The Global Asthma Report 2018

Global Asthma Network

Asthma affects 339 million people.*

*For explanation see Chapter 3 "How many people have asthma?"

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www.globalasthmanetwork.org

Global Asthma Network

The Global Asthma Report 2018

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Foreword

The year 2018 is an important milestone in highlighting the importance of the Sustainable Development Goals (SDG), especially SDG Goal 3: Ensure healthy lives and promote well-being for all at all ages. While it is well understood that non-communicable diseases (NCDs), including cardiovascular diseases, cancers, diabetes and chronic respiratory diseases (CRDs), are the biggest killers today, countries are struggling to reduce premature mortality from NCDs by one third by the year 2030. The UN High Level Meeting on NCDs in September 2018 will be an important opportunity for Heads of States and Governments, Ministers of Health, Civil Society and the donor community to act on their SDG commitments and to scale up cost-effective interventions to reduce the burden of NCDs, including asthma, globally.

CRDs affect more than 1 billion people worldwide, and asthma is a large contributor, affecting children, adults and the elderly, often throughout their entire lives. Capacity for CRD management, such as spirometry and steroid inhalers, are not generally available in primary health care in public health services.

This Global Asthma Report 2018 highlights all the major issues related to prevention and management of asthma, including access to essential medicines. It is an excellent tool for advocacy purposes in all countries suggesting concrete actions for all stakeholders.

I would like to congratulate the Global Asthma Network for putting this impressive report together and I am looking forward to the Global Asthma Network's future contributions in data collection, surveillance and educational activities.

For all those working towards implementation of the WHO Global Action Plan on NCDs, this report will be a key companion as a reminder of the pressing issues related to asthma.

I am sure that this report will be widely used in all countries and will ultimately contribute to a reduction in the global burden of asthma.

Cherian Varghese
World Health Organization
Coordinator, Management of Noncommunicable Diseases

Preface

Asthma is one of the common non-communicable diseases (NCDs). It affects around 339 million people in all regions of the world (Appendix A). It causes a high global burden of death and disability, with around 1000 people dying each day from asthma, and is in the top 20 causes of years of life lived with disability. Yet many people, especially in low- and middle-income countries (LMICs), are unable to access the quality-assured essential asthma medicines and care they need.

The United Nations (UN) has included asthma in all its NCD deliberations, with three High Level Meetings to date (2011, 2014, 2018). The UN General Assembly in 2011 made a political declaration on the prevention and control of NCDs, focussing world attention on the increasing threat of these diseases to global health, social welfare and economic development, especially in LMICs.

In 2015 the UN created the 2030 Agenda for Sustainable Development, aiming to transform our world, with 17 Sustainable Development Goals (SDGs) and 169 targets. Among the SDGs, Goal 3 "ensure healthy lives and promote well-being for all at all ages" specifically addresses health priorities. Several targets and indicators address issues related to reducing the global burden of asthma.

The Global Asthma Report 2018 has been prepared by the Global Asthma Network (GAN) to give a state-of-the-art analysis of asthma in the world, in the context of the UN's leadership. Authors include GAN Steering Group members and invited authors with additional expertise from many countries around the world.

Designed for the UN, the World Health Organization (WHO), government ministers, policy-makers, health authorities, health professionals, professional societies, patient organisations, asthma support organisations, industry, funders, and people living with asthma, this report gives an update of what is known about the global burden of asthma and where the gaps lie. It makes recommendations to authorities on required actions, especially management and care of asthma and capacity building, and ways of making asthma a global priority.

It is encouraging to see that recognition of asthma as a global problem has increased since the first Global Asthma Report 2011 was published by The International Union Against Tuberculosis and Lung Disease (The Union) and the International Study of Asthma and Allergies in Childhood (ISAAC); and the second Global Asthma Report 2014 published by GAN. The Forum of International Respiratory Societies published its second major report in 2017 "The Global Impact of Respiratory Disease". It calls for respiratory health in the world to be a top priority in global decision-making, and highlights asthma as one of the five most important respiratory diseases in the world.

All these activities, concerns, developments and knowledge have informed the contents of the Global Asthma Report 2018 and its recommendations. We hope you will find it useful. We will continue to work together to increase the worldwide understanding of this disease, and to reduce the burden and suffering from asthma, over the next few years.

Innes Asher
Chair
The Global Asthma Network

Executive Summary

The purpose of this report

The Global Asthma Report 2018 is the third such report prepared by the Global Asthma Network (GAN). GAN builds upon the work of the International Study of Asthma and Allergies in Childhood (ISAAC) and The International Union Against Tuberculosis and Lung Disease (The Union) to monitor asthma and improve asthma care, particularly in low- and middle-income countries (LMICs).

This report brings together in one document an up to date account on where the major gaps lie in asthma information and management. It is intended to influence those in authority to act promptly and wisely to reduce the global burden of asthma.

Asthma remains a worldwide health problem

Asthma is a common chronic disease that is estimated to affect as many as 339 million people worldwide. It is a cause of substantial burden of disease, including both premature death and reduced quality of life, in people of all ages in all parts of the world. Globally, asthma is ranked 16th among the leading causes of years lived with disability and 28th among the leading causes of burden of disease, as measured by disability adjusted life years (DALYs).

Asthma continues to be a major source of global economic burden in terms of both direct and indirect costs. Strategies to improve access and adherence to evidence-based therapies can be effective in reducing the economic burden of asthma in both developed and developing countries.

Global trends in the burden of asthma are poorly documented

Establishing the proportion of the population who have asthma (that is, the prevalence of asthma), and comparing this prevalence between countries, requires the use of standardised measures implemented in large-scale, global surveys. The last such surveys were about 15 years ago. GAN is currently collecting new information on global asthma prevalence, severity, management and risk factors in children and adults.

Hospital admissions for asthma are an indirect indicator of the burden of more severe asthma, and the efficacy of care. Large reductions in asthma admission rates have occurred over the last decade in several higher income countries. Currently, routinely collected asthma admissions information is almost entirely restricted to high-income countries, limiting the value of admission rates for surveillance of the global burden of asthma.

Deaths due to asthma are of serious concern because many of them are preventable. Although asthma mortality rates have fallen in many countries over the last decade, avoidable asthma deaths are still occurring due to inappropriate management of asthma, including over-reliance on reliever medication, rather than preventer medication, and this needs to be rectified.

Effective treatments for asthma are often unavailable or unaffordable

Many governments have overlooked asthma in their plans to address non-communicable diseases (NCDs) and have

made little progress in improving access to asthma management and medicines, especially the inhaled corticosteroids crucial for the long-term control of asthma.

Inhaled therapy is essential for treatment of acute and chronic asthma, and the metered dose inhaler with a spacer is the optimal delivery system in children. Proper modification of a low cost 500ml plastic bottle creates an effective spacer, with the neck of the bottle held in the mouth. For a young child a mask should be attached to the bottle neck.

In many countries, essential asthma medicines are unavailable, unaffordable, or are of unreliable quality, resulting in unnecessary burden and mortality from asthma. Patients are dying of asthma in low-income countries from lack of effective management. Prompt action is needed from leaders (governments, development partners and technical organisations) to address this and achieve more success stories.

Asthma as a national policy issue: examples from around the world

Africa: Profiles from Benin, Ghana, Kenya, Nigeria, South Africa and Sudan show that asthma is a large problem. Unmet needs should be addressed by comprehensively applying asthma Standard Case Management and improving access to affordable quality-assured essential asthma medicines.

Asia and India: Profiles from China, India, Indonesia, Malaysia and Thailand indicate that the burden of asthma is substantial, but asthma remains underdiagnosed and undertreated. Many asthma patients are not using inhaled corticosteroids, mainly because these medicines are either inaccessible or unaffordable. To improve asthma care, implementation of asthma guidelines should be strengthened.

Latin America: Profiles from Argentina, Brazil, Chile, Colombia and Mexico demonstrate important advances in asthma care, but to improve asthma care from infancy to late adulthood there are continuing needs for: implementation of national asthma programmes with up-to-date public registries, universal access to essential asthma medicines, and education on asthma for parents, patients and health personnel.

Asthma is a global priority requiring global action

Asthma is one of the most significant NCDs. Two of the five interventions adopted by the World Health Organization (WHO) to tackle NCDs – tobacco control, and essential medicines and technologies – will directly reduce the worldwide burden of asthma. A third priority aimed at reducing obesity – improved diets and physical activity – is likely to be beneficial for asthma.

The focus of the United Nations (UN) 2030 Strategic Development Goals on mortality alone does not capture morbidity and the imperative to reduce the worldwide burden of asthma. Economic prosperity will be helped by correctly treating asthma, especially in LMICs.

Policies are needed to enable access to affordable, good quality medical care and quality-assured asthma medicines for all people with asthma worldwide. Patient advocacy can ensure integration of patient viewpoints into planning and policy decisions.

Asthma monitoring needs to be ongoing and widespread. Nearly half of the world's countries have never studied the prevalence of asthma. For many of the remainder, the latest available information on the prevalence and severity of asthma is about 15 years old.

Asthma is a major but remediable global health problem. We call upon world leaders to action the recommendations in this report, which are summarised on the following pages.

Key Recommendations

The World Health Organization (WHO) should

- ensure that asthma and other chronic respiratory diseases are included as a priority in the outcome document of the 2018 United Nations (UN) High Level Meeting on non-communicable diseases (NCDs);
- develop and disseminate training manuals for asthma management for low-and middle-income countries (LMICs);
- ensure essential asthma medicines are added to its Prequalification Programme;
- promote the harmonisation, across international reference pharmacopoeias, of quality requirements that govern the production and testing of asthma medicines;
- facilitate the development of independent laboratories for the testing of generic products that are not already approved by a stringent regulatory authority or relevant global mechanism.

Governments should

- include asthma in all their actions resulting from the WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020, and the WHO NCD Global Monitoring Framework;
- ensure their country has a coordinated national strategy towards better measurement of the true burden of asthma, improving access to care and improving adherence to asthma management strategies;
- aim to achieve the UN Strategic Development Goal 3: "ensure healthy lives and promote well-being for all at all ages" to lessen the burden of asthma;
- ensure that essential asthma medicines are on their country's Essential Medicines List and ensure that they are free, subsidised or reimbursed;
- develop and implement insurance schemes which will

allow patients to access and buy asthma medicines;

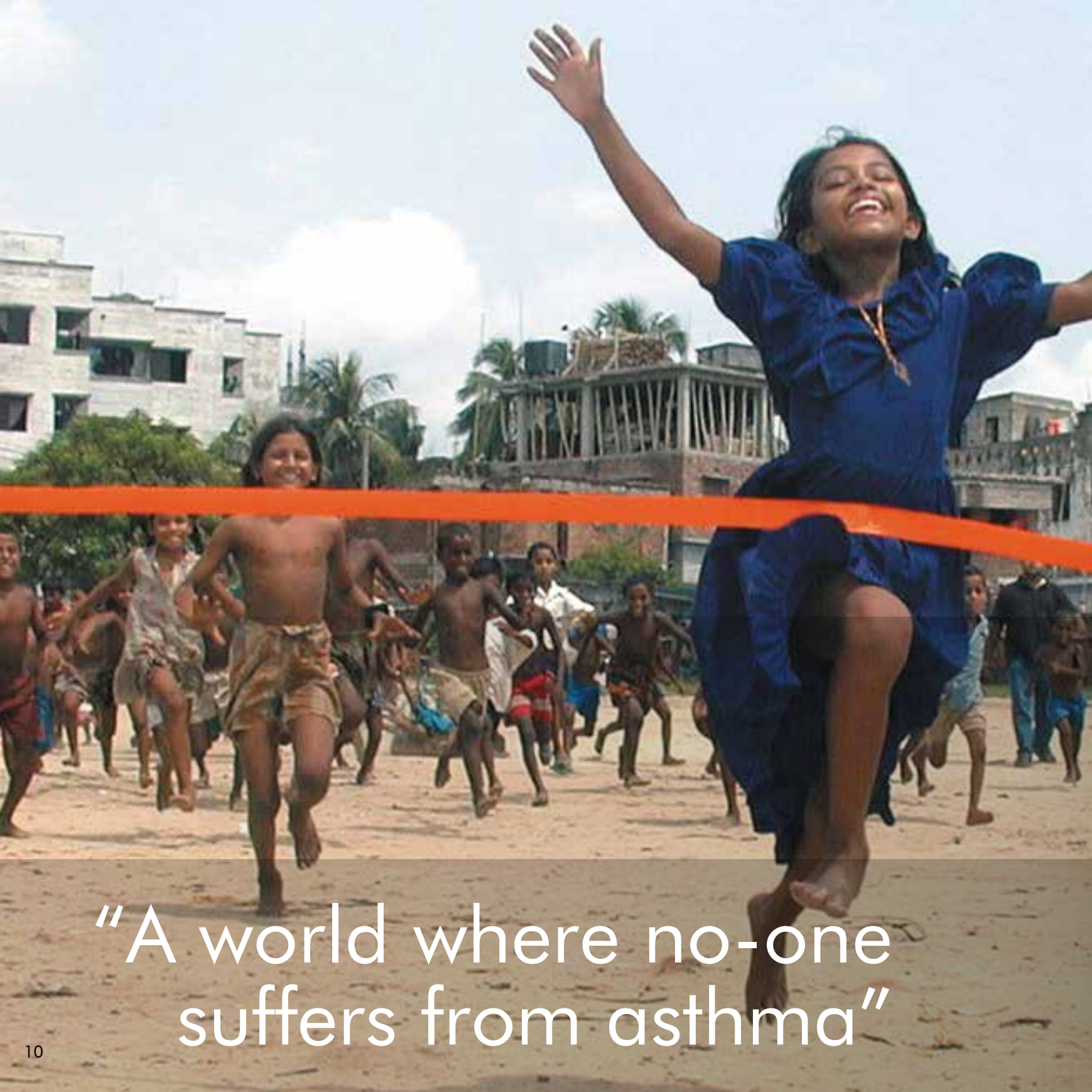
- strengthen their national policies, such as those to reduce tobacco consumption, encourage healthy eating and reduce exposure to potentially harmful chemicals, smoke and dust;
- support further research into known asthma triggers and identifying the causes of asthma;
- commit to research that increases the understanding of asthma, its causes, its costs, and lead to improvements in management;
- support the acquisition of new standardised data to track the country and global burden of asthma.

Health authorities should

- collect counts of hospital admissions for asthma among children and adults from defined catchment populations, to monitor trends in asthma over time;
- report national rates of asthma deaths in children and adults to monitor progress in asthma care, and as an early warning of epidemics of fatal asthma;
- monitor the availability and costs of asthma medicines;
- develop new ways to target and deliver asthma care in diverse health systems and contexts, and assess their cost-effectiveness, affordability and feasibility;
- in LMICs recognise asthma as an important public health issue, include asthma in all their actions and set up a national programme to improve asthma care and limit costs.

Health professionals, professional societies and patient organisations should

- encourage patient advocacy to improve asthma outcomes;
- support the government in developing asthma guidelines which are adapted to the national situation;
- actively participate in improving asthma programmes by assisting in improving correct inhaler technique and adherence to treatment;
- ensure that their country joins the Global Asthma Network.



"A world where no-one suffers from asthma"

THE GLOBAL ASTHMA NETWORK

1. Global Asthma Network

Innes Asher, Nils Billo, Karen Bissell, Chiang Chen-Yuan, Philippa Ellwood, Asma El Sony, Luis García-Marcos, Guy Marks, Neil Pearce, David Strachan

The Global Asthma Network (GAN) aims to reduce the global suffering from asthma by preventing asthma and improving asthma care with a focus on low- and middle-income countries (LMICs). GAN activities include surveillance of asthma, research, and capacity building; improving access to effective asthma management, particularly affordable quality-assured essential asthma medicines; and advocating for asthma to be high on the non-communicable disease (NCD) and public health agendas (Table). GAN builds on the work of the International Study of Asthma and Allergies in Childhood (ISAAC) and The International Union Against Tuberculosis and Lung Disease (The Union).

Global Asthma Network Phase I Surveillance data collected in 2017 to 2019 will provide new information on global asthma prevalence, severity, management and risk factors in children and adults.

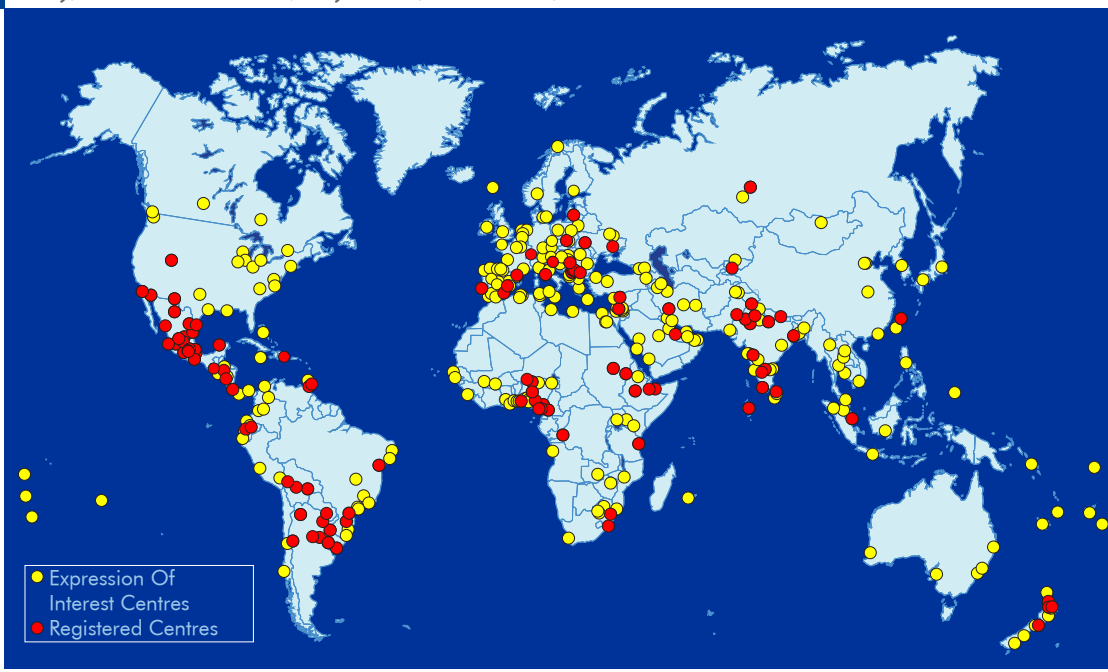


Figure: Global Asthma Network Centres at June 2018.

What does GAN do?

Established in 2012, GAN plays a crucial role in collecting standardised asthma data on adults and children globally. In this regard, GAN is filling an important gap. The last global asthma surveys were ISAAC in children (2002-3) and the World Health Survey in adults (2002-4). The present GAN survey began in 2017. By June 2018, there were 353 centres in 135 countries involved in some way in GAN, with 127 centres in 53 countries registered to undertake GAN Phase I (Figure) and identified on the GAN website (www.globalasthmanetwork.org). GAN is operating on the ISAAC principles of collaborative and systematic application of standardised methodologies suitable for use in all settings in the world, and has added to the ISAAC approach by studying asthma in adults as well as children. A 10-member international Steering Group (the authors of this chapter) leads GAN and is responsible for developing and overseeing the GAN work programme, including GAN advocacy activities. The GAN Global Centre is located in Auckland, New Zealand. It takes a lead in co-ordinating global surveys, conducting methodology checks, overseeing publications, and maintaining the GAN website. GAN also published the Global Asthma Report 2014, distributed to 2500 recipients, with approximately 75,000 downloads of the report from the website.

Partnerships

Partnerships for global asthma work are important for GAN. It has established communication with worldwide organisations concerned with respiratory health and NCDs. The WHO acknowledged

GAN's work with the 2017 appointment of the Chair of GAN (Innes Asher) to the inaugural WHO Expert Panel on NCDs as a Chronic Respiratory Diseases expert. GAN is a member of the Global Alliance against Chronic Respiratory Diseases (GARD). In 2017, GAN was one of several partners in two successful grants, involving 18 organisations in 11 countries directed by the Liverpool School of Tropical Medicine (Bertie Squire and Kevin Mortimer), aiming to improve lung health (including asthma) and tuberculosis (TB) outcomes in Africa.

GAN Phase I

GAN Phase I (Asthma Global Surveillance: Prevalence, Severity, Management and Risk Factors) is underway. The GAN Phase I Co-ordinator is Neil Pearce, who also leads the Phase I Data Centre in London (United Kingdom); Luis García-Marcos leads the Phase I Data Centre, in Murcia (Spain). GAN Phase I will assess time trends in asthma prevalence, severity and risk factors in centres that participated in ISAAC Phase Three and will include new centres. Participant recruitment is in schools, with schools selected at random within a specified geographical area. Two age groups of school children are involved (13-14 year olds [compulsory age group] and 6-7 year olds [optional age group]), as well as parents/caregivers of each age group [optional group]. Participants complete written questionnaires, developed from the ISAAC Phase Three questionnaire with additional questions on asthma management and the environment. For the adolescents, a non-spoken video questionnaire is available for optional use. A sample size of 3000 per age group per centre is sought to give sufficient power to detect differences in the severity of asthma. Tools enabling centres to follow and use the methodology are available on the GAN website.

Conclusion

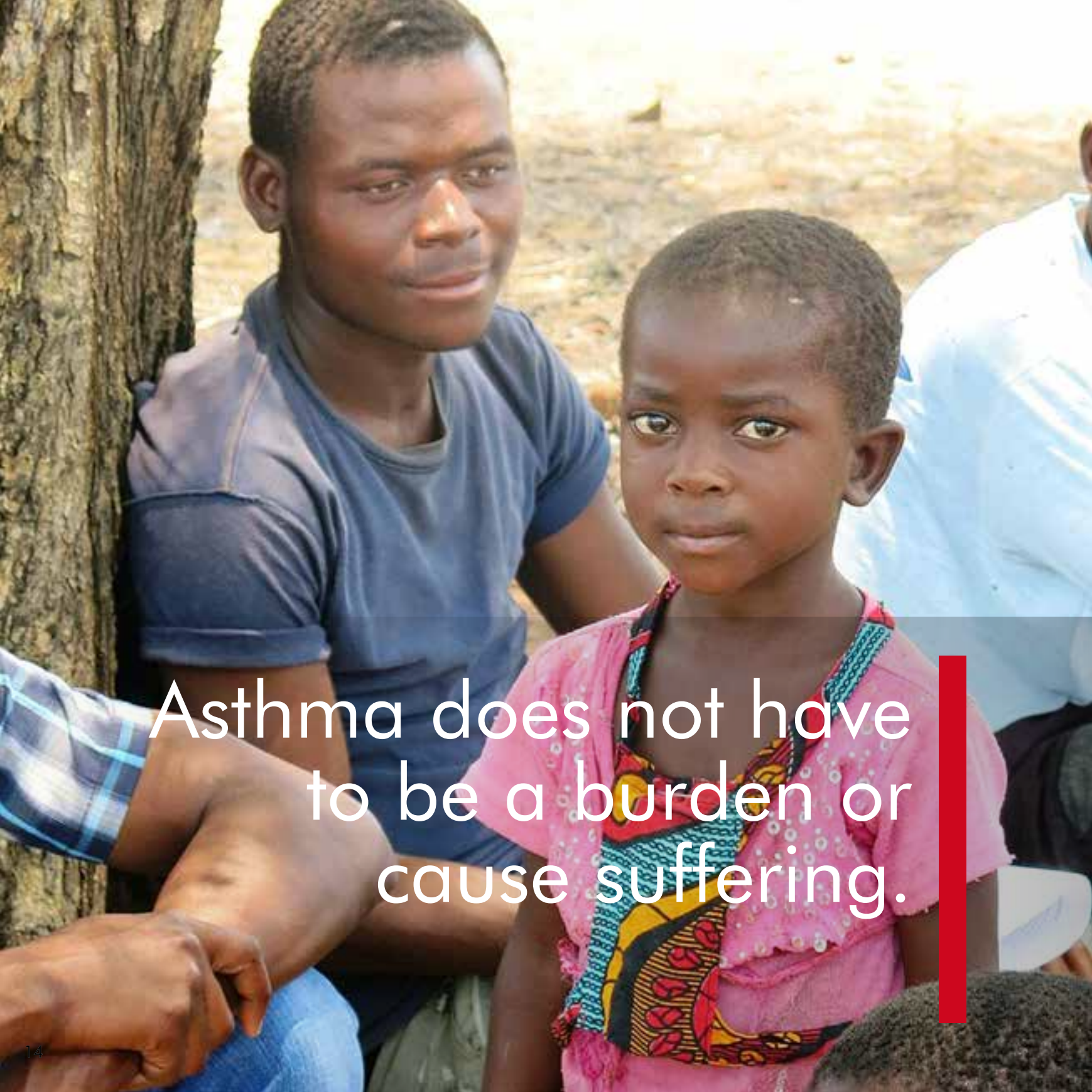
GAN Phase I is the only global population-based study of asthma conducted since 2003 (ISAAC Phase Three) and will contribute new information on adults and children. GAN will build on the ISAAC findings by collecting new information on asthma prevalence, severity, diagnoses, emergency room visits, hospital admissions, management, and use of essential asthma medicines. GAN aims to provide further evidence to improve recognition of asthma as an important NCD and to understand how to reduce global asthma burden.

Table: Aspirations of the Global Asthma Network.

Strive for a world where no-one suffers from asthma.
Be the asthma surveillance hub for the world.
Raise the profile of asthma as a non-communicable disease.
Stimulate and encourage capacity building in low- and middle-income countries.
Promote access to appropriate management of asthma.
Research ways of reducing the burden of asthma.

Key Recommendation

Health professionals, professional societies and patient organisations in all countries should ensure that their country joins the Global Asthma Network.


Asthma does not have
to be a burden or
cause suffering.

PART ONE:

THE BURDEN OF ASTHMA

2. What is asthma?

Innes Asher, Neil Pearce, David Strachan, Nils Billo, Karen Bissell, Chiang Chen-Yuan, Philippa Ellwood, Asma El Sony, Luis García-Marcos, Guy Marks

Although physicians first recognised asthma over 1800 years ago, its definition has evolved over the last three decades as our understanding of underlying pathophysiology and different clinical presentations has developed.

Although many causes and biological mechanisms may lead to asthma, the use of this term as a clinical diagnosis is useful in the majority of patients because it will open the door to appropriate management to reduce disease burden.

History

The first written description of an asthma attack was by a Greek physician Aretaeus of Cappadocia in the second century of the Common Era. The word "asthma" comes from a Greek word "aazein" meaning "panting", but ancient Egyptian, Hebrew, Indian and other medical writings also refer to asthma.

During the 20th century, researchers thought that constriction of airway smooth muscle and excessive sensitivity of the airway to external stimuli (hyper-responsiveness) was the key feature of asthma. In the 1980s, it was recognised that airway inflammation was a cardinal feature, with structural changes in the airway (remodelling) present early in the development of disease.

Asthma remains one of the most important non-communicable diseases (NCDs). It is a cause of substantial disability and death worldwide. As such, asthma requires global attention and commitment to lessen its burden.

Defining asthma

The definition and classification of asthma has been the subject of controversy for several decades. The Global Initiative for Asthma (GINA) describes asthma as "a heterogeneous disease, usually characterised by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation". Although not strictly a definition, this description captures the essential features for clinical purposes.

For population-based studies, where doctor diagnosis is not practicable, questionnaires are the tool of choice. Questions about more recent symptoms (in the past 12 months) are more reliable than questions about symptoms in the past, because they reduce errors of recall. The

most commonly used standard question is "Have you [has your child] had wheezing or whistling in the chest in the past 12 months?"; when the answer is 'yes', the term 'current wheeze' is commonly used, or 'current asthma symptoms'. However, asthma can cause other respiratory symptoms (Table).

A recent Lancet Commission has suggested a range of new ways of thinking about asthma, its mechanisms and its treatment, challenging conventional concepts of asthma as a single disease and proposing a more targeted approach. Notwithstanding these novel ideas, it remains clear that most people with asthma symptoms improve with asthma medicines, yet many lack access to these treatments (Chapter 10).

The use of the term asthma as a clinical diagnosis is still useful in most patients because it opens the door to appropriate management to reduce disease burden (Chapter 11). In low- and middle-income countries (LMICs), where most of the people

with asthma live, this basic asthma care is often non-existent or out of reach.

Asthma medicines

There are two key asthma treatments: (i) bronchodilators (most commonly β_2-agonists) that reverse airway narrowing by relaxing airway smooth muscle, and (ii) corticosteroids, which treat the underlying airway inflammation; inhaled corticosteroids (ICS) are known as preventers (called "controllers" by GINA). The inhaled route, with the use of a spacer, is the best way to administer both of these classes of medicines (Chapter 9). Inhalation is more effective and has fewer side effects than the oral route.

Acute asthma symptoms require short-acting β_2-agonists (SABA). ICS are the first line asthma preventer for those with frequent or persistent symptoms. Most people diagnosed with asthma respond well to these forms of treatment, thus they are "asthma essential medicines" (Chapter 10).

Recently the World Health Organization (WHO) added an ICS/long-acting β_2-agonist (LABA) combination to its Essential Medicines List. Asthma management guidelines specify using ICS/LABA medicines to control persistent or difficult-to-treat asthma. Moreover recent research suggests their role in asthma treatment is likely to expand.

Is asthma an allergic disease?

Asthma is often described as an allergic disease in which allergens (such as pollens, mites or cockroaches) or certain workplace exposures can trigger attacks of airway narrowing and, through continued exposure, lead to airway inflammation and enhanced airway responsiveness. However, this paradigm came from observations predominantly in western high-income countries, and the association between allergy and asthma is much weaker in LMICs. Some occupational causes of asthma do not appear to involve allergy. It is now widely recognised that allergic mechanisms are involved in half, or less, of the people with asthma. In many people, asthma probably involves non-allergic inflammation of the airways, although we do not understand well the mechanisms involved.

Course of asthma over the lifespan

It is not possible to define a single natural history for asthma and it can develop at any stage in life, including adulthood. However, asthma symptoms most commonly develop for the first time in early childhood. Young children of pre-school age often wheeze with viral infection, but only about half of them go on to have characteristic asthma at school age. Children who have frequent or persistent wheeze are more likely to have evidence of airway inflammation and remodelling, impaired lung function, and persistently troublesome symptoms into adulthood. Recent reports raise the possibility that childhood asthma, persisting into adulthood, may predispose people to chronic obstructive pulmonary disease (COPD).

Table: Asthma symptoms and components.

THE SYMPTOMS OF ASTHMA:	THREE COMPONENTS USED TO DEFINE ASTHMA:
• wheezing • breathlessness • chest tightness • cough • sputum production	• chronic airway inflammation • reversible airflow obstruction • enhanced bronchial reactivity

Key Recommendation

Governments should commit to research that increases the understanding of asthma, its causes, and leads to improvements in management.

Conclusion

The definition and understanding of asthma has developed since the 1980s, with new ways of thinking about asthma recently proposed. It is vital that asthma essential medicines of proven benefit are accessible for all people who have asthma symptoms. At the same time, commitment to research that increases the understanding of asthma and its causes, and leads to improvements in asthma management are essential.

3. Global Burden of Disease due to Asthma

Guy Marks, Neil Pearce, David Strachan, Innes Asher, Philippa Ellwood

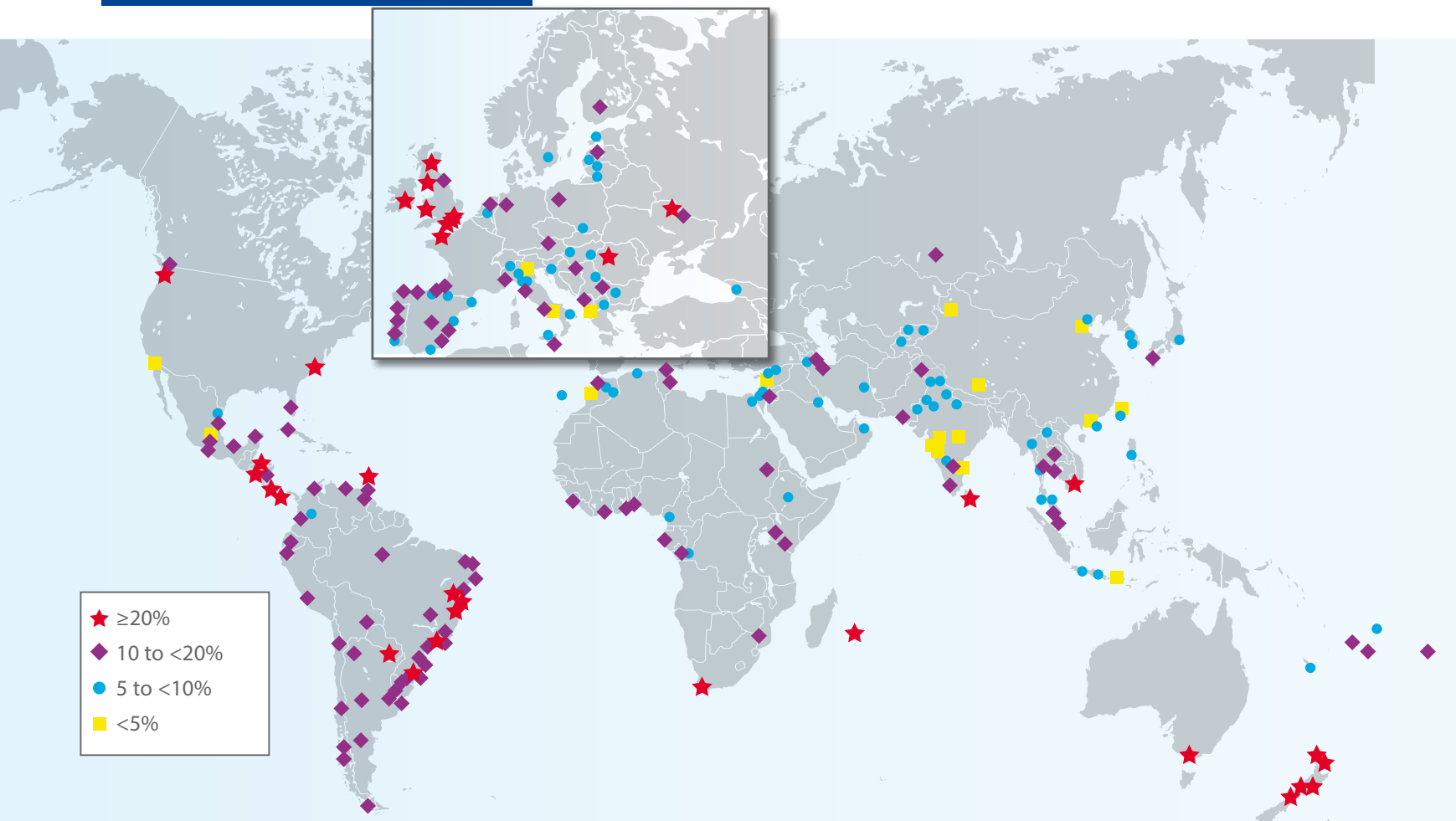


Figure 1: Prevalence of asthma symptoms among 13-14 year olds (ISAAC).

Source: Lai CKW, et al. Thorax 2009.

Asthma is a common chronic disease that affects people of all ages in all parts of the world. It is a cause of substantial burden of disease, including both premature death and reduced quality of life in people of all ages.

How many people have asthma?

Establishing the proportion of the population who have asthma (that is, the prevalence of asthma), and comparing this prevalence between countries, requires the use of standardised measures implemented in large-scale, global surveys. Fortunately, we have this information from separate surveys of asthma in adults and children, but the last surveys were about 15 years ago. Questionnaires were used to measure asthma prevalence in these surveys. Although this method has some limitations as an accurate way of identifying the presence of asthma in individuals, it provides reasonable estimates of prevalence in populations and has the advantage of being feasible for large-scale surveys.

The International Study of Asthma and Allergies in Childhood (ISAAC) surveyed a representative sample of 798,685 adolescents aged 13-14 years in 233 centres in 97

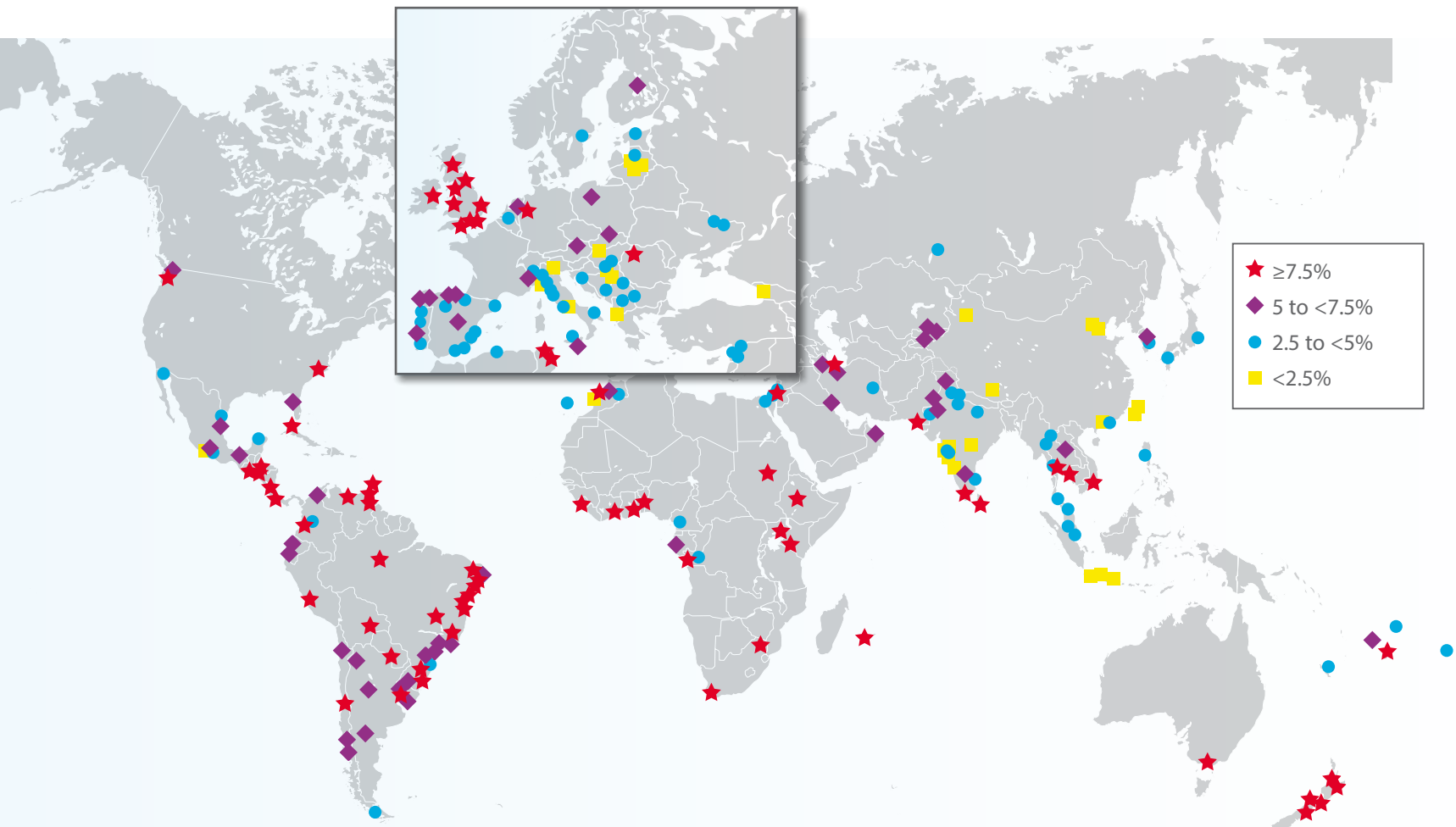


Figure 2: Prevalence of severe asthma among 13-14 year olds (ISAAC).

Source: Lai CKW, et al. Thorax 2009.

countries between 2000 and 2003. In ISAAC these adolescents were asked whether they had experienced wheeze, a symptom that is commonly attributable to asthma, in the preceding 12 months. The crucial finding was that the prevalence of recent wheeze varied widely between countries and between centres within countries (Figure 1). The highest prevalence (≥20%) was generally observed in English-speaking countries of Australasia, Europe and North America, and in parts of Latin America. The lowest prevalence (<5%) was observed in the Indian subcontinent, Asia-Pacific, Eastern Mediterranean, and Northern and Eastern Europe.

In this same survey, the prevalence of symptoms of severe asthma in the preceding 12 months (four or more attacks of wheeze, waking at night with asthma symptoms one or more times per week, and/or any episodes of wheeze severe enough to limit the ability to speak) also varied substantially, but was ≥7.5% in many centres (Figure 2).

Globally, asthma is ranked 16th among the leading causes of years lived with disability and 28th among the leading causes of burden of disease.

The prevalence of asthma in younger adults, aged 18-45 years, was estimated using data from the World Health Survey conducted by the World Health Organization (WHO) about the same time as ISAAC (2002-2003), in 177,496 adults living in 70 countries. As observed in children, the overall prevalence of asthma varied widely in younger adults. Overall, 4.3% of the global population in this age group reported a doctor's diagnosis of asthma, 4.5% reported either a doctor's diagnosis or that they were taking treatment for asthma, and 8.6% reported that they had experienced attacks of wheezing or whistling breath (symptoms of asthma) in the preceding 12 months (Figure 3). Australia, Northern and Western Europe, and Brazil had the highest prevalence.

The Global Asthma Network (GAN) is continuing the work of ISAAC. GAN Phase I (Chapter 1), based on the ISAAC methodology, will provide new data on asthma prevalence and severity in children (6-7 years), adolescents (13-14 years) and adults (parents or caregivers) around the world, and GAN expects to report their findings by 2020.

Researchers know much less about the prevalence of asthma in middle-aged and older adults including the elderly. This reflects both a paucity of survey data and the greater difficulty of distinguishing asthma from other respiratory conditions, such as chronic obstructive pulmonary disease (COPD), in older age groups. In 2016, the Global Burden of Disease (GBD) study estimated that there were 339.4 million people worldwide affected by asthma. This represents a 3.6% increase in age-standardised prevalence since 2006.

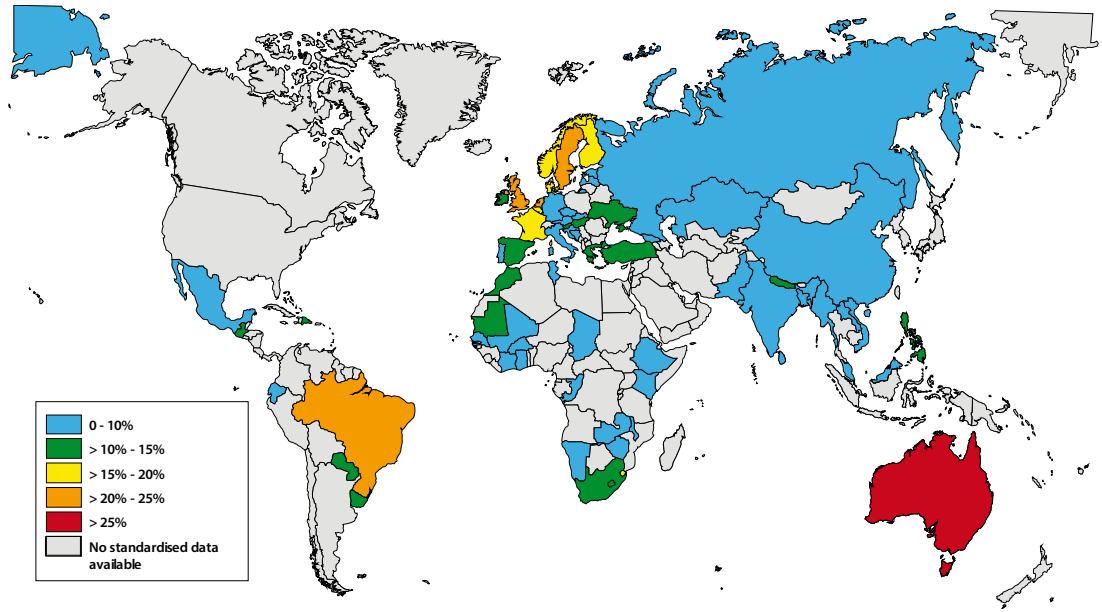


Figure 3: Prevalence of symptoms of asthma in the past 12 months among persons aged 18 to 45 years in 70 countries, World Health Survey 2002-2003. Source: To T, et al. BMC Public Health 2012.

What is the impact of asthma on disability and premature death?

Burden of disease is a measure of health loss attributable to specific diseases. The GBD study has used mortality statistics and health survey data, where available, to estimate, for many countries of the world, two components of disease burden: Years of Life Lost due to premature death (YLL) and Years of Life lived with Disability (YLD). The latter quantifies both the extent of disability and its duration. Disability Adjusted Life Years (DALYs) are the sum of YLL and YLD. The GBD study publishes new analyses every few years and the 2016 findings are the basis of the estimates cited below.

In 2016, asthma, across all ages, contributed 23.7 million DALYs globally. This total burden of disease has remained unchanged since 1990, despite the substantial increase in world population over that time. Hence, the age-standardised rate (329·2 DALYs per 100,000 population in 2016) has decreased by 36% since 1990. Globally, asthma ranked 28th among the leading causes of burden of disease and 27th in low- and middle-income countries (LMICs).

More than half (56%) of the global burden attributable to asthma was due to 13.2 million YLD. This represents a small (3.0%) increase in the age-standardised rate of YLD due to asthma since 2006. In 2016, asthma ranked 16th in the leading causes of YLD globally.

Worldwide, there were 10.5 million YLL attributed to asthma-related premature deaths. This represents an age-standardised rate of 148·5 YLL per 100,000 population, 26% lower in 2016 compared to 2006. In 2016, asthma ranked 23rd (global) and 31st (LMICs) among the leading causes of premature mortality (YLL).

The age distribution of the burden of asthma, represented as DALYs per 100,000 persons, follows a bimodal distribution with peaks at age 10-14 years and at age 75-79 years (Figure 4). The lowest burden occurs at age 30-34 years. The burden is similar in males and females at ages below 30-34 years. However, in older adults, the burden is higher in males and increases with age (Figure 4).

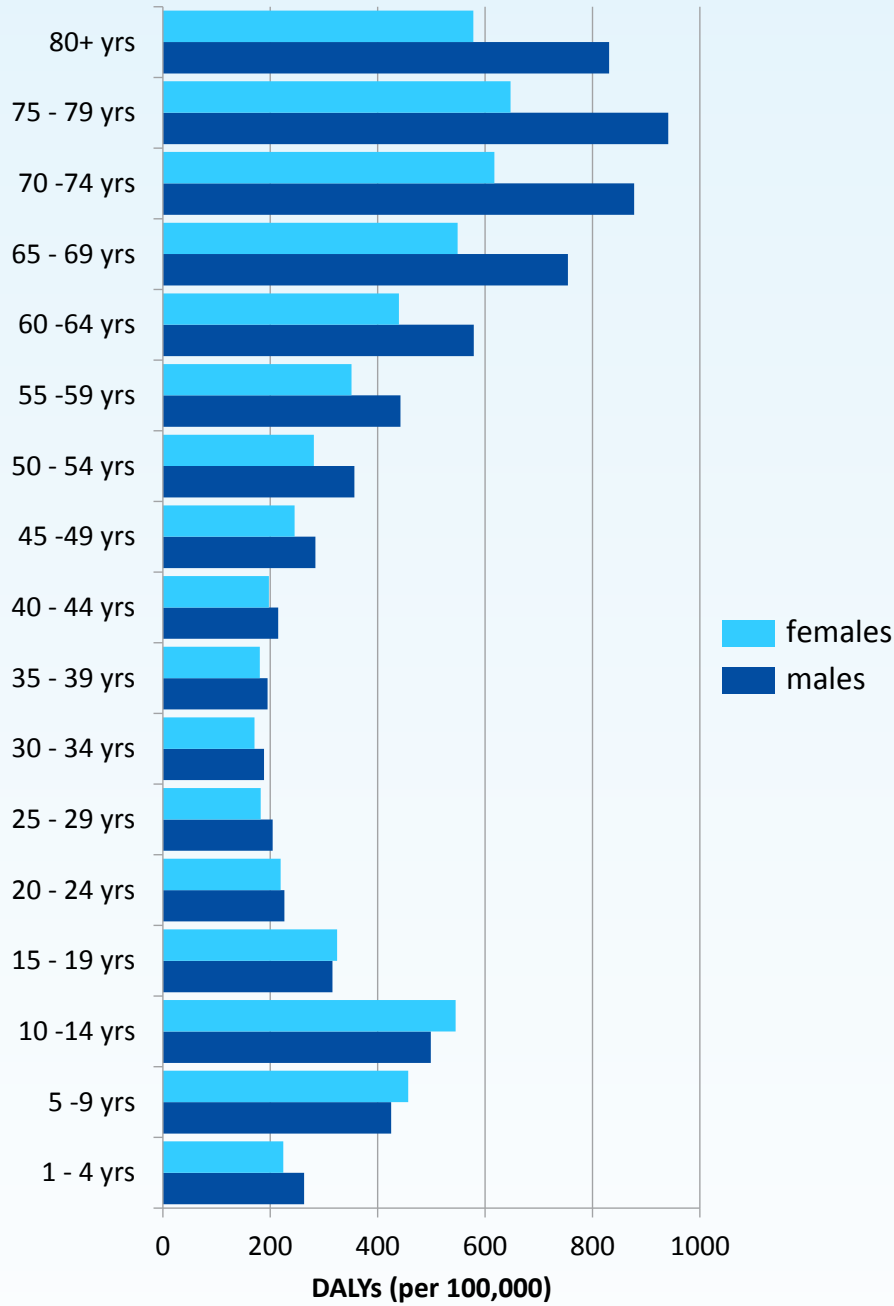
What further information do we need about the burden of asthma?

Tracking the global burden of asthma depends on the acquisition of new standardised data over time for relevant parameters including, at least, prevalence, disability and mortality. It is becoming clear that asthma is a heterogeneous disease, with diverse causes, life-courses, outcomes and optimal treatments (Chapter 2). In further work on the burden of asthma, including both disability and premature mortality, it would be useful to link this burden to avoidable causes and treatable traits. This would highlight the potential value of interventions to prevent asthma and mitigate the consequences of asthma with effective treatment.

Figure 4:

Burden of disease, measured by disability adjusted life years (DALYs) per 100,000 of global population attributed to asthma by age group and sex, 2010.

Source: Institute for Health Metrics and Evaluation (IHME).



Key Recommendation

Acquisition of new standardised data is vital to track the global burden of asthma

4. Hospital Admissions for Asthma

David Strachan, Virginia Perez-Fernandez, Eva Morales, Javier Mallol, Luis García-Marcos

Hospital admissions for asthma are often used as a target indicator of improvements in asthma care, but we have poor understanding of the factors underlying variations in hospital admission rates. Admission to hospital during an asthma attack may indicate the first asthma episode or a failure of preventive care for established asthma. Hospital care may be important to prevent a fatal outcome in severe or troublesome asthma. Historically, the relationship between asthma prevalence, severity and admission rates in high-income countries (HICs) has been complex, but changes in the admission rate over time correlate, albeit imperfectly, with changes in the prevalence and severity of childhood asthma.

There is potential for using asthma hospital admissions as an indirect indicator of the burden of more severe asthma, and the efficacy of care. However, more research is required to understand factors underlying the variations in hospital admission rates observed in different settings.

International comparisons

Many attacks of asthma are mild and self-limiting. The proportion of acute episodes resulting in hospital admission varies greatly, both within and between countries. Factors affecting hospital admission rates include the accessibility and affordability of the healthcare system, and the local thresholds for referral from community to hospital and from outpatient clinic or emergency room to inpatient care. National hospital admission statistics are lacking for most low- and middle-income countries. Hospital admissions and discharges for asthma are usually similar, as death in hospital is rare. In Europe, asthma contributes 0.6% of all hospital admissions and 0.4% of inpatient bed-days. However, rates vary by up to 10-fold between countries (Figure 1) and there is considerable variation between hospital admission rates for children (where rates are generally higher) and adults. It is important to exercise caution when interpreting geographical differences and trends over time in asthma admission rates for pre-school children (where diagnostic overlap with other wheezing illnesses may occur) and for older adults (where chronic obstructive pulmonary disease (COPD) may be confused with asthma).

Trends over time

In most European countries (Figure 1), age-standardised asthma admission rates from 2001-2005 to 2011-2015 declined, with an over two-fold reduction in some countries. Adult and child/adolescent admission rates declined to a similar degree (Figure 2). The continuing decline in asthma admission rates among children is part of a longer-term rise and fall, which peaked in several HICs the early 1990s (Figure 3). Taking a 50-year perspective, the 'epidemic' of asthma admissions bears no temporal relationship to two epidemics of asthma mortality (in the 1960s and the 1980s, discussed in Chapter 5), nor to time trends of self-reported asthma prevalence (Figure 3). However, data from the United Kingdom

Figure 1:

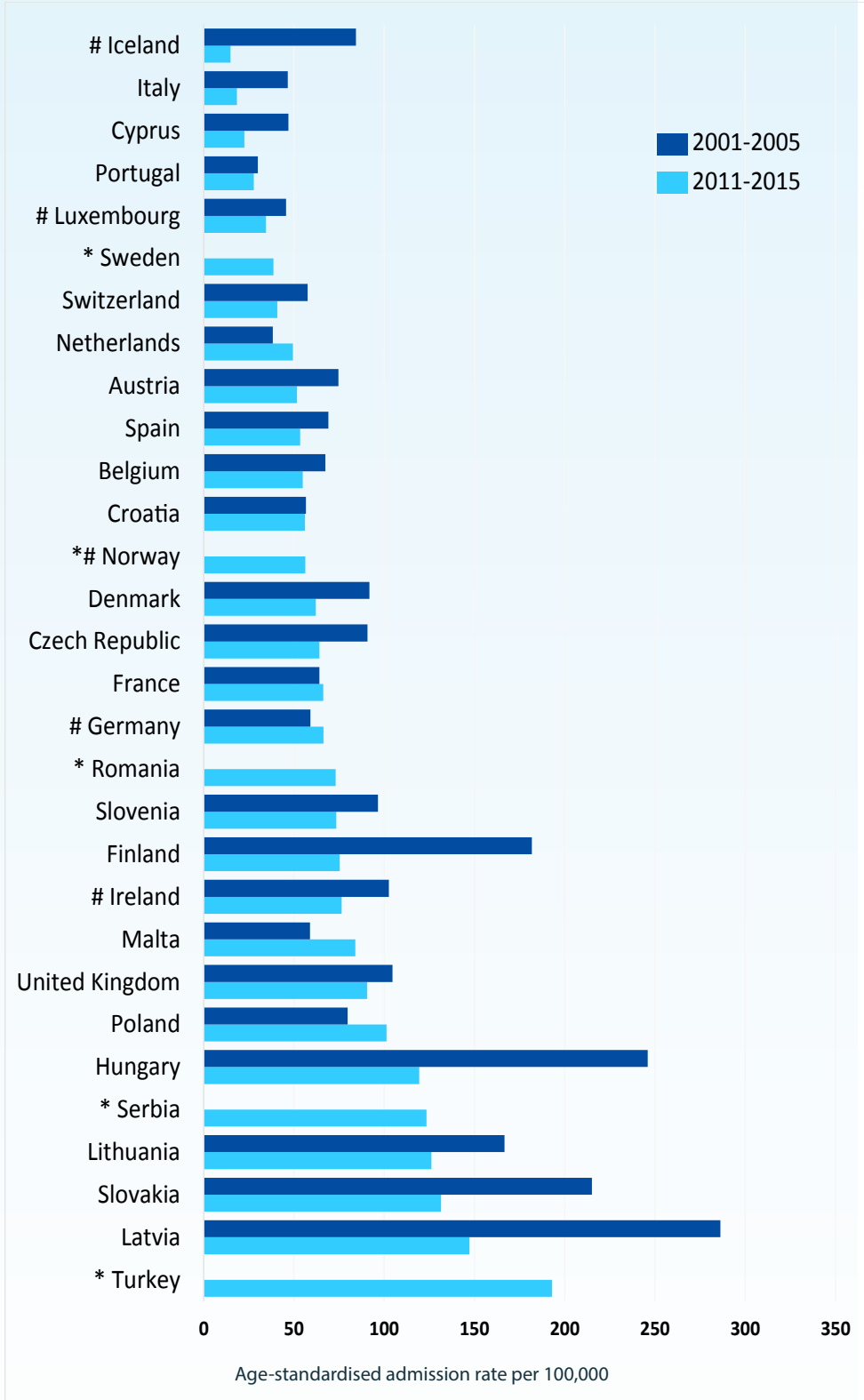
Title: Age-standardised admission rates for asthma (all ages) in 30 European countries, 2001-2005 and 2011-2015, ranked by age-standardised admission rate in 2011-2015.

Source: Eurostat updated from http://ec.europa.eu/eurostat/web/health/health-care/data/database [version dated 16 November 2017].

Note: The earlier data correspond approximately to the ISAAC Phase Three study period.

* No data available for 2001-2005

Some provisional data included



showed a peak of primary care contacts for acute asthma, particularly among children, in the early 1990s, similar to that of asthma hospital admissions. This suggested a rise and fall in the incidence of asthma attacks in the community, rather than simply a change in patterns of referral to secondary care, or a reduction in the severity threshold for admission to the hospital ward.

An international comparison of time trends in asthma admissions and asthma drug sales in 11 countries during the 1990s found that increased inhaled corticosteroids (ICS) sales were associated with a decline in hospital admission rates for asthma. During the 1980s, ICS became more widely used for asthma prevention, however hospital admission rates for children increased during this period. Thus, it is not possible to draw firm conclusions about the extent to which uptake of effective 'preventer' medication has reduced hospital admission rates for asthma in HICs.

Relationship of hospital admissions to other measures of the burden of asthma

Data from centres participating in the International Study of Asthma and Allergies in Childhood (ISAAC) Phase One (1993-5) found that national asthma admission rates correlated with the prevalence of more severe asthma symptoms in 13-14 year olds, but not in 6-7 year olds. In contrast, there were no significant correlations between national admission rates and measures of asthma prevalence and severity in children participating in ISAAC Phase Three (2001-3). Cautious interpretation is required, however, because ISAAC centres are self-selected and are not necessarily representative of the countries in which they are located. Additionally, between-country comparisons at a single point in time have significant potential for bias. However, some of these biases become less relevant if within-country changes are examined over time.

For countries with ISAAC study centres participating in both Phase One and Phase Three, national admission rates for childhood asthma declined in all except Hong Kong and Poland. This admission rate decline correlated with a decline in the prevalence of severe asthma symptoms over a similar period (Figure 4). In contrast, comparison of within-country changes in asthma mortality and admission rates for 24 European countries over the decade 2001-2005 through 2011-2015 (Chapter 5, Figure 3) shows no correlation between time trends. Over this period, national age-standardised death rates for asthma reduced more, in relative terms, than age-standardised admission rates.

Conclusion

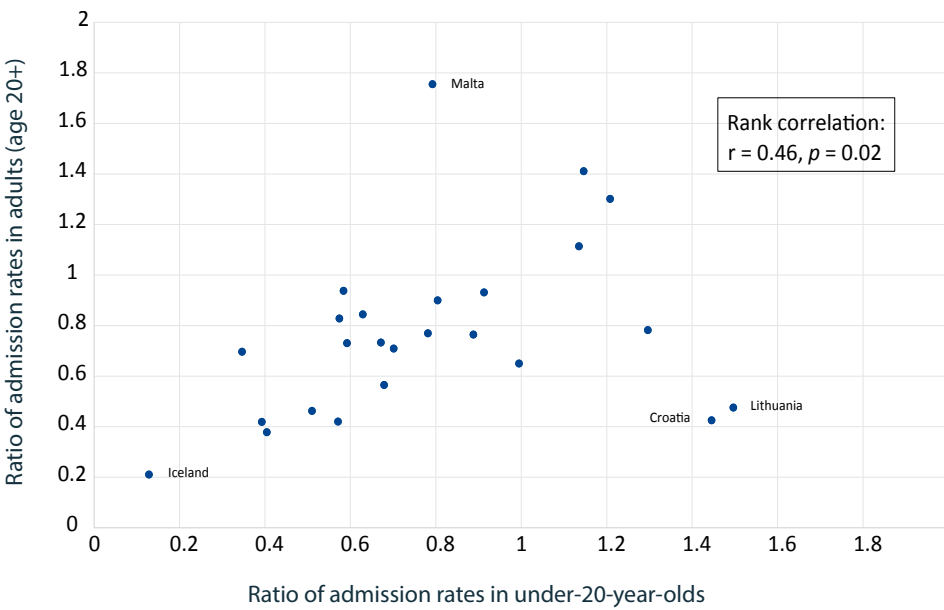
Asthma admission rates have been proposed as a target indicator for monitoring progress towards improved asthma care. Large reductions in admissions have occurred already over the last decade in several countries.

Currently, routinely collected asthma admissions information is almost entirely restricted to HICs, limiting the value of admission rates for surveillance of the global burden of asthma.

In countries that routinely collect admissions data, change in hospital admissions over time may be used as an indirect indicator of the burden of more severe asthma. More countries need to collect admissions data before admission rates can be used as an indirect indicator of the global burden of severe asthma.

Figure 2:

Relative changes in age-standardised rates of hospitalisation for asthma, 2011-2015 vs. 2001-2005, for adults (age 20+) and children & adolescents (age 0-19) in 25 European countries.

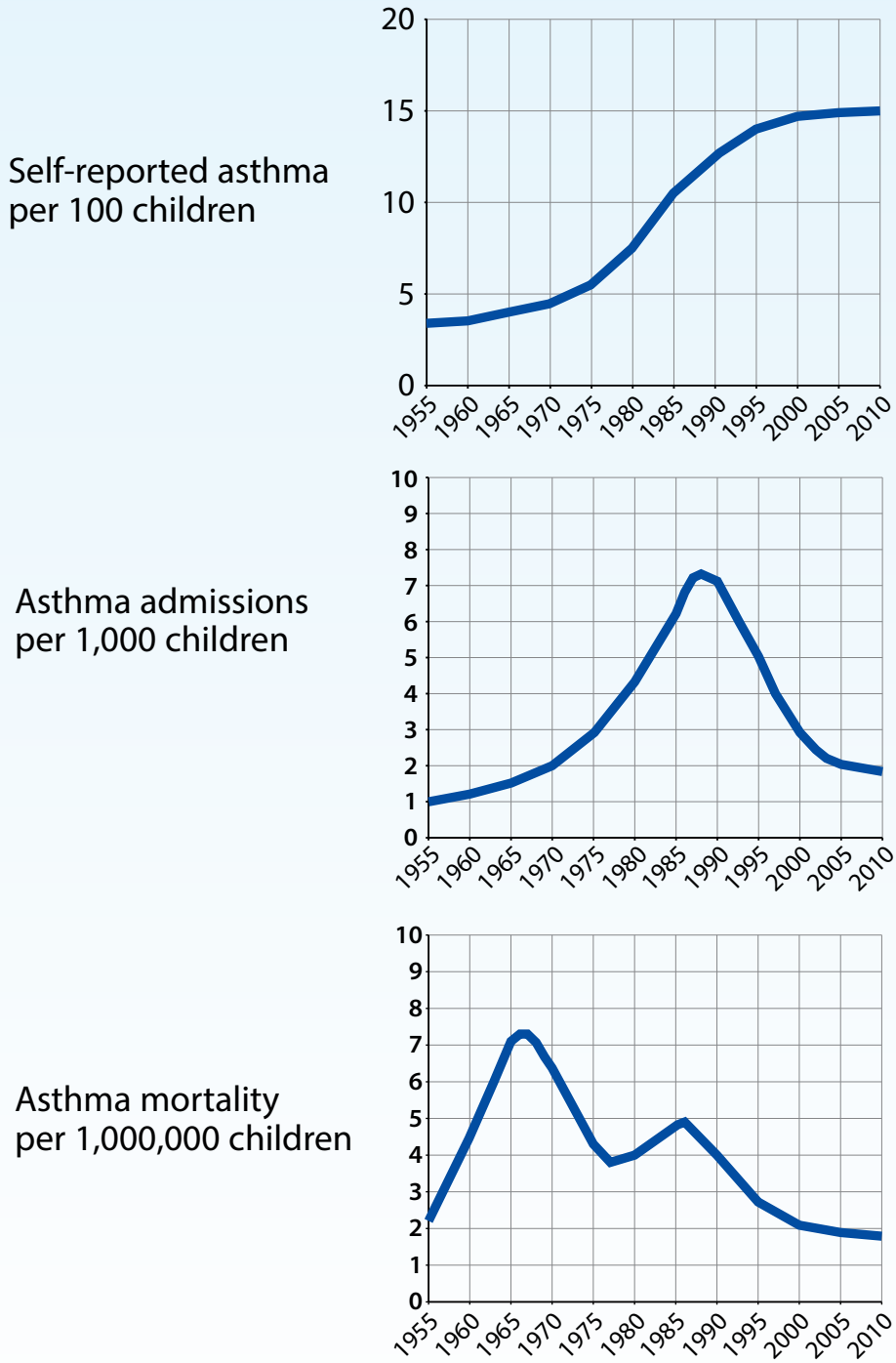


Source: Eurostat updated from http://ec.europa.eu/eurostat/web/health/health-care/data/database [version dated 16 November 2017].

Figure 3:

Schematic representation of long-term time trends in self-reported asthma prevalence, hospital admission rates and mortality rates for asthma among children in high-income countries (some European countries, USA, Canada, Australia, New Zealand, Hong Kong and Singapore).

Source: Chawla J, et al. Pediatric Pulmonology 2012.

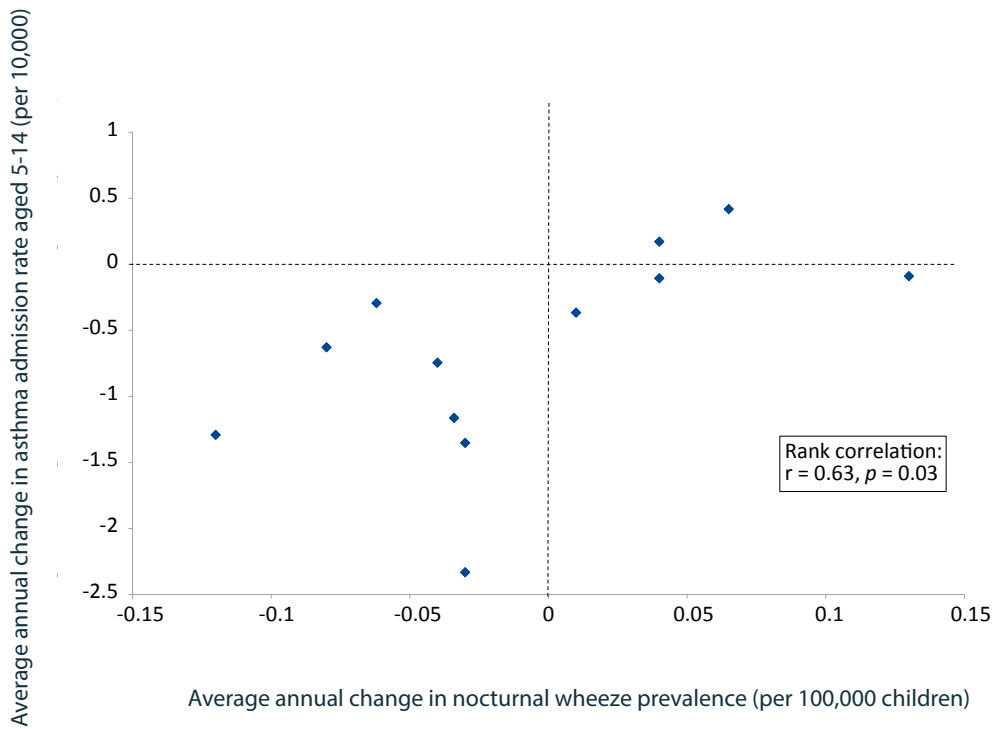


Key Recommendation

Health authorities in all countries should collect counts of hospital admissions for asthma among children and adults from defined catchment populations, to monitor trends in asthma over time.

Figure 4:

Annual change in hospital admission rates for childhood asthma (ages 5-14) by change in prevalence of nocturnal wheezing among 13-14 year olds in countries with one or more ISAAC centres providing prevalence data for both ISAAC Phase One (around 1995) and ISAAC Phase Three (around 2002).



Sources: National admissions data from Anderson HR et al. IJE 2008; (updated by WHO Hospital Morbidity Database). Prevalence data fom Pearce NE et al. Thorax 2007.

5. Asthma Mortality

David Strachan, Elizabeth Limb, Neil Pearce, Guy Marks, Eva Morales, Virginia Perez-Fernandez

Deaths due to asthma are uncommon but are of serious concern because many of them are preventable. Although most deaths certified as caused by asthma occur in older adults, comparisons of mortality rates have tended to focus upon children and younger adults, among whom the diagnosis of asthma death is more accurate, because alternative diagnoses such as chronic obstructive pulmonary disease (COPD) are less common. Over the past 50 years, mortality rates in these younger age groups have fluctuated markedly in several high-income countries (HICs). Changes in medical care for asthma, especially the introduction of new asthma medications, potentially contributed to these epidemics of asthma deaths.

Avoidable asthma deaths are still occurring due to inappropriate management of asthma, including over-reliance on reliever medication, rather than preventer medication.

International comparisons

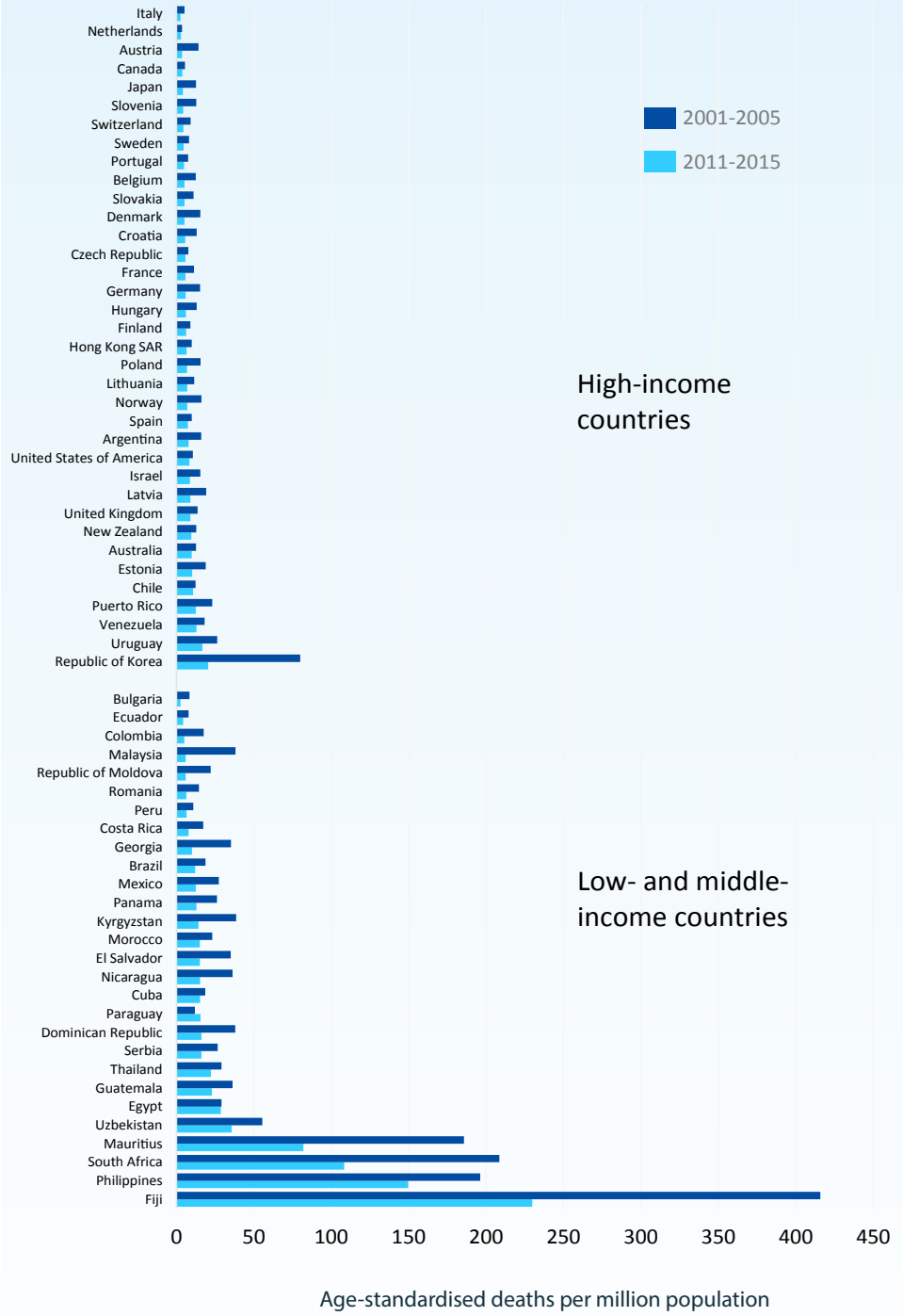
Asthma is a rare cause of mortality, contributing less than 1% of all deaths in most countries. Asthma death rates increase markedly from mid-childhood to old age and the majority of asthma deaths occur after middle age. Since there is considerable potential for diagnostic confusion with other forms of chronic respiratory disease in the older age groups, comparisons of mortality rates tend to focus on children and younger adults.

In 2016, the Global Burden of Disease collaboration estimated that 420,000 people in the world died from asthma – more than 1000 per day. International mortality statistics for asthma are limited to those countries reporting detailed causes of death. Figure 1 compares the age-standardised mortality rates for asthma among countries reporting asthma separately in two recent 5-year periods (2001-2005 and 2011-2015). This figure excludes some of the less populous countries, with fewer than 100 asthma deaths in either period. However, among the more populous countries there is an almost 100-fold variation in age-adjusted rates, between Italy (low) and Fiji (high).

When the comparisons are limited to 5-34 year olds (Figure 2), deaths are fewer and margins of error are greater, but the large disparities persist.

Figure 1:

Age-standardised asthma mortality rates (all ages) 2001-2005 and 2011-2015 by country, ranked by 2011-2015 age-standardised mortality rate within World Bank 2014 income group.

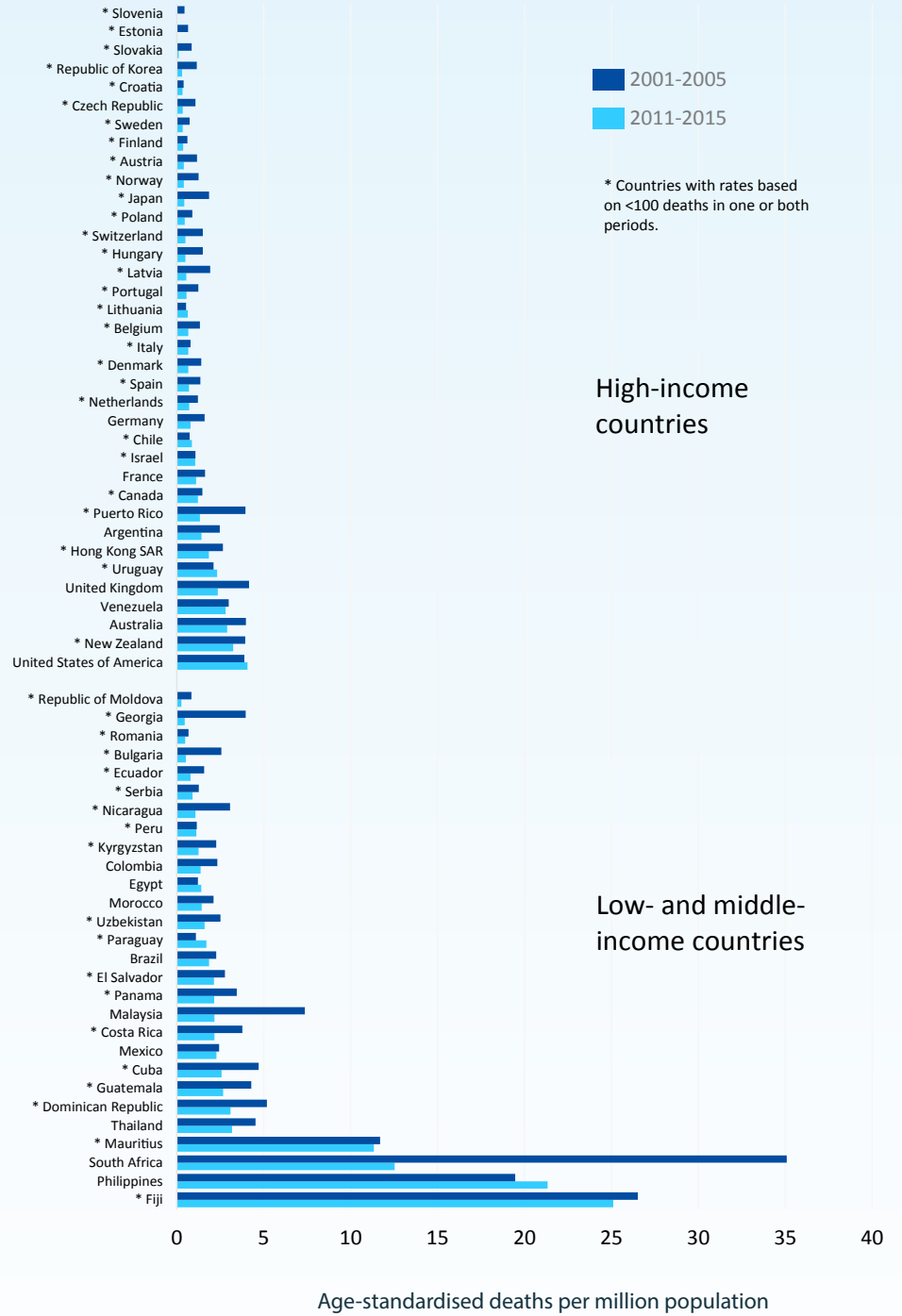


Source: WHO Mortality Database updated from http://www.who.int/healthinfo/statistics/mortality_rawdata/en/ [version dated 1 October 2017]. Population denominators from UN World Population Prospects, June 2017 revision http://data.un.org/Data.aspx?d=POP&f=tableCode%3A22 [Accessed 8 January 2018]. Income groups based on the World Bank 2014 definitions https://blogs.worldbank.org/opendata/new-country-classifications [Accessed 11 January 2018].

Restricted to countries where asthma is separately coded as a cause of death and rates were based on at least 100 asthma deaths (all ages) in each time period. Rates were calculated from the average number of deaths and average population for each 5-year age group over the periods 2001-2005 and 2011-2015, using all available data for each country (the number of available years over each period ranged from 1 to 5). Rates were standardised to the age distribution of the World Standard Population.

Figure 2:

Age-standardised asthma mortality rates (ages 5-34) 2001-2005 and 2011-2015 by country, ranked by 2011-2015 age-standardised mortality rate within World Bank 2014.



Sources: WHO Mortality Database updated from http://www.who.int/healthinfo/statistics/mortality_rawdata/en/ [version dated 1 October 2017]. Population denominators from UN World Population Prospects, June 2017 revision http://data.un.org/Data.aspx?d=POP&f=tableCode%3A22 [Accessed 8 January 2018]. Income groups based on the World Bank 2014 definitions https://blogs.worldbank.org/opendata/new-country-classifications [Accessed 11 January 2018].

Restricted to countries where asthma is separately coded as a cause of death and rates were based on at least 100 asthma deaths (all ages) in each time period. Countries with rates in either period based on fewer than 100 asthma deaths in the 5-34 age group are indicated with an asterisk. Rates were calculated from the average number of deaths and average population for each 5-year age-group over the periods 2001-2005 and 2011-2015, using all available data for each country (the number of available years over each period ranged from 1 to 5). Rates were standardised to the age distribution of the World Standard Population.

Trends over time

Figure 1 shows that age-standardised death rates from asthma have fallen substantially (by about one-half) in most countries from 2001-2005 to 2011-2015. This decline is generally reflected in the age group 5-34 years, including most of the 16 countries with more than 100 asthma deaths in this age group in both 5-year periods (Figure 2).

Over the past half-century, there have been two distinct peaks in early asthma mortality in many higher-income countries. The first occurred during the mid-to-late 1960s, with an approximately 50% increase in asthma death rates among 5-34 year olds. Researchers attributed this peak in asthma mortality to the introduction of high-dose isoprenaline inhalers as an asthma reliever medication, which can have toxic effects on the heart during acute asthma attacks. When these inhalers were withdrawn, the 1960s epidemic of asthma deaths subsided.

The second epidemic, during the mid-1980s, represented an increase of approximately 38% in asthma death rates among 5-34 year olds. In at least some of the affected countries, it was probably due to the widespread use of fenoterol, another inhaled asthma medication with potential cardiac toxicity.

Relationship of mortality to other measures of the burden of asthma

Taking a 50-year perspective, the epidemics of asthma mortality bear little relationship to the time trends for asthma prevalence or hospital admission rates for asthma. In several HICs asthma admission rates among children rose to a peak in the 1990s, after the 1980s peak in asthma mortality. Both hospital admission rates and asthma mortality rates among children have been declining since 2000, whereas asthma prevalence has been stable or rising in many countries (Chapter 4, Figure 3).

Figure 3 compares recent changes in age-standardised rates of mortality and hospital admission for asthma in 24 European countries reporting both measures during 2001-2005 and 2011-2015. Death rates declined more (in relative terms) than did admission rates, but there was very little correlation between these national trends.

When national asthma mortality rates for children were compared with asthma symptom prevalence and severity data for ISAAC Phase One centres in the same countries, a significantly positive correlation was found between childhood asthma mortality and the prevalence of more severe asthma symptoms in both 6-7 year olds (29 countries) and 13-14 year olds (38 countries). Such comparisons need to be interpreted with caution, because ISAAC centres are not necessarily representative of the countries in which they are located.

Avoidable factors in asthma deaths

Although asthma mortality rates have declined in many higher income countries, confidential enquiries in the United Kingdom have suggested that avoidable factors still play a part in most asthma deaths.

The most recent comprehensive review, of 195 asthma deaths in the UK during 2012-2013, found that nearly half died without seeking medical assistance or before emergency medical care could be provided, and the majority were not under specialist medical supervision during the year prior to death. Only one quarter had been provided with a personal asthma action plan, acknowledged to improve asthma care, and there was evidence of excessive prescribing of short-acting reliever medication, under-prescribing of preventer medication, and inappropriate prescribing of long-acting β_2-agonist (LABA) bronchodilator inhalers as the sole form of treatment.

These observations, from a HIC with a tradition of evidence-based medicine and a national health service which is free at the point of use, suggest that improved access to appropriate asthma medication is a key goal in reducing asthma mortality worldwide.

Conclusion

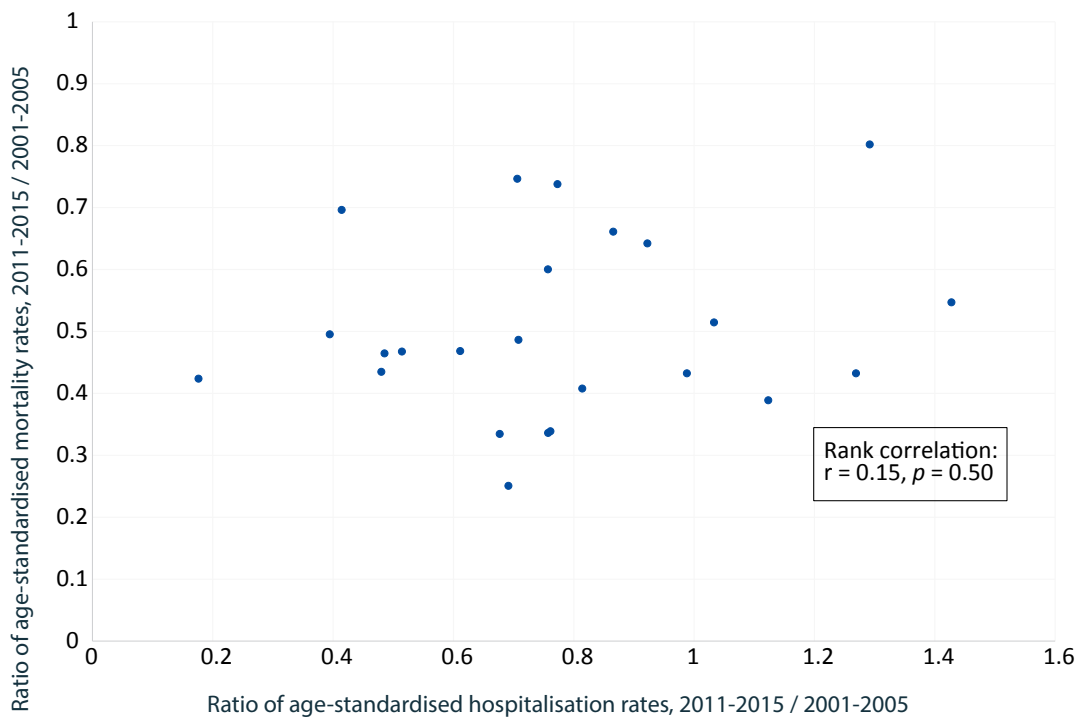
Asthma deaths represent the "tip of the iceberg" with respect to the global burden of asthma. Although the risk of any individual person with asthma dying of their disease is thankfully very low, continued surveillance of asthma mortality rates is essential to monitor progress in asthma care and as an early warning of epidemics of fatal asthma, as have occurred in the past half-century.

Key Recommendation

Health authorities in all countries should report rates of asthma deaths in children and adults to monitor progress in asthma care, and as an early warning of epidemics of fatal asthma.

Figure 3:

Relative changes in age-standardised mortality and hospitalisation rates for asthma (all ages) in 24 European countries, 2011-2015 vs 2001-2005.



Sources: WHO Mortality Database updated from http://www.who.int/healthinfo/statistics/mortality_rawdata/en/ [version dated 1 October 2017]. Eurostat: http://ec.europa.eu/eurostat/web/health/health-care/data/database [version dated 16 November 2017].

6. The Economic Burden of Asthma

Mohsen Sadatsafavi, Solmaz Ehteshami-Afshar, Mark FitzGerald, Tari Haahtela

Asthma continues to be a major source of global economic burden in terms of both direct and indirect costs. Given that asthma cannot be cured or effectively prevented, attempts at reducing costs should focus on better disease management. This approach is consistently associated with significant reduction in asthma costs. Improving access to care, especially to controller (including preventer) therapies, and better adherence to such therapies can significantly reduce the economic burden of asthma.

Strategies towards improving access and adherence to evidence-based therapies can be effective in reducing the economic burden of asthma in both developed and developing countries.

Estimating the economic burden

The economic burden of a disease is the product of its prevalence; the costs due to consumable healthcare services and products such as hospital services, doctor visits, and medicines (direct costs of the disease); and costs to society, due to loss of work productivity of patients or their caregivers (indirect costs of the disease). There are challenges in estimating each of these components. For example, diagnosis of asthma may be subjective, resulting in under-diagnosis of asthma in some jurisdictions and over-diagnosis of asthma in others. Estimating direct costs is also challenging. For example, in a patient who suffers from both clinical depression and asthma, it is difficult to decide if clinical depression is because of asthma symptoms and as such should count towards costs of asthma. Robust estimation of the impact of asthma on work productivity is challenging and those that have addressed the issue mostly overlook the fact that individuals with asthma might have reduced work performance even if they attend the workplace (presenteeism).

What we know about the global costs

A recent review on the economic burden of asthma demonstrated wide variations in costs across countries. Annual direct costs varied from less than US$150 per patient (Abu Dhabi, United Arab Emirates) to more than US$3,000 per patient (United States of America (USA)), a 20-fold difference). At the national level, the total annual asthma costs in the USA increased from US$53 billion (US$60 billion*) in 2002 to US$56 billion (US$64 billion*) in 2011. Total costs of asthma for people aged 15 to 64 living in Europe were €19.3 billion (US$24.7 billion*) during 1999-2002, while in the United Kingdom alone the costs were £5 billion (US$9.8 billion*). Unfortunately, reliable

national estimates of costs are not available for the vast majority of developing countries.

In North America and Europe, asthma medicines were the largest component of direct medical costs. On the other hand, in the Middle East and Southeast Asia, outpatient costs, doctor visits, and visits to Emergency Departments were responsible for a greater proportion of the total costs. Cost estimates often ignore indirect costs but studies reporting indirect costs of asthma consistently demonstrate that these costs constitute a significant aspect of the economic burden.

The importance of symptom control

Currently, asthma cannot be cured, and there are very limited evidence-based options to prevent its development. The emphasis is therefore on achieving asthma symptom control and preventing future asthma attacks. The reduction in the costs of asthma when an individual moves from uncontrolled to controlled symptoms can be considered as a 'preventable' source of costs. Patients´ ability to work more productively and better cope with daily life reflects improved clinical management of their asthma. A Canadian study demonstrated that a patient with uncontrolled asthma would avoid CAD$7,768 (US$7,923*) per year in productivity loss if the disease was optimally controlled. Severe, uncontrolled asthma accounts for a disproportionately high burden in high-income countries and the availability of expensive biological therapies may add to these costs. Careful targeting of expensive novel drugs to patients expected to benefit the most from them will ensure value for money.

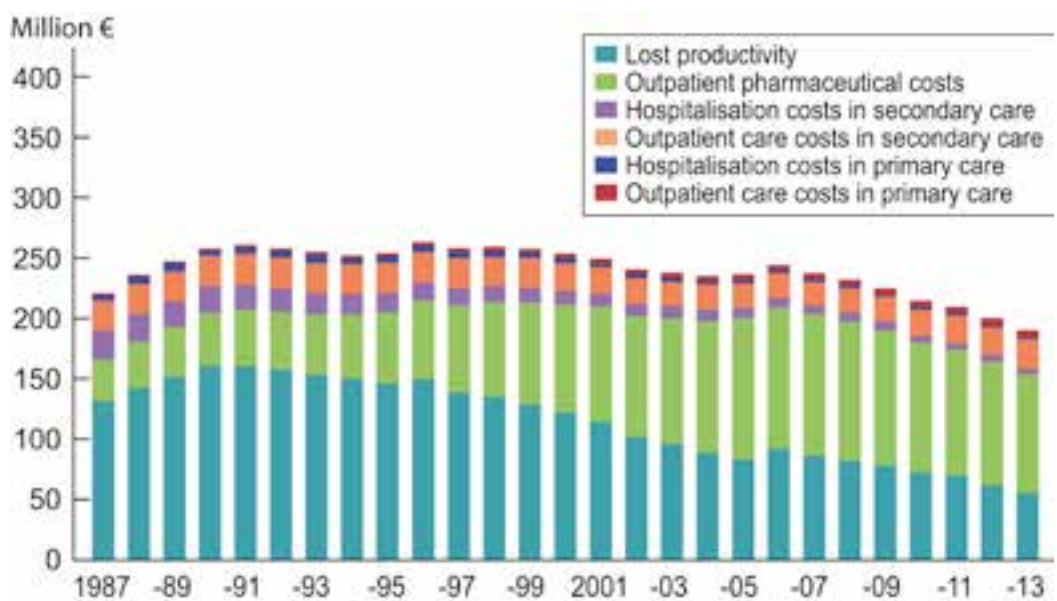
The role of national strategies

Evidence suggests that coordinated national strategies to implement changes in healthcare systems are more likely to succeed than isolated attempts at a local level. Development and implementation of national and regional asthma strategies can improve evidence-informed disease management among healthcare providers and use of medicines among patients. In Finland, with a population of 5.5 million, asthma costs have been monitored for an extended period. A nation-wide Asthma Program (1994-2004) and an Allergy Program (2008-2018) have been implemented to improve asthma management across the country. From 1987 to 2013 the total annual asthma related costs decreased by 14%, from €222 million (US$249 million*) to €191 million (US$214 million*) (Figure). This overall reduction was despite a 3-fold increase in the number of patients taking medication regularly and a modest increase in asthma prevalence. Annual costs per patient also significantly decreased from €2,656 (US$2,976*) to €749 (US$839*) (72% decline).

*The costs in brackets are converted to 2016 $US.

Figure:

Success of a national asthma strategy: overall annual costs of asthma care at the societal level in Finland from 1987 to 2013; the national Asthma Program began in 1994. Monetary values are in euros (€).



Source: Adapted with permission from Haahtela T et. al. Journal of Allergy and Clinical Immunology. 2017.

Key Recommendation

Each country needs a coordinated national strategy towards better measurement of the true burden of asthma, improving access to care and improving adherence to asthma management strategies.

Conclusion

Over 330 million individuals in the world have asthma, with future increases expected. Not only is the prevalence of asthma is increasing, but per-patient costs also appear to be on the rise. Developing countries are facing an even steeper increase in the future burden of asthma, and patients often do not have reliable access to the essential asthma medicines (Chapter 10). There is strong evidence that in the vast majority of patients, effective asthma control, with accessible and inexpensive preventer and controller therapies is achievable. These medicines should be part of strategies to deliver Universal Healthcare Coverage. More than ever, countries across the globe need coordinated national strategies towards both better measurement of the true burden of asthma and improving access to care and adherence to evidence-informed asthma management strategies.

7. Factors Affecting Asthma

Luis García-Marcos, Neil Pearce, David Strachan, Richard Silverwood, Charlotte Rutter, Philippa Ellwood

Research has found that both genetic and non-genetic factors affect asthma. A number of factors may cause exacerbations in people who have asthma but there is no recognised cause, either biological or environmental, for asthma itself. Thus, when considering non-genetic factors, it is important to distinguish between the triggers of asthma attacks and the causes of the underlying asthmatic process or trait. Both groups of factors may contribute to the severity and persistence of asthma.

In low- and middle-income countries the proportion of people with non-allergic asthma is greater than in high-income countries. Also, environmental factors may act differently in these settings.

Who is at risk of asthma?

Genetic susceptibility

Asthma often runs in families, and identical twins are more likely to have the same asthma status than are non-identical twins. Researchers have identified a number of genetic variants that influence asthma risk, mainly in children. However, there is still a great gap of 'missing heritability' to be discovered, and the interaction between genes and the environment through epigenetic changes is a current focus for research.

Environmental tobacco smoke

Environmental tobacco smoke has been confirmed as a risk factor for asthma, both in childhood and adulthood. Pre-natal exposure to tobacco smoke is also important. This is considered to be a causal relationship, implying that the prevalence (and severity) of asthma would reduce if exposure to tobacco smoke was reduced.

Air pollution

Evidence of an increased risk of asthma due to indoor air pollutants (e.g. cooking on an indoor open fire) or outdoor air pollutants (e.g. suspension particles or sulphur dioxide) is less clear and consistent than for tobacco smoke.

Mould and damp

Dampness is a potentially modifiable risk factor for asthma worldwide, though its association with asthma is stronger in low- and middle-income countries (LMICs) than in high income countries (HICs). This risk is independent of allergic sensitisation to house dust mites, which is more common in damp homes.

Animals

In HICs, exposure to furry pets is often less common among asthmatic children and adults, due to avoidance or removal of pets by allergic families. In LMICs, this avoidance is less common and there is evidence that cats in the home during the first year of life are a risk factor for asthma. Several large studies in HICs have shown a lower prevalence of asthma among children living on farms, but this is probably not so in LMICs.

Antibiotics and paracetamol (acetaminophen)

Asthma symptoms are more common among children treated with antibiotics in early childhood. The direction of cause and effect is uncertain because antibiotics may be given for chest illnesses which could be an early manifestation of asthma. Similar considerations of 'reverse causation' apply to the association with paracetamol (acetaminophen) exposure in infancy.

Occupational exposures

Occupational asthma may develop after the prolonged inhalation of certain agents, in people with no previous history of chest disease, and can sometimes persist after exposure to the causal agent is removed. High-risk occupations include baking, woodworking, farming, exposure to laboratory animals, and use of certain chemicals, notably paints containing isocyanates.

Diet and obesity

The available evidence suggests that diets widely recommended to prevent cardiovascular diseases and cancer may slightly reduce the risk of asthma. Thus, 'fast food' increases risk and fresh fruit and vegetables appear to be protective against asthma. A link has also been established between obesity and increased risk of asthma, both in children and adults.

Breastfeeding

Prolonged exclusive breastfeeding protects against early respiratory viral infections that cause wheezing in infancy. However, protection from asthma at school age seems confined to non-atopic asthma in LMICs.

Common triggers in asthmatics

Asthma attacks are often triggered by upper respiratory tract infections, including common colds. Other factors that may provoke asthma attacks include inhaled allergens (dust mites, animal fur, pollens, moulds, allergens in the workplace), inhaled irritants including air pollutants (cigarette smoke, fumes from cooking, heating or vehicle exhausts, cosmetics, aerosol sprays), medicines (including aspirin), exercise, emotional stress, and certain foods or beverages.

Recent findings

Recent analyses of the International Study of Asthma and Allergies in Childhood (ISAAC) Phase Three looked at multiple individual level risk factors for asthma symptoms (Figure) and compared them to risk factors at the sampled school level. The reason to look at school-level effects is that an individual may change their behaviour if they (or their children) develop asthma, and this may bias the results of individual-level analyses, known as reverse causation. However, such a behaviour change would have only a small effect at the school-level. The strongest individual-level associations for asthma symptoms in 6-7 year olds were current paracetamol use, early life antibiotic use and open fire cooking, with consistent results at school-level. For 13-14 year olds, the strongest individual-level associations were with current paracetamol use, open fire cooking and maternal tobacco use, again with consistent results at school-level. These consistencies provide evidence against reverse causation, thus strengthening the evidence for a causal relationship between these risk factors and asthma.

Conclusion

Environmental factors are much more likely than genetic factors to have caused the large increase in the numbers of people in the world with asthma, but we still do not know all the factors and how they interact with each other and with genes. Some of these factors may not act in the same way in HICs and LMICs.

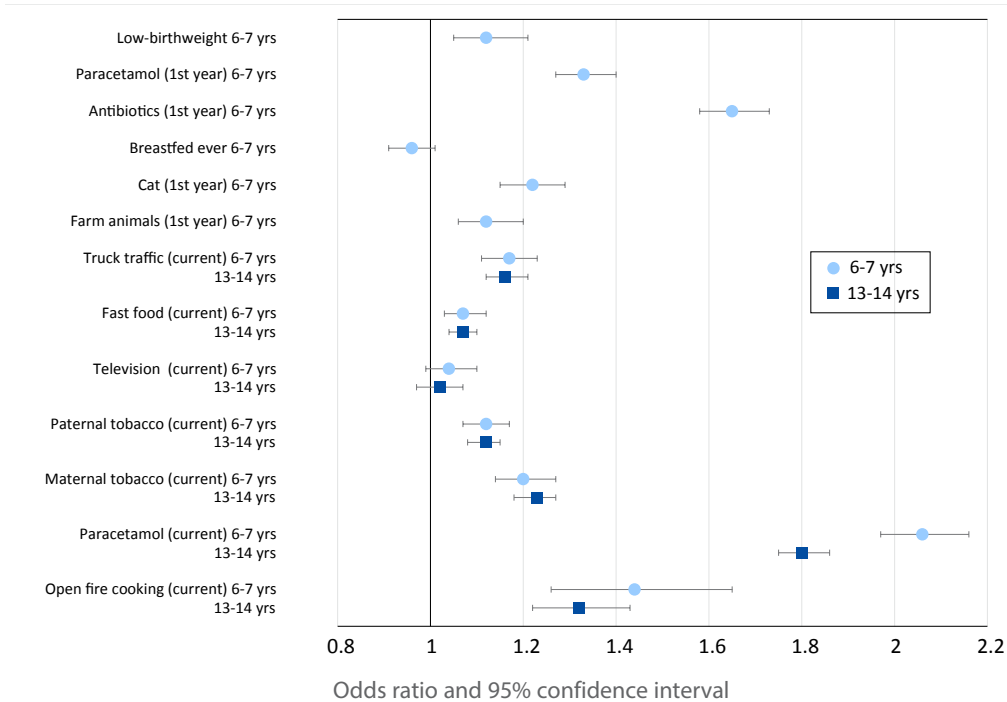
Figure:

Effects of individual-level exposures on wheeze in the last 12 months.

Mixed logistic regression models with random intercepts at the school, centre and country levels.

Sample sizes:
6-7 year old = 131,924
13-14 year old = 238,586

Sources: ISAAC Publications
Found at http://isaac.auckland.ac.nz/publications/publicationsintro.html



Key Recommendation

Governmental policies, such as those reducing tobacco consumption, encouraging healthy eating and reducing exposure to potentially harmful chemicals, smoke and dust, should be strengthened. Governments should also support further research into known asthma triggers and identifying the causes of asthma.


Quality-assured
asthma medicines
need to reach
everyone with
asthma.

PART TWO:

MANAGEMENT OF ASTHMA AND CAPACITY BUILDING

8. Cost-effectiveness of Asthma Management using Inhaled Corticosteroids

Karen Bissell, Philippa Ellwood, Chiang Chen-Yuan, Nils Billo, Guy Marks

Many governments have overlooked asthma in their plans to address non-communicable diseases (NCDs) and have made little progress in improving access to asthma management and medicines, especially the inhaled corticosteroids (ICS) crucial for the long-term control of asthma. Most governments invest very little in improving asthma patients' quality of life and reducing the huge financial costs borne by national and state economies, health services, patients and families. Systematic monitoring and evaluation, at the country and global level, of the costs and outcomes of asthma management activities will be essential for improving economic and patient outcomes.

We need new ways of targeting and delivering standardised, affordable inhaled corticosteroid-based asthma care to achieve better economic and patient outcomes.

Asthma competes with other NCDs

In 2011, a World Health Organization (WHO) report estimated that, out of the four major groups of NCDs, respiratory diseases had the second highest predicted economic burden for 2011-2025: a cost of US$1.59 trillion. For the 2011 United Nations High-Level Meeting on NCDs, WHO listed 'highly cost-effective interventions' that governments should consider prioritising in order to reduce the economic impact of NCDs, so-called 'best buys': interventions that would be the most cost-effective, and also affordable and feasible for countries to implement. Cost-effectiveness analysis compares the value of the resources spent on an intervention with the quantity of health gained as a result.

Unfortunately, the 'treatment of asthma based on WHO guidelines' did not meet the criteria for 'best buys' in WHO's Global Action Plan for the Prevention and Control of NCDs 2013–2020. Another of WHO's reports, 'Scaling up action against NCDs', which was designed to help governments budget for and plan implementation and expansion of their NCD activities, limited its scope to WHO's 'best buy' interventions, so did not include asthma management in its costing scenarios.

Asthma treatments are effective and cost-effective

In 2017, WHO published an updated analysis of the cost-effectiveness of a range of interventions that are relevant to its Global Action Plan. Using

a method known as 'WHO-CHOICE', they assessed evidence of each intervention's effectiveness and estimated the cost of the intervention, including medicines, administration, training and other programme elements. Statistical models were then used to estimate the effect of the intervention, in terms of health-adjusted life expectancy over the next 100 years, and its likely cost.

Among the 89 interventions for NCD risk factors and diseases assessed, two are relevant to asthma:

- Symptom relief for patients with asthma with inhaled salbutamol
- Treatment of asthma using low dose inhaled beclometasone and a short-acting β_2-agonist

Economists assumed that the interventions would be implemented according to WHO's recommended step-wise approach to the intensification of asthma management. Both interventions were found to be effective for improving the control of asthma, with a cost-effectiveness ratio of more than 100 international dollars per Disability Adjusted Life Year (DALY) averted in low- and middle-income countries (LMICs).

More country-level research needed for better targeting and delivery of asthma care

What is needed is better evidence of how to deliver effective asthma management in diverse health systems and contexts, and how to ensure that the right patients receive the right medicines. It will be crucial to gather evidence of the outcomes achievable with new ways of targeting and delivering standardised, affordable asthma care, especially in LMICs. By analysing costs as well as programme and patient outcomes, health services will be able to develop models for highly cost-effective, affordable and feasible interventions. A clear view of the burden, costs and outcomes should help LMIC governments see why and how they should be prioritising asthma care.

Conclusion

Countries need to evaluate the costs and outcomes of their asthma management activities. Research regarding the implementation of asthma interventions in diverse settings would help governments and health providers see how the provision of affordable quality-assured essential asthma medicines and more efficient, targeted and equitable delivery of standardised asthma management can reduce the economic and patient burden of asthma. The basic asthma intervention (Standard Case Management, see Chapter 11) and the essential asthma medicines are already known to be effective. Now we need to see how to improve the delivery of asthma care, so that more people will receive the appropriate essential medicines for their condition.

Key Recommendation

Governments, health services and allied researchers should develop new ways to target and deliver asthma care in diverse health systems and contexts, and gather evidence of costs and outcomes, cost-effectiveness, affordability and feasibility.

9. Spacers for Asthma and Wheezing in Children

Heather Zar, Javier Mallol, Luis García-Marcos, Refiloe Masekela, Asma El Sony, Innes Asher

Inhaled therapy is the treatment of choice for delivering medicines for the relief and prevention of asthma. While the metered dose inhaler (MDI) is the core inhaler device, all preschool children and most older children are unable to coordinate their breathing when they use it, and thus it is ineffective. The MDI used with a spacer device is the optimal delivery system for treatment of acute and chronic asthma in children. An alternative to a commercially produced valved spacer is a 500ml plastic bottle spacer, adapted from a drink bottle.

Figure 1:

Child using a homemade bottle spacer by holding the neck of the bottle in their mouth

Inhaled therapy is essential treatment of acute and chronic asthma, and the metered dose inhaler with a spacer is the optimal delivery system in children.

The value of spacers

When an MDI and spacer are used together, large non-respirable particles in the MDI aerosol mist deposit on the walls of the spacer. This leaves only the smaller respirable particles airborne for inhalation. The child does not need any special inhalation technique – just ordinary tidal breathing – for optimal delivery of the aerosol medicine to the airways.

For acute asthma, bronchodilators given via MDI with spacer are equivalent or superior to nebulised therapy for relief of bronchoconstriction in infants and children, even when the degree of airways obstruction is severe. An MDI with spacer delivery system has many other advantages over nebulisation, including faster and easier administration of the drugs; more compact, easier to transport; no need for a power source; and lower risk of spread of infection between patients.

For chronic asthma, prevention of asthma symptoms requires inhaled corticosteroids (ICS). At all ages, the MDI with a spacer delivery system is the most effective, because of reliable ICS drug delivery, and is preferred over MDI alone or a dry powder device. Like the MDI alone, dry powder delivery systems also depend on a specific breathing technique for optimal drug delivery.

The bottle spacer is an effective option

Various commercially produced spacers exist but expense and unavailability have restricted their use in resource-limited settings. A modified 500 ml plastic bottle can be an effective spacer for delivery of MDI bronchodilator therapy in children of all ages. Aerosol deposition and clinical studies have shown that a 500ml plastic bottle spacer, made according to the steps below, is as effective as a commercially produced spacer for delivery of bronchodilators in children with asthma and young children with wheezing. Conversely, a polystyrene

cup was an ineffective spacer for children with moderate to severe airway obstruction, and is therefore inappropriate for use.

How to make a bottle spacer

To modify a 500ml plastic bottle for use as an effective spacer:

1. Wash the bottle with soap and water and air dry for a minimum of 12 hours to reduce electrostatic charge on the interior plastic.
2. Make a wire mould similar in size and shape to the mouthpiece of the MDI.
3. Heat the mould and hold in position on the outside of the base of the plastic bottle until the plastic begins to melt (~10 seconds). Rotate the mould 180% and reapply to the bottle until the mould melts through to make a hole.
4. While the bottle is still warm, insert the MDI into the hole to ensure a tight fit between the MDI and bottle spacer.

New bottle spacers should be primed initially with 10 puffs of the medicine to reduce electrostatic charge on the walls, which attracts small particles, and thus make more aerosol medicine available for inhalation.

How to use a bottle spacer

Use a modified 500ml plastic bottle in a similar way to a conventional spacer.

1. Insert the MDI into the hole at the base of the bottle spacer.
2. Hold the neck of the bottle spacer in the child's mouth, simulating a mouthpiece and making it easier to direct the aerosol into the airways (Figure 1). For a young child who cannot form a tight seal with the spacer in their mouth, a small commercially available facemask that fits on the open end of the bottle can be applied (Figure 2).
3. Give the child a single puff of the MDI with the spacer, followed by normal breathing, and repeat until the desired amount of medicine is given, which is frequently 2 puffs, but may be up to 6 puffs for relief of bronchoconstriction. This method ensures optimal MDI drug delivery to the child.

Conclusion

Low cost, effective spacer devices are essential equipment for the delivery of good asthma care. Modification and use of a bottle spacer is included in national and international asthma guidelines. The use of the bottle spacer has enabled delivery of optimal inhaled asthma therapy in the poorest households, empowering children and their families to provide such care.

Figure 2:

Mother using a homemade bottle spacer to give bronchodilator therapy to her infant.

Key Recommendation

For acute asthma, using a spacer with a metered dose inhaler for bronchodilator therapy is preferable to nebulisation.

Modification of a low cost 500ml plastic bottle creates an effective spacer, with the neck held in the mouth. For a young child attach a mask to the bottle neck.

10. Achieving Access to Affordable, Quality-Assured, Essential Asthma Medicines

Asma El Sony, Innes Asher, Karen Bissell, Nils Billo

Asthma, once diagnosed, can be managed well with inhaled medicines of proven efficacy: preventer inhaled corticosteroids (ICS) for more frequent symptoms and reliever bronchodilator for acute symptoms. Patients with asthma need uninterrupted, affordable and quality-assured supplies of these medicines, yet many do not have these; challenges and solutions are put forward here.

In many countries, essential asthma medicines are unavailable, unaffordable, or of unreliable quality, resulting in unnecessary burden and mortality from asthma.

World Health Organization Essential Medicines

Until 2017, the World Health Organization (WHO) Model List of Essential Medicines (EML) included two ICS and one short-acting β_2-agonist (SABA) for asthma. In 2017 a combination ICS and rapidly-acting long-acting β_2-agonist (LABA) was added, the latter giving symptom relief and thus encouraging adherence to ICS. Recent evidence suggests that, in people with mild asthma, combination budesonide–formoterol, used as needed for symptoms, may be as effective as ICS, used regularly twice daily, together with SABA used as needed for symptoms. However, at present, combination inhaler devices are more expensive than ICS and SABA devices, which may limit the use of this regimen. Indeed many countries, especially low- and middle-income countries (LMICs) do not yet have ICS and bronchodilators on their national EML, and many are not providing them free or subsidised for patients. Thus there is an urgent need to address essential asthma medicine-related measures at both country and global levels.

Several studies show that there is limited access to affordable, quality-assured essential asthma medicines in many LMICs. The WHO Non-Communicable Disease (NCD) Global Action Plan 2013-2020 set an 80% target for availability of essential NCD medicines in both public and private facilities by 2025. We have not reached this target for asthma medicines, with little progress to date.

The WHO EML 2017 includes three medicine groups for asthma:

(i) ICS aerosol: beclometasone dipropionate (50µg and 100µg), and budesonide (100µg and 200µg)

(ii) one combination ICS and LABA: dry powder budesonide with formoterol two dose strengths: 100µg with 6µg, 200µg with 6µg

(iii) one bronchodilator: salbutamol sulphate in these formulations: metered dose inhaler:

100µg, respirator solution for use in nebulisers: 5mg/mL, and injection: 50µg/mL in 5mL ampoule.

Quality assurance

Asthma inhalers are among the most complex medical devices manufactured by the pharmaceutical industry in widespread use. They require accurate manufacturing so that they deliver the required dose in particles of the right size to reach the lower airways. The WHO EML states "It is the responsibility of the relevant national or regional drug regulatory authority to ensure that each product is of appropriate pharmaceutical quality". This is vital for asthma inhalers.

To be safe and efficacious, asthma inhalers need to comply with international quality standards. Although many inhalers may meet these standards, some in the marketplace do not. The WHO Prequalification Programme is a centralised quality assessment initiative that has achieved greater access for millions of patients to quality-assured medicines for other selected diseases. Unfortunately asthma inhalers are not included in this programme, but it is time they were.

Access is limited

Many LMICs do not have essential asthma medicines on their EML or National Reimbursement List (NRL), and some do not have them on either list. The 2013-14 Global Asthma Network survey of 111 countries found that, among LMICs, only about half had ICS on their EML and NRL. People with asthma in the LMICs with no NRL and those with an NRL but no ICS on it are likely to have very poor access to affordable, quality-assured ICS. A 2012 survey within 52 LMICs found ICS availability was particularly poor in national procurement centres and main hospitals, and some countries were applying very high margins on these medicines.

Solutions

The International Union Against Tuberculosis and Lung Disease (The Union) developed the Asthma Drug Facility (ADF) as a practical solution to these issues and this was operational from 2006 to 2013. The ADF provided quality-assured medicines with independent testing of inhalers; lower pricing through a competitive process; financing strategies using the Global Fund to Fight AIDS, TB and Malaria, Revolving Drug Funds (after an initial capital investment, medicine supplies are replenished with monies collected from the sales of medicines) and health budgets; asthma guidelines and training materials; and the monitoring of asthma outcomes, such as emergency visits and hospitalisations.

It is vital that the supply within countries of affordable, quality-assured, essential asthma medicines is guaranteed and uninterrupted to achieve effective asthma management for everyone needing it. Countries may need to work on how their national policies, programmes,

guidelines, budgets and teaching curricula, for example, address asthma medicines, as well as how medicines are procured and made available to patients.

In most countries, the funding of essential asthma medicines competes with the funding for very expensive asthma medicines that benefit asthma patients not responding to essential asthma medicines. For the greater good, however, prioritisation of essential asthma medicines is vital.

Countries need to base national asthma management guidelines on medicines that are available and affordable in their country. It is vital that countries ensure access to medicines at all levels of healthcare, especially among poor and marginalised populations.

In low-income countries, authorities should develop methods of payment for people with chronic asthma, such as health insurance and ZAKAT (Islamic Relief Worldwide), so they can pay for their medicines.

The Table summarises measures aimed at improving access to affordable, quality-assured, essential asthma medicines.

Conclusion

Now that the WHO EML includes the ICS/LABA combination-inhaler, there is further potential to improve asthma management. Nevertheless, many countries have not yet included the essential medicines recommended by the WHO on their own EMLs and many do not subsidise these asthma medicines, especially in LMICs. ICS, the main asthma preventers, which lead to improved asthma control and reduction in the burden of asthma, are less commonly supported by governments than the short term reliever inhalers, and this needs to be corrected.

Key Recommendation

All Governments should ensure that essential asthma medicines are on their country's Essential Medicines List and ensure that they are accessible and affordable at the point of need.

Table: Measures needed to improve access to affordable quality-assured essential asthma medicines.

World Health Organization (WHO)	
1	*Add essential asthma medicines to its Prequalification Programme.*
2	*Promote the harmonisation, across international reference pharmacopoeias, of quality requirements that govern the production and testing of asthma medicines.*
3	*Facilitate the development of independent laboratories for the testing of generic products that are not already approved by a stringent regulatory authority or relevant global mechanism.*
4	*Monitor and publish on factors that influence availability, affordability, and access to essential asthma medicines.*
Countries	
5	*Include the essential asthma medicines in national Essential Medicine Lists and ensure that they are free, subsidised or reimbursed.*
6	*Prioritise access to essential asthma medicines over "non-essential" asthma medicines.*
7	*Base asthma management guidelines used within a country on medicines that are available and affordable in that country.*
8	*Base affordability of inhaler prices on relationship to the national minimum wage.*
9	*Ensure methods of payment for patients with chronic asthma, such as health insurance, so they can afford essential asthma medicines.*
10	*In LMICs where Universal Health Coverage is not yet in place, support a procurement model to obtain substantially reduced prices for quality-assured products.*
People with asthma	
11	*Encourage populations in LMICs to demand access to affordable, quality-assured, essential asthma medicines as part of the healthcare provided by the government.*

11. Asthma Management in Low-Income Countries[x]

Asma El Sony, Chiang Chen-Yuan, Nadia Aït-Khaled, Kevin Mortimer, Karen Bissell

Asthma is a major health problem in low- and middle-income countries (LMICs), resulting in unnecessary deaths and disability. Although the uptake of asthma management guidelines has been impressive over the past two decades, with examples of successful systematic strategies in some high-income countries and LMICs (Chapter 6), uptake by other regions and countries is slow, especially in LMICs. This chapter provides a summary of the current challenges facing asthma management in low-income countries (LICs), which also apply to some but not all middle-income countries, and suggests several steps are needed to address these issues.

Special challenges

The goals for successfully managed asthma are the same in all jurisdictions; that people with asthma will have minimal symptoms, minimal side effects from any medicines, and have no lifestyle limitations. However, LICs face extra challenges to reach these goals. In addition to poor access to essential asthma medicines, other challenges include the lack of (i) well-organised health services that can provide long-term care, (ii) Standard Case Management (SCM) (Table 1), (iii) well-trained health professionals and (iv) adequate information systems. To achieve all these vital components where resources are scarce, commitment from governments, non-governmental organisations (NGOs) and global governmental agencies such as the World Health Organization (WHO) are needed.

For everyone with asthma, access to affordable quality-assured, essential asthma medicines is needed, appropriate to the asthma severity, with a β_2-agonist for all and inhaled corticosteroids (ICS) for those with more frequent symptoms. Studies in LICs have found that healthcare workers often don't prescribe ICS when indicated. When ICS is prescribed, patients may abandon the inhaler, inclined to believe that bronchodilators are more effective.

LICs experience more difficulty achieving an uninterrupted supply of essential asthma medicines, having enough well-trained health professionals, well organised health services to provide long-term care, and all the components of SCM. To turn this situation around requires action on several fronts.

Solutions

Correct diagnosis of asthma is of vital importance. Expert clinical assessment by trained health professionals is key. For adults and older children access to quality-assured spirometry (Chapter 12 Spirometry) may be useful in diagnosis and monitoring management. The International Union Against Tuberculosis and Lung Disease (The Union) asthma management guidelines were pilot-tested in nine countries in 1998. The measures were found to be feasible, effective and cost-effective. In four asthma pilot projects (Benin, China, El Salvador and Sudan) organised by The Union and its partners, the training of clinicians in implementation of guidelines and evaluation of outcomes was combined with the procurement of affordable, quality-assured, essential asthma medicines. After one year all countries observed a substantial reduction in asthma severity, visits to emergency services and hospitalisations.

Successful management also depends on promoting adherence of patients to treatment and clinicians to guidelines. Patients need to learn that ICS are not addictive or dangerous. People with symptoms first contact their health centres for assessment, so an effective network of responsible, trained health professionals, combined with adherence to guidelines, is essential.

In Huaiyuan County (China) in 2008 it was found that asthma patients presenting with cough or difficulty breathing were usually diagnosed with chronic bronchitis and treated with antibiotics, systemic steroids, xanthine-derivatives and/or oral β_2-agonists; ICS had never been available. What this project suggested was that asthma may be a hidden disease, yet it was feasible to train health workers to provide SCM for asthma.

In 2017 a combination inhaler of ICS and rapidly-acting long-acting β_2-agonist (LABA) was added on the WHO Essential Medicines List, as a result of efforts led by The Union. This addition has great potential to improve asthma management because the relief of airflow limitation experienced with the rapidly acting LABA delivered at the same time with ICS may encourage greater adherence than that with bronchodilator and ICS in separate inhalers.

Table: Standard Case Management: The eight components

1.	*Diagnosis of asthma*
2.	*Locally appropriate asthma management guidelines*
3.	*Standardisation of treatment according to asthma severity*
4.	*Patient education*
5.	*A simple system for monitoring patient outcomes*
6.	*Appropriate training of healthcare workers*
7.	*Uninterrupted supply of affordable quality-assured essential asthma medicines*
8.	*Evaluation of the asthma programme*

Political commitment needed

In LICs, the huge majority of asthma patients are being treated only on an emergency basis. The main goal of asthma treatment is to achieve and maintain clinical control. Political commitment with appropriate policies is critical for establishing and maintaining the long-term management of chronic asthma with functioning treatment chains and regular follow-up. This will reduce emergency visits, hospitalisations and financial drain, on struggling health systems.

Competitive prices for quality-assured essential medicines are vital to asthma control. However in LICs, they are more likely to be unavailable or of inadequate quality (Chapter 10) due to inadequate government regulation. The inhalers are more likely to be unaffordable, such that an ICS inhaler may cost the equivalent of two weeks wages. A situation analysis in Benin 2008 revealed that only 11% of patients were prescribed ICS, and in El Salvador 2005 and Sudan 2003 ICS were not available. The Union, through its Asthma Drug Facility 2008-2013, worked with several countries running pilot-projects which demonstrated that the price of essential medicines could be markedly reduced (Chapter 10); an illustrative example is in Figure.

Information systems are less likely to be well developed in LICs. Standardised recording and reporting for evaluating treatment results, identifying problem areas and lessons learned, was shown to work in The Union projects.

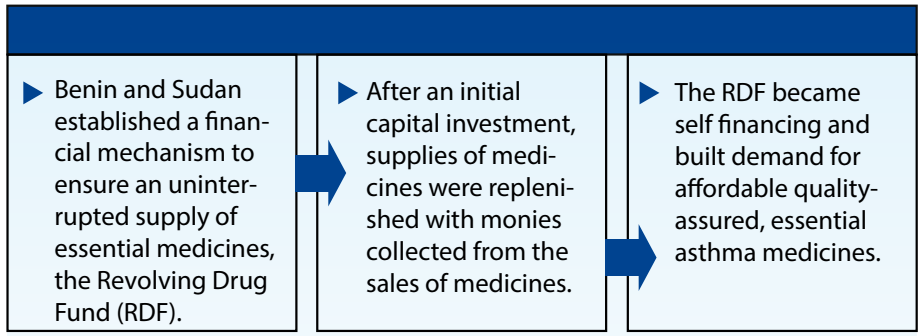
Conclusion

Asthma is an increasing major health problem in LICs. Governments in LICs should increase political commitment by: creating policies which make quality-assured essential asthma medicines available and affordable; adopting all components of SCM; and introducing evidence-based asthma control strategies.

Key Recommendation

Governments and Ministries of Health in resource-poor countries should recognise asthma as an important public health issue, include asthma in all their actions and set up a national programme to improve asthma care in a cost-effective way.

Figure: Example of financial mechanism to maintain supply and reduce cost



Patients are dying of asthma in LICs from lack of effective management. Prompt action is needed from leaders (governments, development partners and technical organisations) to achieve more success stories.

12. Asthma in regions: Country reports from Africa

Introduction

Asma El Sony

The International Study of Asthma and Allergies in Childhood (ISAAC) found that asthma was a greater problem in Africa than had been thought (Appendix A Table). The African country profiles show unmet needs which should be addressed by comprehensively applying asthma Standard Case Management (SCM) (Chapter 11) and improving access to affordable quality-assured essential asthma medicines (Chapter 10).

Benin

Serge Ade, Gildas Agodokpessi, Nadia Aït-Khaled

Comprehensive Approach to Lung Health project.

In 2008, in order to improve the management of asthma in Benin and facilitate better access to quality care, the World Bank, with the technical support of the International Union Against Tuberculosis and Lung Diseases (The Union), implemented the "Comprehensive Approach to Lung Health" project. In 2009, The Union funded the "Asthma Drug Facility", donating essential quality-assured asthma medicines, with the goal of making them affordable for patients. Six health facilities, including the national reference hospital for respiratory diseases, implemented these projects. With the funds injected from these two projects, Benin established a "Revolving Drug Fund" (RDF) to buy asthma medicines and sell them to patients at an affordable price and to ensure regular renewal of the supply of essential asthma medicines. Ten years on, assessment of asthma management in these facilities is uniformly positive, although some challenges still exist.

Main achievements

Since the project started, physicians use simple tools to confirm asthma diagnosis. Medical doctors and nurses provide a daily clinic in the reference hospital for people with asthma and plan for follow-up appointments. Compared to the price in private pharmacies, essential asthma medicines (short-acting bronchodilator and inhaled corticosteroid (ICS)) are low cost. The RDF system is working well, ensuring regular renewal of the supply of medicines. When indicated, those involved in the project prescribe preventers to patients, and systematic training of new staff ensures continuity of care.

Challenges

The high rate of "lost to follow-up" within the cohort remains a concern. Many such patients do not attend follow-up appointments because their asthma improves, while others describe persistent poor control of their disease, resulting in them abandoning ICS treatment. For these patients, prescription of a combination ICS with long-acting β_2-agonist (LABA) bronchodilator (on the World Health Organization Essential Medicines List since 2017) may improve disease control, but the cost of these medicines remains too high. Discussions are ongoing to address these issues.

Patient Story

24 year old Anita received preventer medicine for her asthma, but abandoned it when she lost her job and her income. When she was five months pregnant she had a severe exacerbation and required urgent hospital admission. Patient access to asthma preventer medicines remains a major issue in Benin.

Ghana

Emmanuel Addo-Yobo, Rafiuk Cosmos Yakubu

Effective long-term control of asthma is hampered by the absence of a National Asthma Control Programme.

In the last decade, asthma in Ghana has rapidly increased. The World Health Organization (WHO) estimate in 2004 for asthma disability adjusted life years (DALYs) in Ghana was 1.5/1000 people per year.

Guidelines but no programme

Opportunities for improving asthma prevention and control emerged following the 1992 establishment in Ghana of the Non-Communicable Diseases Control and Prevention Programme. However, Ghana has no specific national strategies for the prevention and control of asthma. Although the Ghana National Standard Treatment Guidelines include asthma, the absence of a National Asthma Control Programme, similar to that employed for infectious diseases like tuberculosis (TB), hampers effective long-term control of asthma in Ghana.

Asthma assessment

Health professionals in Ghana commonly diagnose asthma by history, examination and repeated observations, with limited use of spirometry. Asthma Clinics, recently established in some major hospitals, mostly in southern Ghana, are improving asthma management in their catchment areas. However, dedicated asthma management facilities in other locations are rare. Adolescent asthmatics are a neglected group, as neither paediatricians nor adult physicians see them. Frequent emergency room visits and avoidable deaths occur in children and adults due to poorly controlled asthma more often than severe disease.

Patient Story

After hospitalisation for life-threatening asthma at 5 years of age and regular follow-up asthma clinic visits, 12 year old Sefa now enjoys a normal life. However, being in a family of 11, monthly treatment costs are difficult to sustain being 15% of the annual family income of <US$4,000. Moreover, asthma medicines are not always available.

Priorities for improved asthma management

Controlling tobacco smoking, combating the obesity epidemic, and subsidising medication and devices for asthma management are recognised strategies for asthma control. However, the limited range and prohibitive cost of asthma medications, shortage of asthma management experts, and poor funding for asthma control activities undermine progress in asthma management.

Advocacy

Advocacy for an effective asthma control strategy in Ghana continues in line with Global Asthma Network recommendations. This includes, but is not limited to, the introduction of electronic clinical databases of asthma patients and adequate funding for research to inform effective control strategies.

Kenya

Evans Amukoye, Hellen Meme, Barbara Miheso

Lack of community awareness and asthma misdiagnosis a challenging issue.

Kenya has little prevalence data on respiratory diseases. The Kenya Association for the Prevention of Tuberculosis and Lung Diseases says children are the most affected by asthma. From 1995 to 2001, the International Study of Asthma and Allergies in Childhood (ISAAC) showed an increase in the prevalence of current asthma symptoms in 13-14 year old children from 10.4% to 13.8% (Eldoret) and17.1% to 18.0% (Nairobi).

Awareness

Many Kenyans unknowingly suffer from asthma. There is a lack of community awareness and people underestimate the severity of asthma. Major public hospitals have spirometers for lung function tests, but they are under-utilised, although the testing is inexpensive.

Risk factors

In Kenya, indoor pollution from using wood and charcoal for cooking and exposure to allergens are important factors in asthma.The Kenya Demographic Health Survey 2014 found 74% households use solid fuels, with more than half cooking inside. Animal and poultry-keeping by households in urban areas is on the increase and may be a contributor to asthma. Furry animals and mites in furniture stuffing can also trigger asthma.

Improving diagnosis

Asthma diagnosis remains a challenging issue, with many cases, misdiagnosed and patients given the wrong medicine. In December 2015, GlaxoSmithKline with Amref Health Africa rolled out a programme to train Kenyan frontline healthcare workers on the diagnosis and management of diabetes and asthma in children and this programme is continuing.

Cost of medicines

The management of hypertension, diabetes and asthma in the public sector costs from US$26-$234 annually and US$418-$987 annually in the private sector. This is unaffordable for most Kenyans and as a result their asthma often goes untreated. The World Bank Kenya reported that 4 in 10 Kenyans live below the poverty line, earning less than US$1 a day (<US$365

annually). Despite the high cost of non-communicable disease treatment, the rate of health insurance coverage is low, significantly limiting the affordability of essential medicines for most of the population.

Patient Story

"…I had run away from my husband, so that I go die in my parents' home. I had to stop working at the factory and I could not even do the housework…. Since I came here and started on treatment for asthma three months now, I moved back to my matrimonial home last month...".

Nigeria

Adegoke Falade

Poverty, inadequate resources, weak health systems, and poor infrastructure hamper asthma management.

Challenges in the management of bronchial asthma in Nigeria include poverty, inadequate resources, weak health systems, and poor infrastructure. In the last few decades, different therapeutic regimens and approaches have been employed in treating Nigerian people with asthma.

Figure: Cover page of the Guideline for Asthma Management in Nigeria

Guideline

To streamline various treatment plans among healthcare practitioners, the Nigerian Thoracic Society launched the National Guideline for Asthma Management in Nigeria on 2 May 2017 (Figure). The guideline serves as a reference document for healthcare providers and other stakeholders. There is a plan to systematically evaluate the adoption of the guideline among healthcare practitioners in Nigeria, and determine its impact on reducing asthma morbidity and mortality.

Access to medicines

The challenges which some centres in Nigeria face with access to medicines:

1. The cost of asthma medicines, particularly inhaled corticosteroid (ICS), is prohibitive because up to 70.2% of Nigerians live on less than US$1.00 per day and they have to pay for their healthcare, as they have no insurance coverage.
2. ICS, either in the form of pressurised metered dose inhalers or nebules for delivery through a nebuliser, are not commonly available. The consequence is that all patients needing ICS are given combination drugs (ICS with long-acting β_2-agonists (LABA)), when some could be effectively managed with ICS alone.
3. In under-5 children the combination ICS/LABA inhaled medicine is not considered safe, yet ICS is largely unavailable in Nigeria. Therefore in those who would otherwise be prescribed ICS alone, leukotriene modifiers are employed. However, a proportion of them report side effects necessitating discontinuation.
4. Ipratropium bromide has not been available in the last several months.

Priorities

Asthma diagnostic facilities are essential at all levels of care in Nigeria, and the government should provide them. It is urgently desirable to subsidise asthma medicines in Nigeria, as only a few Nigerians are enrolled in the National Health Insurance Scheme. More importantly, Nigeria urgently needs to improve the availability of ICS for asthma patients.

Doctor Story

"For children under 5 years old who need inhaled corticosteroid the family cannot buy it even when they could afford it. Use of leukotriene modifiers in these children is frequently associated with side effects. This makes management of paediatric asthma difficult."

South Africa

Heather Zar

Despite substantial reductions, asthma death rates in South Africa remain among the highest in the world.

Asthma is the most common chronic illness in South African children and its prevalence is increasing in both urban and rural areas. According to the International Study of Asthma and Allergies in Childhood (ISAAC) Phase Three, asthma prevalence for 13-14-year-olds was 20% in Cape Town (increased from 16% found in ISAAC Phase One) and 18% in Polokwane (Table). Severe symptoms also increased over this time, with approximately half of all children with asthma having severe, uncontrolled symptoms. Amongst 6-7 year old children in Polokwane, the prevalence of asthma symptoms and of severe disease was 11.2% and 5.7%, respectively.

Increasing prevalence

Studies using bronchial hyper-responsiveness (excessive sensitivity of the airway to external stimuli) have also shown an increase in asthma prevalence in both rural and urban settings. Factors associated with asthma prevalence or disease severity in South African children include the adoption of an urban lifestyle, atopy, obesity, respiratory infection, or exposure to industrial pollution or tobacco smoke.

High mortality

South Africa is ranked 25th worldwide for asthma prevalence and is ranked fifth for asthma mortality, with an estimated 18.5 deaths per 100,000 asthma cases (Chapter 5, Figures 1 and 2). Thus, despite substantial reductions in mortality over the past decade, the death rates in South Africa remain among the highest in the world. The lack of appropriate diagnosis, treatment or access to care may be important considerations in tackling asthma morbidity and mortality in South Africa.

Patient Story

A 5 year old child has attended clinic three times with recurrent wheezing and a troublesome cough which have not improved with inhaled asthma reliever. The father is being treated for tuberculosis. There is a family history of asthma. The mother smokes. Whether the child's symptoms are due to poorly controlled asthma or tuberculosis may be a diagnostic dilemma in areas of high tuberculosis prevalence.

Table: Prevalence of current symptoms of asthma (12 month prevalence rate of wheeze) by centre in South Africa in 6 – 7 year and 13 – 14 year age groups as measured on the International Study of Asthma and Allergies in Childhood (ISAAC) Phases One and Three.

	6-7 Years	13-14 Years
	N (% with asthma)	N (% with asthma)
Cape Town (ISAAC One)		5178 (16%)
Cape Town (ISAAC Three)		5037 (20.3%)
Polokwane (ISAAC Three)	2437 (11.2%)	4660 (18%)

Sudan

Rashid Osman

Despite progress, asthma medicine cost still out of reach for most.

In Sudan, asthma is a disease of high prevalence, morbidity and economic costs, which affects 12.5% of children and 10% of adults.

Guidelines

In 2000, Sudan developed National Asthma Guidelines. Being one of the pioneer countries piloting asthma Standard Case Management (SCM) using The Union's model (Chapter 11), Sudan initiated a pilot in district hospitals in Khartoum and Gezira states, commencing in 2007. With funds from the World Bank and technical assistance from The Union and World Health Organization, the pilot evolved into a full project achieving a 97% reduction in asthma-related emergency room and reductions in asthma hospitalisations and asthma severity.

Asthma Drug Facility

When the World Bank funds expired, Sudan benefited from The Union's Asthma Drug Facility, which demonstrated that the price of essential asthma medicines could be markedly reduced (Chapter 10). Following reductions in asthma severity, emergency room visits and hospitalisations, the project gained the Gezira State Ministry of Health's political commitment, benefited from the Revolving Drug Fund (ensuring an uninterrupted supply of essential asthma medicines) and expanded to cover 50% of the eligible hospitals in a plan to cover the whole Gezira state.

Standard Case Management

Despite some challenges, including shortages of inhaled medicines, high turnover of trained staff and high lost-to-follow-up rates, application of SCM led to improved asthma management in Sudan.

Cost of medicines

However, despite this progress emergency rooms remain the basis of asthma management in Sudan. Long-term asthma medicines are not in the National Essential Drug List and costs are exorbitant. For example, the cost of a combination inhaler exceeds the lowest government salary per month by 25% and inhaled corticosteroids alone are almost unavailable nowadays.

The Ministry of Health should recognise asthma as an important public health issue, including asthma explicitly in healthcare planning, and scale up the current project to a nationwide programme to improve asthma care and limit costs.

Patient Story

Ahmed, a 9 year old child from central Sudan, repeatedly admitted to hospital for asthma at least monthly for the past 2 years, and he is clearly in a need of an asthma preventer medicine. Unfortunately, physicians have never prescribed him an inhaled corticosteroid.

Africa-tailored spirometry training course

Lindsay Zurba

Spirometry in Kenya, Uganda and Ethiopia being put into clinical practice and major research projects about asthma.

In 1997, Dr Tom Petty called for widespread distribution of spirometers to measure airflow and air volume for a variety of clinical indications, including asthma. This approach is pertinent in the African context.

There is no job more rewarding than seeing a child encumbered by debilitating asthma freed and living a healthy life, or a group of healthcare professionals inspired and using spirometry for the first time, making considerable change to the care they deliver. It takes a network of teams to make it happen.

Foundational Spirometry Training Programme

The Pan African Thoracic Society (PATS) has developed an international standard Foundational Spirometry Training Programme available for any setting. This uses a blended learning approach, with particular focus on unique African settings and challenges. The first PATS spirometry skills workshop (50 participants) occurred at the inaugural PATS Congress in Nairobi in April 2016 followed by another at the 2017 South African Thoracic Society meeting in Cape Town. Subsequently, in November 2017, Uganda and Ethiopia developed and piloted a full Certificate of Competence Foundational Spirometry course.

The capability built in spirometry in Kenya, Uganda and Ethiopia is already being put into clinical practice and in major research projects about asthma and other non-communicable lung diseases in Africa.

Full course spirometry training

The full course spirometry training takes a minimum of two months to complete and has three stages: online self-study, three days of face-to-face training, and a portfolio of evidence workbook. The training materials, including five standard operating procedures for spirometry, are freely available online, at http://panafricanthoracic.org/.

If you want to walk fast, walk alone; if you want to walk far, walk together (African proverb)

Spirometry trainers encountered challenges in some settings, including availability, age and quality of equipment; language barriers; and the lack of onsite co-worker expertise. PATS, together with in-country partners, are committed to providing

First ever spirometry training in Ethiopia held in Addis Ababa November 2017

spirometry training tailored to the local context, with personalised one-on-one mentorship of all trainees to ensure spirometry competency and to forge an ongoing partnership with programme attendees.

In every community we visit spirometry champions and future spirometry trainers are identified and trained. Africa is a continent of challenges but also a continent of positive change. While the environment may appear challenging, there are great things happening in Africa.

13 Asthma in regions: Country reports from Asia and India

Introduction

Chiang Chen-Yuan

The burden of asthma in Asia and India is substantial, but asthma remains underdiagnosed and undertreated. Many asthma patients are not using inhaled corticosteroids mainly because these medicines may not be accessible, or, if accessible, not affordable. To improve asthma care, implementation of asthma guidelines should be strengthened.

China

Chuanhe Liu, Yuzhi Chen

Social stigma barrier to effective asthma treatment.

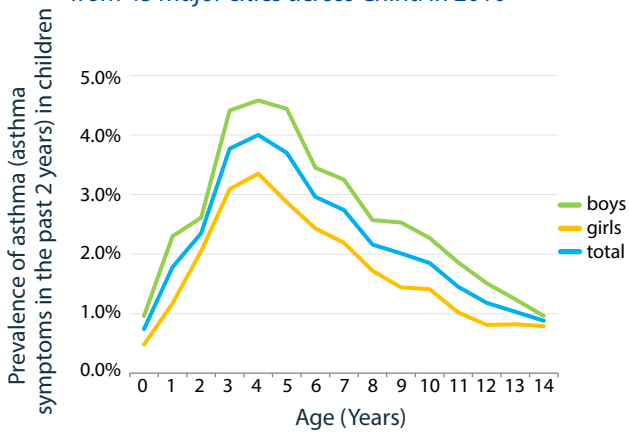
Although asthma is uncommon in China, the population size (1.4 billion) means huge numbers of people are affected.

Prevalence

The Third Nationwide Survey of Childhood Asthma in Urban Areas of China (2010) found that in the 43 cities studied the prevalence of asthma in children under 14 years had increased to 3.0% from 2.0% in 2000. There was large variation between cities: the highest rate of 7.6% in Shanghai and the lowest rate of 0.5% in Tibet. Asthma prevalence was 3.5% in boys and 2.3% in girls. Prevalence of asthma in preschool-aged children was 3.8%, higher than that in infants or school-aged children (Figure).

Respiratory infections triggered asthma symptoms in 90% children. Only 67% of the children with asthma symptoms had asthma diagnosed by a doctor. Inhaled corticosteroid (ICS) use increased from 36% (2000) to 62% (2010), whereas oral corticosteroid use decreased from 74% to 39% over the same period. However, the hospitalisation rate for asthma did not change. Only 14% of children with asthma aged over 5 years used a peak flow meter to monitor disease symptoms.

Figure: Prevalence of asthma (asthma symptoms in the past 2 years) in children under 14 years from 43 major cities across China in 2010



Zhu W-J. Chinese Medical Journal, 2015.

Urban rural differences

In Beijing, the total prevalence of asthma in children aged less than 14 years in rural areas (1.3%) was much lower than in urban areas (3.7%), as was the diagnosis of asthma in those with symptoms (49% versus 74%). Compared with urban asthmatic children (57%), only 36% of rural asthmatic children received ICS. Results of a recent follow-up in urban Beijing found only 19% of children with asthma had symptoms of asthma in the past 12 months after 6 years.

Improvements

The diagnosis and treatment of asthma has improved throughout China. Contributing factors have been the promotion of Global Initiative for Asthma (GINA) guidelines in China since 1994, the establishment of the National Cooperation Group of Children's Asthma, use of asthma action plans, the availability of lung function and peak flow meters in many children's hospitals, and new portable electronic spirometers. However, there is still a long way to go to promote standard treatment. China can achieve this by enhancing disease awareness, reducing stigma, and improving diagnostic, treatment and monitoring skills.

Patient Story

A 4 year old child with recurrent wheezing attended a Tier III hospital to consider asthma diagnosis and management. The specialist suggested an asthma preventive medicine; however, the parent asked "could you NOT prescribe corticosteroids for my child" as they did not want an asthma diagnosis. This can also lead to parents stopping prescribed asthma treatment once symptoms have improved.

India

Virendra Singh

Despite barriers, regular patient education programmes are increasing the acceptability of inhaler treatment.

Among India's 1.31 billion people, about 6% of children and 2% of adults have asthma. Most people do not have health insurance and there is a wide gap in healthcare facilities for rich and poor. Almost all types of inhaled corticosteroids, β_2-agonist and combination inhalers are available at pharmacies but these are expensive in comparison to oral formulations. In 2015, the Indian Chest Society and National College of Chest Physicians published national Indian asthma guidelines. However, medical professionals appear to underutilise these guidelines.

Barriers in treatment

A large number of patients in India still consider asthma a stigma and therefore conceal the disease. Many believe that inhalers are habit forming and strong medicines. Asthma has different deceptive symptomatic names, such as cough and saans (breathlessness). Many patients take treatment when they are symptomatic, or symptoms are intolerable, and stop when symptoms subside. Despite these barriers, with frequent and regular patient education programmes, the acceptability of inhaler treatment for bronchial asthma is gradually increasing.

Reducing mortality

From 1990 to 2005 asthma mortality in India fell, particularly in prosperous states and urban areas where healthcare facilities are better. India's highest mortality, which health authorities are addressing, is in Uttar Pradesh and Rajasthan.

In India, almost 80% of expenditure on a sick patient is on buying medicine, mostly from personal savings.

Since 2011, Rajasthan provided free inhaled asthma medicines at all points of care. Pooled procurement of medicines for 70 million people has reduced the costs to the state.

Rajasthnan initiatives

In Rajasthan (western India), since 2011 most important medicines are provided free to all state patients at government hospitals. The state has undertaken pooled procurement of medicines for Rajasthan's 70 million people, leading to a substantial reduction in procurement cost. Annual spending, including supply chain, personnel and cost of medicine, is around 3000 million rupees (0.5% of the state budget). Across the state, including remote areas, the government opened 15,000 pharmacies. The state provides asthma patients with free metered dose inhalers, dry powder inhaler capsules and nebulizer solution. Many patients have shifted from private to government hospitals, where outpatient and inpatient numbers increased. The outcome is that asthmatic patients are accessing treatment more easily, but compliance issues persist.

National initiative

The Government of India announced in February 2018 that it is planning free health insurance to cover treatment costs for 100 million low-income families.

Indonesia

Cissy Kartasasmita, Rina Triasih

High prevalence of infectious diseases can lead to underdiagnosis and inadequate treatment of asthma.

In Indonesia, a country of 261 million people, geographic and demographic characteristics vary among provinces. National data on emergency visits, hospital admissions, and mortality of childhood asthma are not available. However, studies using the questionnaire from the International Study of Asthma and Allergies in Childhood (ISAAC) determined the prevalence of asthma in children in some provinces (Table). The prevalence differs by province, ranging from 4-11% in 6-7 year olds and from 6-13% in 13-14 year olds.

Table:

Epidemiology studies on childhood asthma in Indonesia (2008–17).

		Subjects		
Study Site	Year	Age(years)	Number	Prevalence
Bandung	2012	7-14	332	9.6%
Jakarta	2008	13-14	10273	12%
	2010	13-14	2023	13%
	2011	13-14	562	9.4%
	2011	13-14	2003	6.4%
Medan	2012	9-12	238	9.7%
Padang	2009	6-7	933	8.0%
Palembang	2008	6-7	1026	8.0%
	2017*	6-7	4007	4.2%
*Semarang**	2013	13-14	900	7.1%
*Yogyakarta**	2016	6-7	2106	11%
	2016	13-14	3445	12%

*Data from personal communication

Some barriers

Infectious diseases in Indonesia are still a significant problem, contributing to a lack of awareness and health worker expertise in the diagnosis and management of childhood asthma. This can lead to underdiagnosis and inadequate treatment of asthma in children. Poor access to asthma medicines worsens the problem. Inhaled bronchodilators and corticosteroids are expensive and, although national insurance covers some medicines, availability is limited in most district hospitals. Leukotriene receptor antagonists and anti-IgE are available but not covered by national insurance. Spacers are often not available, resulting in the use of nebulisers in most provinces, and oral bronchodilator use is common. Asthma education and written asthma action plans are not part of asthma management in Indonesia.

Guideline

The national asthma guideline was updated by the Indonesian Pediatric Respirology Working Group of the Indonesian Pediatric Society in 2015 (adapted from international guidelines), but implementation presents challenges. Diagnosis is clinical, as spirometry is not available in most hospitals. Since 2015, the Indonesian Pediatric Society and Ministry of Health have conducted training on paediatric asthma in some provinces. Efforts are underway to improve the affordability of asthma medicines, e.g. proposing more asthma medications that are covered by the National Health Insurance.

Patient Story

A 5 year old boy has persistent asthma that requires management with an inhaled corticosteroid. The drug is available and covered by health insurance. However, the family cannot afford a spacer. Hence, a homemade bottle spacer is used.

Malaysia

Jessie de Bruyne, Anna Marie Nathan

Social stigma of asthma increases underdiagnosis and inadequate treatment.

Asthma affects many children in Malaysia but it is under-recognised and often goes undiagnosed, and hence inadequately managed. This is, in part, due to the stigma associated with asthma, leading to denial of the diagnosis by patients and caregivers, and hesitancy among medical practitioners to diagnose asthma.

Initiatives

Patient support groups and asthma websites are available in Malaysia. There are periodic media initiatives on asthma, especially around World Asthma Day. Malaysian medical schools teach the recognition and management of asthma. Continuing education initiatives update clinicians with asthma information both on-the-job and at academic meetings.

Guidelines

National clinical practice guidelines, updated in 2014 and 2017, respectively, are available for paediatric and adult asthma. These guidelines highlight the need for preventive treatment and asthma action plans. The paediatric clinical practice guideline encourages the use of metered dose inhalers and spacer devices in the management of asthma. However, a recent survey showed many patients are still receiving oral or nebulised bronchodilators inappropriately.

Medicines free for some

Asthma medication is freely available. Children diagnosed with asthma and attending public schools may receive their prescribed medications, at least inhaled bronchodilators and inhaled corticosteroids, free-of-charge from government healthcare facilities. This is more likely to happen in areas where there are paediatric units.

Patient Story

A 5 year old girl had episodes of cough and breathlessness after colds and running. She responded well to nebulised bronchodilator. There was a strong family history of asthma and atopy. The parents (physicians) believed she had reactive airway disease but were wary of the diagnosis of asthma. Thus, the girl only took the prescribed inhaled corticosteroids or montelukast during acute episodes. There was no asthma action plan or regular medical follow-up.

Thailand

Pakit Vichyanond, Sasawan Chinratanapisit

Despite increased access to medicines, asthma prevalence remains high.

Asthma has been a common disease in Thailand, especially among younger children. However, over the past two decades, severe asthma attacks presenting to emergency rooms and/or requiring hospital admission have decreased. This may be due to an increase in the availability of asthma preventers and controllers throughout the country, especially inhaled corticosteroids and montelukast. For those eligible for medical support (government employees, and those receiving social security and Universal Health Coverage), the Government subsidised cheaper generic versions of asthma medicines in the Essential Medicines List.

Global Asthma Network survey

Despite gains, the 2017-2018 Global Asthma Network (GAN) survey in Thailand found that asthma prevalence in children remains over 10%, with prevalence of severe wheeze at 2%. Therefore, we need further research into utilisation of acute and in-hospital care for asthma.

Air pollution measures

Over the last decade, Thailand has enforced stricter regulations to reduce outdoor air pollution, such as cleaner air emissions and vehicle fuels. Despite this, air quality in major cities in Thailand (Bangkok and Chiang Mai) continues to be at a critical level, especially in cooler months. Thankfully, due to effective advocacy by non-governmental organisations (NGOs), smoking in homes and public places is now a rare event.

Guidelines

The Chest and Allergy Societies in Thailand have regularly updated asthma guidelines for adults and children, and social media has made it easier for parents/patients to find appropriate professional care. Although death due to asthma is becoming more unusual, the recent asthma-related death of a prominent politician led to calls for the provision of asthma action plans by physicians and improved asthma knowledge and procedures in emergency care settings.

Allergy

In recent years, Thailand has noted an increase in the number of patients with food allergy and atopic dermatitis, suggesting that the allergic march may be at play. If this is the case, we would expect to see an increase in the number of asthma patients, rather than a continuing decrease, in the next decade.

Patient Story

A 50 year old woman dentist with latex allergy had breathlessness and nasal congestion for six months. She partly responded to antibiotics, asthma relievers and an inhaled preventer. Her investigations showed high blood and eosinophil counts, and sputum with numerous degranulated eosinophils. She responded well to a short course of prednisolone, resulting in reduction of eosinophil levels.

14 Asthma in regions: Country reports from Latin America

Introduction

Javier Mallol

In Latin America, there have been important advances in asthma, but still needed are: implementation of national asthma programmes with up-to-date public registries, universal access to essential asthma medicines, and education on asthma for parents, patients and health personnel, to improve asthma care from infancy to late adulthood.

Argentina

Hugo Neffen, Álvaro Teijeiro

Improving asthma management at the primary health care level.

Argentina has high asthma prevalence and hospitalisation rates but mortality has fallen over the last 3 decades (Figure). In 2014, the national Ministry of Health (MoH) launched a national programme for the control of chronic respiratory diseases (CRD) in the adult population by strengthening the capacity of healthcare services to detect and manage CRD and improving treatment access.

Asthma prevalence

For children, the International Study of Asthma and Allergies in Childhood (ISAAC) Phase One found the prevalence of current asthma symptoms was 16% in 6-7 year olds, and 11.5% in 13-14 year olds rising to 13.6% in ISAAC Phase Three. In one year olds prevalence of recurrent wheezing was 18.9%. In adults aged 20-44 years, national asthma prevalence was 6.5% using the European Community Respiratory Health Survey questionnaire.

Asthma control

Hospitalisation rates for asthma in Argentina were 15% in 2005 and 17% in 2013, with emergency room visit rates of 43% and 44%, respectively. Thus, many Argentine patients have poorly controlled asthma and it is necessary to identify factors that may improve patient outcomes.

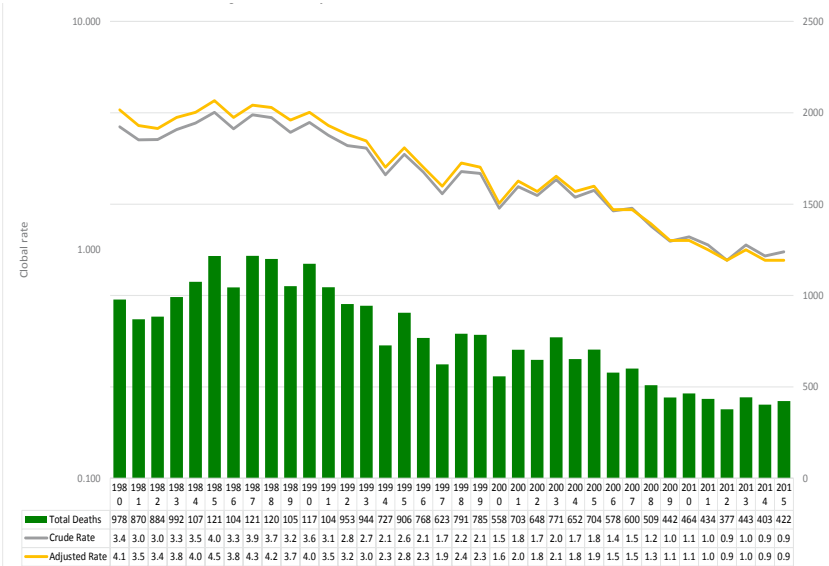
Mortality decreases

The asthma mortality rate has fallen from 3.93% (1980s) to 0.96% (2015). From 1996 to 1999, Global Initiative for Asthma (GINA) assembly members from Argentina developed a national programme to disseminate and implement GINA guidelines which included activities during congresses and meetings organised by Argentine Association of Allergology and Argentine Association of Respiratory Medicine. It also reached 10,000 family doctors, paediatricians and primary care physicians nationally, focusing on early diagnosis and therapeutic recommendations to achieve better asthma control and reduce asthma morbidity and mortality.

Campaign

In 2018, the MoH will launch the zero asthma mortality campaign in the 5-39 year age group which has 40 deaths/year (2014-5). The cause of death, number and severity of exacerbations, quality of care, and therapy during the two previous years will be assessed. It will provide over 1000 spirometers to primary care centres, improving diagnostic capability. The inhaled corticosteroids/long-acting β_2-agonist combination will be included in the universal drug provision system.

Figure: Trends in asthma mortality in Argentina (1980-2015)Age- and sex-adjusted rates, crude rate and number of deaths



Sources: Departmento Programas de Salud. Instituto Nacional de Enfermedades Respiratorias Emilio Coni Administración Nacional de Laboratorios e Institutos de Salud. Database from the Dirección Nacional de Estadisticas de Salud. Argentina. 2017

Patient Story

A 9 year old boy, on budesonide treatment, was admitted to hospital for asthma. The physician recommended switching to inhaled corticosteroid with long-acting β_2-agonist treatment, but the public hospital pharmacy did not stock it. The mother could not afford to buy it at a private pharmacy, so he continued with only budesonide.

Brazil

Dirceu Solé, Álvaro Cruz

No national asthma plan despite continued high prevalence of asthma.

The prevalence of asthma in Brazilian children and adolescents is among the highest in the world and remains unchanged. More than a decade ago the International Study of Asthma and Allergies in Childhood (ISAAC) Phase Three found the average prevalence of current asthma symptoms in adolescents was around 20%. The World Health Organization's World Health Survey database found that 23% of Brazilians aged 18-54 years old had wheezing in the last year. Nevertheless, only 12% had a doctor diagnosis of asthma.

Prevalence remains high

The Ministry of Health's (MoH) National Adolescent School-based Health Survey (PeNSE), included ISAAC questions on asthma for the first time in 2012. PeNSE is a national cross sectional study of 9th grade students, with 109,104 adolescents at public and private schools self-completing a questionnaire. The prevalence of asthma symptoms was again 23% and the prevalence of a medical diagnosis of asthma 12%, similar to previous findings in Brazilian adults and adolescents.

Admissions and mortality

In 2011, asthma was the fourth leading cause of hospital admissions in the country, with the MoH registering 175,000 asthma admissions at all ages. Asthma mortality is still over 2,000 deaths a year. However, the hospital admission and mortality rates are declining in most regions, except for underserved areas of the Northeast. Inhaled corticosteroids, short-acting inhaled bronchodilators and a combination of inhaled corticosteroids and long-acting β_2-agonists are free of charge for the users of the public health system. Although there is neither a national action plan for asthma control in Brazil, nor a priority to build the capacity of primary care teams for asthma, several municipal interventions at the outpatient primary and secondary care levels, have proven effective on symptom control, reducing exacerbations and hospital admissions. These activities could be expanded to further reduce the burden of asthma in Brazil.

Patient Story

A 6 year old boy presented to the emergency department with his third severe asthma attack in one year. He improved with salbutamol by nebuliser, oxygen and intravenous hydrocortisone. Upon discharge, 24h later, he was prescribed oral prednisolone for five days and inhaled salbutamol as needed, but no inhaled corticosteroid was recommended nor was he referred for follow-up.

Chile

Ricardo Sepúlveda, Viviana Aguirre

Despite increased access to medicines, asthma remains underdiagnosed in primary care.

Chile is a middle-income country, with per capita Gross Domestic Product US$24,089 (2015) and health expenditure of US$1,606. The Public Health System covers more than 70% of the population but in the last 15 years, the health expenditure per person was the second lowest in the Organisation for Economic Cooperation and Development (OECD). Chileans have coverage for only 3.2 medical appointments per year, compared to the OECD average of 6.4.

Government programmes

Since the 1990s, the Chilean government has progressively implemented medical programmes to cover common respiratory diseases, including asthma. In 2006, the government established an Explicit Health Guarantees law, ensuring universal access to ambulatory coverage and free inhaled therapy for asthma patients.

Children less than 15 years represent 21% of the population and 6.6% of them receive treatment for moderate or severe asthma. All have free access to salbutamol, inhaled corticosteroids (ICS) and spacers.

Underdiagnosis

In spite of this coverage at primary and specialist care levels, the current challenge is asthma underdiagnosis at the primary care level. This is evident at emergency services or secondary care, where doctors prescribe salbutamol, but not ICS for children with asthma symptomatology.

Adult Respiratory Diseases Units

In 2000, Primary Health Centres established "Adult Respiratory Diseases Units", consisting of a physiotherapist, a nurse and a part-time doctor. All teams had previous training in Chilean national guideline management of asthma, chronic obstructive pulmonary disease and pneumonia. In 2015, there were 133,269 adults with asthma under regular care with these teams, 2.7% of the adult population in the National Health Service; 58% were mild cases, 7% had severe asthma and 55% had well controlled asthma (using the score of Global Initiative for Asthma (GINA)). Over 10 years a progressive reduction in adult asthma hospital admissions resulted, from 22.3/100,000 to 16.3/100,000.

The Chilean experience of providing free access to therapy through an asthma outpatient programme shows a clear impact. Clearly, there is a need to move towards a quality-centred health strategy in Chile.

Patient Story

A 5 year old girl, whose mother has asthma, had recurrent wheeze from 12 months of age. Previously only assessed in primary care, she was hospitalised for an obstructive crisis and diagnosed with asthma. For the first time doctors prescribed inhaled corticosteroids to manage her symptoms.

Colombia

Carlos E. Rodriguez-Martinez

Integral Health Care Routes improving asthma care in Colombia.

In Colombia, a population-based study conducted in 2009–2010 reported an increase in the prevalence and severity of asthma symptoms. This resulted in a significant disease burden to the healthcare system and patients, with more than 60% of patients reporting out-of-pocket expenditures. Thus, suboptimal asthma control was an unmet public health challenge in Colombia.

Public Health Plan

To combat this and other health inequities, Colombia formulated the 2012–2021 Ten-Year Public Health Plan as part of the National Development Plan, with the goal of "achieving equity in health and human development" for all Colombians. The Colombian Ministry of Health and Social Protection then created the Comprehensive Healthcare Model (MIAS), the operative component of the Comprehensive Health Care Policy (PAIS). Both PAIS and MIAS represent a strategic advance by the Colombian health system. It is committed to improving the quality, sustainability, and equity of health by making the individual, the family, and society the focus of healthcare, rather than health providers and insurers. The MIAS includes 10 operational elements for its implementation, among which the Integral Health Care Routes (RIAS) are crucial for guaranteeing the necessary conditions for comprehensive healthcare.

Integral Health Care Routes

The RIAS for asthma comprises three main lines of action.

1. The promotion of respiratory health – through increasing the awareness and strengthening the commitment of governments, the media, the general population, and patients.
2. The comprehensive care of asthma – through promoting the implementation of clinical practice guidelines and ensuring the accessibility and rational use of essential medicines and technologies.
3. Knowledge management and surveillance of asthma – achieved by performing a periodic analysis of asthma mortality, morbidity, disability, and social determinants.

Colombia is currently implementing a national evidence-based paediatric asthma guideline, developed

with broad input from clinical and methodological experts, including economic assessments of the main recommendations.

Patient Story

Marta, whose 6 year old son Santiago suffers from asthma, recently attended an asthma education programme where she learnt about the benefits of the regular use of an inhaler. She is very pleased, as since then Santiago has not been hospitalised for asthma.

Mexico

Blanca Del Rio Navarro, Arturo Berber

Increasing prevalence of asthma, yet underdiagnosis and poor control still major issues.

Mexico is a middle-income country with 80% of its 127.5 million people living in urban areas. The prevalence of asthma continues to increase in Mexico, yet underdiagnosis and poor control of the disease are still major issues.

In the International Study of Asthma and Allergies in Childhood Phase Three, conducted in eight centres, in 6-7 year olds, the prevalence of "wheeze ever" (WE) ranged from 5.5% to 27% and "wheezing in the last 12 months" (W12) from 3.6% to 12.7%. In 13-14 year olds, the figures were 4.1 to 23.7%, and 3.9 to 14.4%, respectively.

Global Asthma Network study

The Global Asthma Network (GAN) Phase I study already has data from four centres. In 6-7 year olds, there is an increase in prevalence of WE in North Mexico City, Toluca and Victoria City, as well as W12 in North Mexico City, Victoria City and Mexicali. In 13-14 year olds, there is increased prevalence of WE in North Mexico City and Mexicali and in W12 only in Mexicali. Within North Mexico City, 26% of possible asthma patients among 6 year olds have diagnosed asthma, of whom 70% have a written plan for treatment.

Access to medicines

The Ministry of Health under Seguro Popular, a public health insurance scheme, provides secondary care for asthma and access to salbutamol, beclometasone, budesonide and montelukast 5 and 10 mg tablets. The other public institutions have broader access to the same medicines, and also fluticasone, salbutamol with ipratropium, tiotropium, and fixed dose combinations of salmeterol/fluticasone, budesonide/formoterol and anti-IgE therapy (omalizumab).

Mexico has a clinical practice guideline for the diagnosis and treatment of asthma developed by a group of specialists and primary care physicians, adapted from international guidelines to the Mexican context.

Political advocacy

On December 2017 Mexican experts in asthma presented in the Senators' Chamber of the Mexican Republic. The discussion included asthma being an important public health problem with increasing prevalence, and mortality; the necessity of a wider basic catalogue of asthma medicines and more well-trained physicians able to care for first and second level allergy patients; patients' and parents' experiences; the project of the Mexican Official Standard for the practice of Allergology.

Patient Story

Gabriel is 8 years old and he has suffered more than six asthma attacks during the last 12 months, resulting in several hospital admissions. His treating physician prescribed inhaled corticosteroids but the family cannot afford to buy the medicine regularly because of their low income.

15. The role of patient advocacy

Tonya Winders

Asthma prevention and control efforts are of worldwide importance due to the high global burden of asthma. The 2011 United Nations High-Level Meeting on non-communicable diseases (NCDs) shifted global health priorities to include asthma along with other NCDs. Thus, asthma advocacy programmes that involve patients, caregivers, and nongovernmental organizations (NGOs) have increasing opportunities for global impact.

Patient advocacy can ensure integration of patient viewpoints into planning and policy decisions.

What is advocacy?

Advocacy is a systematic approach to promoting asthma-related issues and motivating others to take action. Asthma patient advocacy is a framework to ensure meaningful involvement of the community in decisions affecting patient lives. It is also deeply rooted in the concept of empowerment whereby asthma patients are encouraged to understand their own needs and actively participate in their asthma management, thus empowering them to better shape the direction and events of their lives. Patient advocacy can improve access to treatment, raise awareness of the value of prevention and management of asthma, and ensure the integration of patient viewpoints into planning and policy decisions.

Asthma advocacy around the world

The history and impact of asthma advocacy varies globally. In high-income countries, asthma advocacy organisations have existed for over sixty years, raising asthma awareness while increasing levels of understanding and patient engagement. In North America, asthma advocacy groups have significant influence over policymakers, researchers, and healthcare providers. Advocacy is critical to the healthcare paradigm shift from illness-centred to patient-centred care, where patients and families actively participate in their care and in the creation of services and policies. Throughout Europe and Australasia, asthma advocacy organisations have advanced clinical and translational research while providing millions

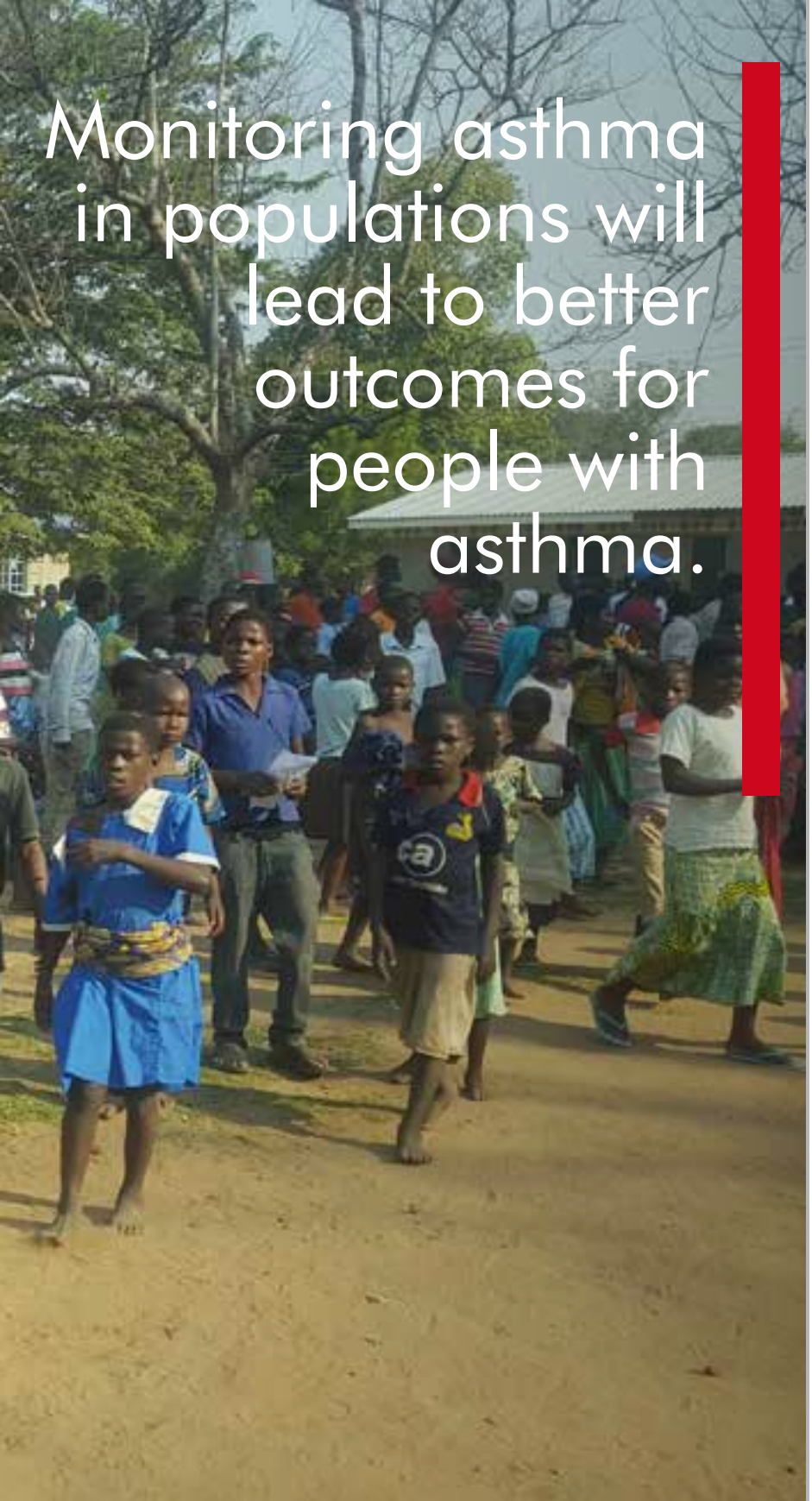
of patients with an opportunity to connect, grow and learn. In low- and middle-income countries (LMICs), patient advocacy efforts are emerging, particularly in Africa and Latin America. There are significant challenges to asthma management in LMICs and patient advocacy is an important component of providing local context and improving asthma outcomes.

Asthma advocacy at all levels

Asthma policy advocates work in parallel with policymakers and patients to affect change. Forums, such as the Global Allergy and Asthma Patient Platform (www.ga2p2.org), connect asthma stakeholders, including patients, caregivers, healthcare professionals, NGOs, media, industry, government leaders, and researchers. By working collaboratively these groups raise awareness of key patient challenges, improve access to care and provide infrastructure for asthma care; provide laboratory, training, and other support facilities; ensure reliable supplies of asthma medicines and devices; can provide professional training or trained staff; and establish mechanisms to distribute resources and expertise to people who need them.

Key Recommendation

Health professionals and policy makers should encourage patient advocacy to improve asthma outcomes.



PART THREE:

ASTHMA - A GLOBAL PRIORITY

16. Asthma as an NCD Priority

Neil Pearce, Javier Mallol, Asma El Sony, Guy Marks

The asthma epidemic experienced by high-income countries over the past 30 years is an increasing problem in low- and middle-income countries (LMICs) as they become more urbanised. Non-communicable diseases (NCDs), including asthma, have emerged as a major global public health problem. There are current challenges facing asthma surveillance, prevention, and management worldwide for which solutions are suggested here.

Asthma is an important NCD in all regions of the world, affecting people in low- and middle-income countries as well as high-income countries.

Asthma is an important NCD

Asthma has become an issue of international development as its economic and social costs have been recognised. Whilst communicable diseases such as pneumonia, tuberculosis, HIV and malaria are still major health problems for many LMICs, NCDs have emerged as a serious problem. Authorities believe that NCDs will be responsible for tomorrow's pandemics. The majority of people with NCDs live in LMICs, and in some LMICs asthma is more common than in high-income countries.

Globally, NCDs outstrip communicable diseases as the leading cause of death. Forty million deaths, or 70% of all deaths worldwide, are attributable to NCDs, with 80% occurring in developing countries. Chronic respiratory diseases (CRDs), including asthma, cause 15% of world deaths. Many CRDs have their origins in childhood illnesses, including asthma, which tobacco smoke exposure may aggravate.

In 2011, 2014 and 2018 the United Nations (UN) High-level Meetings on NCDs recognised the global importance of NCDs and advocated solutions. This NCD work by the UN preceded, and is separate from, the UN Sustainable Development Goals (Chapter 17). Following the 2011 UN Summit on NCDS, the World Health Organization (WHO) identified the burden and suffering caused by CRDs as a priority issue, publishing the WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020, and the WHO NCD Global Monitoring Framework. These included five interventions to tackle NCDs. Two of these – tobacco control, and essential medicines and technologies – will directly reduce the burden of asthma. A third priority aimed at reducing obesity – improved diets and physical activity – is likely

to be beneficial for asthma as a relationship between obesity and asthma is becoming evident. The actions required to make asthma a greater NCD priority are summarised in the Table.

Surveillance of asthma and its determinants

We know that asthma is a serious global health issue because health researchers (paediatricians, respiratory physicians and epidemiologists) in 306 centres in 105 countries, wanting to estimate how large the problem was for children in their locality, joined the International Study of Asthma and Allergies in Childhood (ISAAC) research programme. ISAAC found that asthma affects about one in seven of the world's children. Through ISAAC (children) and the European Community Respiratory Health Survey (ECRHS) (adults), and with the recent estimates from the Global Burden of Disease (GBD) Study, we know that asthma is an important NCD (Chapter 3). WHO has resolved that there needs to be "better surveillance to map the magnitude of CRDs and analyse their determinants with particular reference to poor and disadvantaged populations and to monitor future trends". Thus, surveillance of asthma is globally relevant, and can be achieved on a regular basis by the use of simple instruments. The work of ISAAC is continued by the Global Asthma Network (GAN), with many locations currently conducting GAN Phase I (Chapter 1), which will provide updated prevalence, severity and risk factor information in children and adolescents, as well as new data in adults, and will explore management approaches.

Asthma research in the context of NCDs

Asthma research lags behind research for other NCDs, such as cardiovascular disease, and needs further investment. A key challenge is to identify modifiable environmental risk factors suitable for public health interventions that can reduce the morbidity and severity of asthma worldwide. An important emerging problem is preschool asthma and recurrent wheeze in infants, which is highly prevalent and has greater severity in developing countries.

Medicines for asthma

Universal access to affordable, quality-assured medicines for NCDs is essential. The WHO NCD Global Action Plan 2013-2020 set an 80% target for availability of essential NCD medicines in public and private facilities by 2025, but this is not being achieved for asthma. Access to affordable medicines, appropriate to the severity of their asthma, is needed – a β_2-agonist reliever for all people with asthma, and an inhaled corticosteroid (ICS) preventer for those with more frequent symptoms. These essential medicines, particularly ICS, are

TABLE: ACTIONS REQUIRED TO ENSURE ASTHMA BECOMES A GLOBAL PRIORITY:

Asthma is a major global health problem.

We know it is – world leaders please action all the recommendations in this report.

Asthma is one of the most significant NCDs globally and NCD priority actions will help prevent asthma.

Keep asthma highlighted among NCDs, with morbidity prioritised along with mortality.

Asthma monitoring needs to be ongoing.

All countries should conduct asthma surveillance, updating trends regularly.

Nearly half of the world's countries have not studied asthma – it is essential to understand asthma in ALL countries.

Economic prosperity will be helped by correctly treating asthma, especially in non-affluent countries.

Measure the economic impacts of asthma, and the impact of adequate management, within countries and globally.

More asthma research is needed, including:

- *Identifying the causes of asthma, especially in low- and middle-income countries;*
- *Definition and management of asthma in infants and preschool children;*
- *Understanding links between asthma in children and adolescents and development of COPD;*
- *Understanding how asthma phenotypes (i.e. subgroups of asthma) vary around the world, and whether risk factors differ.*

Universal access to affordable quality-assured asthma medicines, delivery devices, and medical care.

Develop policies to enable access to affordable, good quality medical care and quality-assured asthma medicines for all people with asthma worldwide.

not available or affordable to many patients or the health service in many countries (Chapter 10). Those who are undertreated become disabled, missing increased days of school or work, or die from asthma. Thus, asthma is a factor increasing poverty for individuals and countries, particularly LMICs.

Health services for asthma as an NCD

Another obstacle for the management of NCDs, including asthma, is the lack of health services organisation for long-term management of patients requiring regular follow-up. In many settings, asthma and other NCD treatment only occurs in an emergency. To reduce the burden of NCDs, governments must commit to addressing 'neglected NCDs', such as asthma, organise health services and train healthcare personnel to effectively diagnose and manage asthma and other NCDs at a primary or secondary care level.

Key Recommendation

Governments should include asthma in all their actions resulting from the WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020, and the WHO NCD Global Monitoring Framework.

17. Asthma and the UN's Sustainable Development Goals 2030

Chiang Chen-Yuan, Innes Asher, Javier Mallol, Nils Billo

The United Nations' (UN) 2030 Agenda for Sustainable Development, aiming to transform our world, has set 17 Sustainable Development Goals (SDGs) and 169 targets. Among the SDGs, Goal 3 "ensure healthy lives and promote well-being for all at all ages" specifically addresses health priorities. Several targets and indicators address many of the issues to reduce the global burden of asthma, but there is an overemphasis on mortality rather than disability.

The Strategic Development Goals' focus on mortality alone does not capture morbidity and the imperative to reduce the burden of asthma.

Goals

Building on the Millennium Development Goals that expired in 2015, the SDGs were endorsed by Heads of State and Government, and High Representatives at the UN Headquarters in New York in September 2015. The vision of the SDGs is ambitious: a world free of poverty, hunger and disease; a world where all life can thrive; a world with equitable and universal access to quality education at all levels, healthcare and social protection; and a world that assures physical, mental and social well-being for all. The SDGs, which came into effect on 1 January 2016, will guide global development actions until 2030.

Reduce premature mortality

Goal 3 has 13 Targets, in which Target 3.4 "By 2030, reduce by one third premature mortality from non-communicable diseases (NCDs) through prevention and treatment and promote mental health and well-being" is particularly relevant for asthma. Indicator 3.4.1 assesses the mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease (including asthma and chronic obstructive pulmonary disease). In 2015, deaths due to NCDs were 40 million, 70% of 56 million deaths globally. The major causes of death were cardiovascular disease (17.7 million), cancer (8.8 million), chronic respiratory disease (3.9 million), and diabetes (1.6 million). The risk of dying from one of the four main NCDs

between 30 and 70 years old decreased from 23% in 2000 to 19% in 2015.

Although Target 3.4 includes chronic respiratory disease (asthma and chronic obstructive pulmonary disease (COPD)), it monitors mortality but not morbidity. Air pollution (Target 3.9) is associated with asthma attacks, but Indicator 3.9.1 "mortality rate attributed to household and ambient air pollution" also monitors only mortality. Focusing on mortality alone is not sufficient to capture the economic and personal burden of asthma. Asthma causes considerable morbidity and frequently affects the quality of life of asthma patients, especially those with poorly controlled asthma. To understand the burden of asthma, we need monitoring of emergency room visits and hospitalisations due to asthma attacks.

Universal health coverage

Target 3.8 states "Achieve universal health coverage (UHC), including financial risk protection, access to quality essential healthcare services and access to safe, effective, quality and affordable essential medicines and vaccines for all". Indicator 3.8.1 monitors coverage of essential health services (including NCDs), and Indicator 3.8.2 monitors the "proportion of population with large household expenditures on health as a share of total household expenditure or income". This target will address the financial barriers experienced by asthma patients and their families.

UHC is one of the key drivers of Goal 3, and health workers are the backbone of UHC. Target 3.C "Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries" is highly relevant for asthma. Indicator 3.C.1 monitors health worker density and distribution, but training is also crucial. Health workers require training in the diagnosis and management of asthma, and capacity building of health workers at the first referral level is crucial for decentralisation of asthma care.

Quality-assured asthma medicines

A significant burden for asthma is the lack of availability and affordability of quality-assured asthma medicines. Target 3.C states "Support the research and development of vaccines and medicines for the communicable and NCDs that primarily affect developing countries" and specifically highlighting "provide access to affordable essential medicines and vaccines in accordance with the Doha Declaration on the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on TRIPS regarding flexibilities to protect public health, and, in particular, provide access to medicines for all". This clearly acknowledges the fact that some essential medicines may not be affordable in resource-limited settings, in part due to trade-related issues. Studies have reported that inhaled bronchodilators are widely available in developing countries but not inhaled corticosteroids. Although inhaled bronchodilators provide quick symptom relief, they do not effectively address the underlying problem of airway inflammation. Management of asthma requires inhaled corticosteroids (see Chapters 8 and 10). For Indicator 3.C.3 "proportion of health facilities that have a core set of relevant essential medicines available and affordable on a sustainable basis", it would be particularly important to ensure essential asthma medicines are available and affordable on a sustainable basis in resource-limited settings.

Conclusion

"No one will be left behind" is the fundamental spirit of the SDGs. Globally, the number of people living with asthma is substantial. Asthma is a major chronic respiratory disease that not only results in death but also causes substantial suffering and reduced productivity; yet, asthma can be managed. The monitoring framework of SDGs in all countries should ensure effective management of asthma using affordable and quality-assured essential asthma medicines.

Key Recommendation

Achieve Strategic Development Goal 3 "ensure healthy lives and promote well-being for all at all ages" in all countries to lessen the global burden of asthma.

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Glossary of Abbreviations

ADF	*Asthma Drug Facility*
CRDs	*Chronic Respiratory Diseases*
COPD	*Chronic Obstructive Pulmonary Disease*
DALYs	*Disability Adjusted Life Years*
EML	*Essential Medicines List*
FIRS	*Forum of International Respiratory Societies*
GAN	*Global Asthma Network*
GARD	*Global Alliance against Chronic Respiratory Diseases*
GBD	*Global Burden of Disease Survey*
GINA	*Global Initiative for Asthma*
HICs	*High-Income Countries*
ICS	*Inhaled Corticosteroids*
ISAAC	*International Study of Asthma and Allergies in Childhood*
LABA	*Long-Acting β_2-agonist*
LICs	*Low-Income Countries*
LMICs	*Low- and Middle-Income Countries*
MIAS	*Comprehensive Health Care Model (Colombia)*
MoH	*Ministry of Health*
NCDs	*Non-Communicable Diseases*
NGO	*Non-Governmental Organisation*
OECD	*Organisation for Economic Cooperation and Development*
PAIS	*Comprehensive Health Care Policy (Colombia)*
PATS	*Pan African Thoracic Society*
PeNSE	*National Adolescent School-based Health Survey (Brazil)*
RDF	*Revolving Drug Fund*
RIAS	*Integral Health Care Routes (Colombia)*
SABA	*Short-Acting β_2-agonist*
SCM	*Standard Case Management*
SDGs	*Sustainable Development Goals*
The Union	*The International Union Against Tuberculosis and Lung Disease*
TRIPS	*Trade-Related aspects of Intellectual Property Rights*
UHC	*Universal Health Coverage*
UN	*United Nations*
WHO	*World Health Organization*
YLD	*Years Lived with Disability*
YLL	*Years of Life Lost*

Table: Prevalence of current symptoms of asthma by world region in 6 – 7 year and 13 – 14 year age groups as measured in the International Study of Asthma and Allergies in Childhood (ISAAC) Phase Three.

Region	6-7 Year Age Group			13-14 Year Age Group		
	Participants (n)	Current symptoms of asthma (n)	Current symptoms of asthma (%)	Participants (n)	Current symptoms of asthma (n)	Current symptoms of asthma (%)
Africa	5865	589	10.0	66308	10168	15.3
Asia-Pacific	59979	5719	9.5	99634	8731	8.7
Eastern Mediterranean	40573	3824	9.4	51705	4801	9.2
Indian Sub-Continent	50092	3392	6.7	55783	3884	6.9
Latin America	93774	16256	17.3	165900	26350	15.9
North America	4012	767	19.1	141009	30427	21.6
Northern and Eastern Europe	42548	3715	8.7	72057	7009	9.7
Oceania	13888	3020	21.7	36299	6301	17.4
Western Europe	77722	7487	9.6	107673	15483	14.4
Global Total	**388 811**	**44 799**	**11.5**	**798 685**	**112 630**	**14.1**

Source: Lai et al. Thorax 2009.

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