategic Approach to International Chemicals Management (SAICM) United Nations 2030 Agenda	Guidance on preventing disease through healthy environments *(15)*. Global air quality guidelines *(25)*. Guidelines for drinking-water quality *(26)*.

Action areas	Relevant global policy mandates and frameworks (list non-exhaustive)	Relevant WHO guidelines and guidance (list non-exhaustive)
Promoting optimal brain development in children and adolescents	Every newborn action plan to end preventable deaths (ENAP) Comprehensive implementation plan on maternal, infant and young child nutrition Nurturing care for early childhood development: a framework for helping children survive and thrive to transform health and human potential Global Strategy for Women's, Children's and Adolescents' Health 2016–2030 WHO Framework Convention on Tobacco Control Global alcohol action plan 2022–2030 United Nations 2030 Agenda	Global Scales for Early Development (GSED) *(27)*. Every Woman Every Newborn Everywhere (EWENE) *(28)*. Recommendations on postnatal care of the mother and newborn *(29)*. Improving early childhood development: WHO guideline *(30)*. Guidance on ending the inappropriate promotion of foods for infants and young children: implementation manual *(31)*. Guidelines on physical activity and sedentary behaviour *(9)*. Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age *(10)*. Guidelines on parenting interventions to prevent maltreatment and enhance parent–child relationships with children aged 0–17 years *(32)*. INSPIRE: Seven strategies for ending violence against children *(23)*.

Chapter 6
Research and health information system strengthening

Table A6.1

Breakdown of dedicated government funding allocated for research on neurological disorders/ brain health (number of countries) (2022)

	Brain health	Neurological disorders in general	Specific neurological disorders	Number of countries with any funding	Number of responding countries	Number of WHO Member States
Global	**14**	**13**	**12**	**28**	**102**	**194**
WHO region						
African Region	0	1	0	1	24	47
Region of the Americas	2	0	3	4	23	35
South-East Asia Region	2	2	0	2	4	11
European Region	7	8	6	15	28	53
Eastern Mediterranean Region	1	2	1	3	15	21
Western Pacific Region	2	0	2	3	8	27
World Bank income group						
Low-income	0	0	0	0	13	26
Lower-middle-income	2	2	1	4	22	50
Upper-middle-income	3	5	3	8	30	52
High-income	8	6	8	15	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A6.2

Neurological disorders for which core indicators are integrated into the health information system and routinely collected (number of countries) (2022)

	Stroke	Parkinson disease	Meningitis	Epilepsy	Headache disorders	Neurodevelopmental conditions	All six tracer conditions integrated	Number of responding countries	Number of WHO Member States
Global	**41**	**30**	**25**	**41**	**18**	**30**	**12**	**102**	**194**
WHO region									
African Region	13	7	12	16	6	9	4	24	47
Region of the Americas	4	4	2	5	2	5	1	23	35
South-East Asia Region	4	1	1	2	1	2	1	4	11
European Region	13	11	5	10	3	9	2	28	53
Eastern Mediterranean Region	6	5	4	7	5	4	3	15	21
Western Pacific Region	1	2	1	1	1	1	1	8	27
World Bank income group									
Low-income	7	5	7	9	4	5	2	13	26
Lower-middle-income	9	4	4	10	3	5	2	22	50
Upper-middle-income	11	8	8	12	6	10	4	30	52
High-income	13	13	6	10	5	9	4	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A6.3

Disaggregation of indicators for neurological disorders in health information systems (number of countries) (2022)

	By ICD code	By sex	By age	Across all dimensions	Number of responding countries	Number of WHO Member States
Global	**41**	**45**	**42**	**32**	**102**	**194**
WHO region						
African Region	7	10	10	4	24	47
Region of the Americas	8	7	6	6	23	35
South-East Asia Region	3	4	4	3	4	11
European Region	13	14	14	13	28	53
Eastern Mediterranean Region	7	8	7	5	15	21
Western Pacific Region	3	2	1	1	8	27
World Bank income group						
Low-income	3	6	7	3	13	26
Lower-middle-income	6	10	8	4	22	50
Upper-middle-income	14	11	11	10	30	52
High-income	17	17	15	14	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A6.4

Neurological disorders for which data have been compiled and reported (number of countries) (2022)

	Stroke	Parkinson disease	Meningitis	Epilepsy	Headache disorders	Neurodevelopmental conditions	All six tracer conditions	Number of participating countries	Number of WHO Member States
Global	**48**	**32**	**30**	**47**	**23**	**27**	**13**	**102**	**194**
WHO region									
African Region	10	4	9	12	5	7	2	24	47
Region of the Americas	9	8	7	11	5	7	3	23	35
South-East Asia Region	3	1	1	3	1	1	1	4	11
European Region	17	12	6	12	5	7	3	28	53
Eastern Mediterranean Region	4	4	4	4	3	2	2	15	21
Western Pacific Region	5	3	3	5	4	3	2	8	27
World Bank income group									
Low-income	4	3	4	6	3	3	0	13	26
Lower-middle-income	8	3	6	10	1	5	1	22	50
Upper-middle-income	17	13	13	19	11	11	8	30	52
High-income	18	13	7	11	7	8	4	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Chapter 7

Strengthening the public health approach to epilepsy

Table A7.1

IGAP global target 5.2: Existing legislation promoting and protecting the human rights of people with epilepsy (number of countries) (2022)

	Countries that have developed or updated relevant existing legislation (global target 5.2_A)	Countries with relevant existing legislation + reported compliance with at least one legal provision (global target 5.2_B)	Number of responding countries	Number of WHO Member States
Global	**49**	**38**	**102**	**194**
WHO region				
African Region	11	7	24	47
Region of the Americas	8	8	23	35
South-East Asia Region	2	1	4	11
European Region	16	14	28	53
Eastern Mediterranean Region	6	4	15	21
Western Pacific Region	6	4	8	27
World Bank income group				
Low-income	3	2	13	26
Lower-middle-income	8	5	22	50
Upper-middle-income	17	14	30	52
High-income	20	16	35	63

Global target 5.2_A: Existence of legislation protecting the rights of people with epilepsy.

Global target 5.2_B: Existence of legislation protecting the rights of people with epilepsy + reported compliance with at least one of seven legal provisions – i.e. 1) laws against coercive practices and involuntary admission and treatment; 2) right to legal capacity on an equal basis with others; 3) safeguards against discrimination, violence, exploitation, abuse and other human rights violations; 4) provision of a full range of services and supports to live and be included in the community; 5) provisions for reasonable accommodations ensuring equal rights within the workplace and in employment; 6) equal opportunities in education, marriage, health, employment, housing, transport services, social support/benefits; and 7) participation in design, development, implementation and evaluation of policies, legislation, services and research.

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A7.2

Type of legislation promoting and protecting the rights of people with epilepsy (number of countries) (2022)

	None	Covered by general legislation	Covered by epilepsy-specific legislation	No data provided	Number of responding countries	Number of WHO Member States
Global	**49**	**45**	**4**	**4**	**102**	**194**
WHO region						
African Region	13	11	0	0	24	47
Region of the Americas	13	6	2	2	23	35
South-East Asia Region	2	2	0	0	4	11
European Region	10	16	0	2	28	53
Eastern Mediterranean Region	9	4	2	0	15	21
Western Pacific Region	2	6	0	0	8	27
World Bank income group						
Low-income	10	3	0	0	13	26
Lower-middle-income	13	8	0	1	22	50
Upper-middle-income	13	15	2	0	30	52
High-income	12	18	2	3	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

Table A7.3

Types of legal provisions included in the legislation (number of countries) (2022)

	Laws against coercive practices and involuntary admission and treatment	Right to legal capacity on an equal basis with others	Safeguards against discrimination, violence, exploitation, abuse, and other human rights violations	Provision of a full range of services and supports to live and be included in the community	Provisions for reasonable accommodations ensuring equal rights within the workplace and in employment	Equal opportunities in education, marriage, health, employment, housing, transport services, social support/ benefits	Participation in design, development, implementation, and evaluation of policies, legislation, services and research	Number of countries with existing legislation	Number of responding countries	Number of WHO Member States
Global	**34**	**36**	**38**	**29**	**31**	**34**	**23**	**49**	**102**	**194**
WHO region										
African Region	7	7	8	7	6	7	7	11	24	47
Region of the Americas	6	8	8	5	7	7	5	8	23	35
South-East Asia Region	0	1	0	1	0	2	1	2	4	11
European Region	13	14	14	11	13	12	6	16	28	53
Eastern Mediterranean Region	4	4	4	2	2	2	2	6	15	21
Western Pacific Region	4	2	4	3	3	4	2	6	8	27
World Bank income group										
Low-income	2	2	2	2	1	2	2	3	13	26
Lower-middle-income	5	5	5	4	4	5	4	8	22	50
Upper-middle-income	11	14	14	12	13	13	12	17	30	52
High-income	15	15	16	10	13	13	5	20	35	63

Note that numbers reported by World Bank income classification do not necessarily add up to 100% as some information was missing.

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