

Global Asthma Network Survey Suggests More National Asthma Strategies Could Reduce Burden of Asthma

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Abstract

Background

Several countries or regions within countries have an effective national asthma strategy resulting in reduction of the large burden of asthma to individuals and society. There has been no systematic appraisal of the extent of national asthma strategies in the world.

Methods

The Global Asthma Network (GAN) undertook an email survey of 276 principal investigators of GAN centres in 120 countries, in 2013-2014. One of the questions was: *“Has a national asthma strategy been developed in your country for the next five years? For children? For adults?”*.

Results

Investigators in 112 (93.3%) countries answered this question. Of these, 26 (23.2%) reported having a national asthma strategy for children and 24 (21.4%) for adults; 22 (19.6%) countries had a strategy for both children and adults; 28 (25%) had a strategy for at least one age group. In countries with high prevalence of current wheeze strategies were significantly more common than in low prevalence countries (11/13 (85%) and 7/31 (22.6%) respectively, $p < 0.001$).

Interpretation

In 25% countries a national asthma strategy was reported. A large reduction in the global burden of asthma could be potentially achieved if more countries had an effective asthma strategy.

Introduction

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3 Asthma is a common chronic disease affecting an estimated 241 million children and adults
4 in the world according to the estimates of the Global Burden of Disease 2013 (1), which
5 also . estimated that asthma was the 15th highest ranked cause of Years Lived with
6 Disability (1). Many people with asthma are unnecessarily disabled, because they are not
7 receiving optimal asthma management (2). In 2013, it was estimated that about 22 million
8 disability-adjusted life years are lost because of asthma (3). The International Study of
9 Asthma and Allergies in Childhood (ISAAC) found that the historical view of asthma being a
10 disease of high-income countries (HICs) no longer holds: most people affected are in low-
11 and middle-income countries (LMICs), and asthma prevalence is estimated to be increasing
12 fastest in those countries (4), where most of the world's people live.

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20 To reduce the burden of asthma, several HICs and LMICs have developed an asthma
21 strategy (or an asthma programme which is the terminology used by some countries) at a
22 national or regional level which have resulted in rapid reduction of the ill-effects of asthma
23 (5). The strategies or programmes are formalised with political engagement and
24 commitment. Implementation of such strategies includes relatively simple measures which
25 are consistently applied in the relevant population, to improve early detection of asthma and
26 provide access to effective anti-inflammatory treatment. Extension of this approach to other
27 countries or regions within countries could be of great potential benefit to reducing the
28 burden of asthma in the world.

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36 The first comprehensive national asthma strategy was developed in Finland in 1994 and has
37 served as a model for other countries. They developed and called it a comprehensive
38 nationwide Asthma Programme and over the next decade this lessened the burden of
39 asthma on individuals and society and more than halved the total asthma costs (healthcare,
40 drugs, disability, and productivity loss) (6, 7) and these benefits have continued (8). This
41 model was followed several years later by several other national strategies within the
42 European Union (9) including France (10), Portugal (11), and Spain (12). In other places,
43 independent approaches have been used with improved outcomes, including Australia (13),
44 the city of Salvador, Brazil (14), Canada (15), Costa Rica (16), Singapore (17), Tonga (18)
45 and Turkey (19).

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54 However, there are few reports of such strategies, suggesting that in many countries there is
55 no strategy or it has not been implemented. However there has been no systematic
56 appraisal of the numbers of countries in the world which have a national asthma strategy.
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59 The Global Asthma Network (GAN) was established in 2012, a collaboration between
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1 individuals from ISAAC and the International Union Against Tuberculosis and Lung Disease
2 (The Union). Its goals are to improve asthma care globally, with a focus on low- and middle-
3 income countries (20), through enhanced surveillance, research collaboration, capacity
4 building and access to quality-assured essential medicines. Given the large number of
5 centres and countries involved with GAN, it was well placed to undertake such a survey.
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9 Based on the low number of national asthma strategies reported in the literature, our
10 hypothesis was that most countries in the world do not have a national asthma strategy.
11 GAN has collaborators in more than half of the world's countries, which enabled a simple
12 survey to be undertaken to answer a question about whether a country had a national
13 asthma strategy for children and adults.
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17 **Materials and Methods**

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19 A cross-sectional survey of GAN centres was carried out between April 2013 and July 2014.
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21 A GAN centre was one where an Expression of Interest form had been submitted to the
22 GAN Global Centre (Auckland). The survey was by email survey and was sent to each
23 centre's principal investigator by the GAN Research Manager (PE). The survey was sent to
24 GAN principal investigators in 276 centres in 120 countries; 46 were HICs and 74 LMICs,
25 defined by the criteria used by the World Bank for the period 1 July 2013 - 30 June 2014
26 (21).
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34 The survey form had eight questions, the last one of which was *"Has a national asthma*
35 *strategy been developed in your country for the next five years? For children? (Yes/No/Don't*
36 *Know), For adults?" (Yes/No/Don't Know)*. The former seven questions were about national
37 asthma management guidelines in their country (not included in these analyses).
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42 Where conflicting answers were given by two or more investigators from different centres
43 within a country, the GAN Global Centre staff entered into a discussion via email with the
44 centre investigators until agreement between them was reached.
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48 Country findings were compared with the prevalence of asthma symptoms in 13-14 year olds
49 in countries where this had been estimated in ISAAC Phase Three (22). Countries were
50 categorised as high prevalence if the prevalence of current wheeze was >20%, and low
51 prevalence if the prevalence of current wheeze was <10%. The relationship of national
52 asthma strategies to changes in country prevalence of asthma symptoms in 13-14 year olds
53 in countries where this had been estimated in ISAAC Phase Three (4) was also examined.
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1 The data were entered into an excel spreadsheet and checked for apparent inconsistencies
2 which were reconciled if appropriate. Simple descriptive analyses were undertaken. The Chi-
3 Squared test was used to compare responses about strategies between LMICs and HICs,
4 and high and low prevalence countries with those answering 'Yes' compared with those 'not
5 answering Yes' ('No' or 'Don't know')(23).
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9 **Results**

10 Of the 276 centre principal investigators in 120 countries, 213 (77.2%) investigators in 112
11 (93.3%) countries completed the national asthma strategy question. There were no
12 responses from any investigators in eight countries who were approached: three HICs and
13 five LMICs.
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19 Conflicting answers were obtained from two or more centres in 16 countries, and agreement
20 was subsequently reached. Of the 112 countries, 43 (38.4%) were HICs including 48.3% of
21 the world's 89 HICs; 69 (61.6%) were LMICs including 48.2% of the world's 143 LMICs
22 (Table).
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27 Of those 112 countries where the national asthma strategy questions were answered for
28 children, 12 reported 'Don't Know', seven in HICs and five in LMICs. For adults, 16 reported
29 'Don't Know', 11 in HICs and five in LMICs.
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33 Of the 112 countries, 26 (23.2%) reported a national asthma strategy for children, 24
34 (21.4%) reported a national asthma strategy for adults, and 22 (19.6%) countries had
35 strategies for both children and adults. Twenty-eight (25%) had a national asthma strategy
36 for at least one age group. These are illustrated in the Figure.
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41 Of the 28 countries who reported a national asthma strategy for at least one age group 15
42 (53.6%) were HICs and 13 (46.4%) LMICs. Strategies were reported in 15/43 (34.9%) HICs
43 and 13/69 (18.8%) LMICs; these differences were not significant $p=0.057$.
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47 In 81/112 (72%) countries the prevalence of asthma symptoms had been estimated in
48 ISAAC. Any national asthma strategy was significantly more common in countries with high
49 prevalence of current wheeze ($>20\%$) than low prevalence ($<10\%$): 11/13 (85%) and 7/31
50 (22.6%) respectively, $p<0.001$, with the remaining 37 countries having prevalence 10-20%.
51 Of the 49 countries in whom time-trends in the prevalence of asthma symptoms had been
52 estimated in ISAAC, any national asthma strategy was equally common in those whose
53 prevalence rose (11/30) and in those in whom it fell (6/19) $p=0.72$.
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60 **Discussion**

1 In this email survey of about half the worlds' countries GAN was able to confirm our
2 hypothesis that most countries in the world do not have a national asthma strategy; only
3 about one in four countries reported that they had a national asthma strategy. Of potential
4 concern was that the proportion of LMICs with a strategy was lower than HICs, although this
5 was not statistically significant.
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9 About three in four countries surveyed by GAN had the prevalence of asthma symptoms
10 measured in ISAAC, and of these, having a national asthma strategy was significantly more
11 common in countries with high prevalence compared with low prevalence of current wheeze.
12 While on the face of it this seems logical – more asthma symptoms, more concern to take
13 action to address the issue - there are three caveats. Firstly, many of the countries with a
14 low prevalence of asthma symptoms and no national asthma strategy have very large
15 populations; for example Brazil, China, Indonesia, Mexico, Philippines each of which has
16 >100 million people and is among the top 12 most populous countries in the world in 2015
17 (24). Small improvements in the management and outcomes for people with asthma in each
18 of these countries would have a relatively big impact on the global numbers of people
19 burdened by asthma. Secondly, in this survey one in four countries had not measured their
20 asthma prevalence, which illustrates either their lack of interest in asthma or perhaps they
21 had experienced difficulties engaging in world-wide epidemiological studies. Thirdly, the
22 ISAAC data is already 13 years old (2002-3) and thus not coincident with this survey, so the
23 interpretation needs caution.
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26 This is a very large study, a high response rate of 93% was achieved, data was reported
27 from 112 countries, and the countries which responded were about half the world's HICs and
28 LMICs. The response rate was high because of the close relationship between the GAN
29 Global Centre and GAN Principal Investigators.
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32 The recommended components of a successful national asthma strategy include:
33 government commitment, policies and legislation (e.g. tobacco reduction), management by
34 the health ministry, funding and capacity building, registry of outcome data before and after
35 implementation (prevalence, severity, asthma control, hospitalisations, mortality), asthma
36 management guidelines adjusted for the country, access to medical care and quality-
37 assured, affordable, essential asthma medicines available for everyone with asthma,
38 education of the public, continued education of health professionals, economic analyses,
39 process and outcome evaluation, follow-up programmes, and continued asthma research (5,
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There may be different interpretations of the term 'national asthma strategy' which is also synonymous with the term 'national asthma programme'. National asthma management guidelines alone should not be considered a national asthma strategy or programme, although they form an essential part. In this particular survey national asthma management guidelines alone were unlikely to be confused with strategy, because they were asked about in the preceding seven questions in the survey. However, the survey is likely to have missed asthma strategies which were not country-wide; these would be more likely in a very large country like Brazil or China. Additionally, some national asthma 'programmes' may not have been interpreted as 'strategies' for the purpose of this survey.

In the review of national and regional asthma strategies in Europe (9), a systematic search of the English literature in 2014 found only eight published national and regional asthma strategies in European Union countries: Finland (7), France, Ireland, Italy, The Netherlands, Lodz area of Poland, whole of Poland and Portugal (11), with only three strategies having been evaluated (Finland, Poland, Portugal). Outside the European Union, asthma strategies have been identified from only eight other countries (13-19, 25).

There are likely to be many reasons for the low level of publication of national asthma strategies where they exist, including poor preparation with insufficient documentation, dissemination, implementation or evaluation, lack of appropriate training of primary health care professionals in diagnosis and treatment, poor access to quality-assured, essential asthma medicines, poor outcomes, unable to prepare an article for publication in English, and publication bias. The absence of a national asthma strategy may reflect that asthma is not recognised as a serious public health problem, a lack of asthma prevalence, severity and mortality data, a lack of government prioritisation of asthma among other non-communicable diseases, lack of national health coordination, and/or a lack of government commitment to improving national health issues.

Not all national asthma strategies have been successful. Selroos and others have suggested that good results can also be achieved without a formal national asthma strategy, as long as evidence-based management guidelines are implemented and widely used (9). This is happening, for example, in Sweden, where recommendations (in Swedish) for diagnosis and treatment have been issued and updated by the National Board of Health and Welfare (26). The Swedish Asthma and Allergy Foundation has recently issued a comprehensive national strategy document. It has been estimated that global asthma deaths (all ages) reduced from 504,300 in 1990 to 489,000 in 2013 (27), but many countries do not report asthma deaths separately (28). In Europe asthma mortality decreased from 6441 to 1164 cases (82%) from 1990-2012 (29).

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In 2009, a group of experts in asthma care, the Advancing Asthma Care Network, reviewed asthma projects and strategies in Argentina, Australia, Brazil, China, Japan, Mexico, the Philippines, Russia, South Africa, and Turkey (30). All successful asthma strategies improved early diagnosis and the introduction of first-line treatment with anti-inflammatory medication, improved long-term disease control nationally, introduced simple means for guided self-management to proactively prevent exacerbations/attacks, and had effective education and networking with general practitioners, nurses and pharmacists. A systematic approach was recommended, aiming to motivate and organise, and improvements which could be achieved with relatively simple means. When multidisciplinary actions are being planned, all the main stakeholders should be represented.

A more limited approach to improving asthma outcomes has been used successfully in pilot projects in LMICs, using ‘standard case management’, a term which “*encompasses diagnosis of asthma, standardisation of treatment according to severity based on asthma guidelines, and patient education, coupled with a simple system for monitoring patient outcomes. Appropriate training of health care workers and availability of essential asthma medicines are key to the effectiveness of standard case management.*” (31). Pilot studies in 2007-8 of the feasibility and effects of standard case management were applied in Benin (32), Haiyuan County, Anhui Province, China (33), and Sudan (34) reduced hospitalisations in those completing the study. In El Salvador 2005-2010 (35), by using Practical Approach to Lung Health and essential asthma medicines free of charge, the number of patients being referred from primary to secondary or tertiary level dropped by 60%, with greater convenience for patients, and savings for health services.

Political engagement, leadership and commitment are key components for developing an effective national asthma strategy, and these are challenging and may not be easily achieved. The literature supports the view that programmes (strategies) are more likely to be successful where this has occurred. The political organisation and health leadership in a country would undoubtedly influence the chance of success, as would co-ordinated access to affordable, quality-assured, essential asthma medicines. Identifying a political champion is a critical factor, and may be easier in some localities than others. In 2010 the Global Initiative for Asthma (GINA) launched a challenge to countries to reduce hospitalisations by 50% over 5 years (36) but the results have been modest. The motivation to tackle the asthma burden is not always self-evident, e.g. in places where private health-care dominates and hospitals compete.

In this survey we asked only about national asthma strategies, not local or regional strategies. We know that there have been successful strategies in cities such as Salvador,

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Brazil (14); however these would not have been identified in our survey. Strategies at a sub-national level may be the only feasible approach in some very large and populous countries such as Brazil and China; in such cases, coverage of the whole nation by harmonised sub-national strategies would be sought.

The survey asked about national asthma strategies for children separately from adults. Most who reported strategies had them for both age groups. The reasons why there would be separate strategies may include different approaches between children and adults, as often happens with national asthma management guidelines. Or there may have been ascertainment bias, with child–health professionals not being aware that an asthma strategy had been developed for adults and vice versa.

A successful strategy is not expected to affect prevalence and incidence as we do not have effective interventions for these (20). However reduction in disease severity and improved control may be impressive. In Finland in early 1990s, 20% of patients were estimated to have uncontrolled (severe) asthma compared to 10% in 2001 and 4% in 2010 (7, 37). If the gains of the Finnish study were replicated by having effective national asthma strategies throughout the world, then the number of emergency visits would be estimated to fall by 24% in adults and 61% in children, hospital days would fall by about 54%, significant disability would decrease by about 76%, costs per patient per year would fall by 36%, and deaths by 31%. Even if half these gains were achieved, there would be a large reduction of the burden of asthma in the world. Implementation of a national strategy is an appropriate way to address asthma, where the disability numbers and costs are disproportionately high, in contrast with the relatively high mortality found with other non-communicable diseases (20).

We recommend that health authorities along with governments in all countries should develop national asthma strategies with associated national action plans to improve early detection of asthma and subsequently improve asthma management and reduce costs (5). Such strategies should be evaluated, reported, and published. The problems to be addressed may be different in HICs compared to LMICs, and the solutions need to be tailored according to an individual country’s local needs, resources and organisation. Knowledge of asthma prevalence and severity and changes over time is fundamental to understanding the burden of asthma within each country and thus leading to the development of a national asthma strategy. This can be achieved using the methodology developed by ISAAC (38, 39) and continued (expanded to include adults) under GAN (40).

Declarations

1 The authors declare no conflicts of interest. The corresponding author confirms that she had
2 full access to all the data in the study and had final responsibility for the decision to submit
3 for publication.
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46 Esamai - Moi University, College of Health Sciences (Eldoret); Korea, South: S-J Hong -
47 University of Ulsan (Seoul); Kosovo: L Neziri-Ahmetaj - University Hospital (Prishtina);
48 Kuwait: JA al-Momen - Al-Amiri Hospital (Kuwait); Latvia: V Svabe - Children Clinical
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2 University Children's Clinic (Skopje); Malawi: K Mortimer - Liverpool School of Tropical
3 Medicine (Blantyre); Malaysia: J de Bruyne - University of Malaya (Klang Valley); Mali: Y
4 Toloba - Université de Bamako (Bamako); Malta: S Montefort - University of Malta (Malta);
5 Mexico: BE Del-Río-Navarro - Hospital Infantil de México (Mexico City North), R García-
6 Almaráz - Hospital Infantil de Tamaulipas (Ciudad Victoria), SN González-Díaz - Hospital
7 Universitario, Dr Jose Eleuterio Gonzalez de la Universidad Autonoma de Nuevo Leon
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12 Zealand: I Asher - The University of Auckland (Auckland), S Currie - Hawke's Bay District
13 Health Board (Hawkes Bay), J Douwes - Massey University (Wellington), D Graham -
14 Waikato District Health Board (Waikato), R Hancox - University of Otago (Otago), C Moyes -
15 Whakatane Hospital (Bay of Plenty), P Pattemore - University of Otago, Christchurch
16 (Christchurch); Nicaragua: MZ Cordero Rizo - University National Autonomous of Nicaragua
17 (Matagalpa); Nigeria: GE Erhabor - Obafemi Awolowo University (Ife), A Falade - University
18 College Hospital (Ibadan), AH Gabdo - University of Maiduguri Teaching Hospital
19 (Maiduguri), B Garba Ilah - Yariman Bakura Specialist Hospital (Gusau), N Onyia - Paelon
20 Memorial Clinic (Lagos); Niue: M Pulu - Niue Foou Hosptial (Niue Island); Norway: W Nystad
21 - Norwegian Institute of Public Health (Oslo, Tromsø); Nouvelle-Calédonie: I Annesi-
22 Maesano - Medical School Saint-Antoine, France (Nouvelle-Calédonie); Oman: O Al-Rawas
23 - College of Medicine and Health Sciences (Al-Khod); Pakistan: MO Yusuf - The Allergy &
24 Asthma Institute (Islamabad); Palau: BM Watson - Ministry of Health (Republic of Palau);
25 Palestine: N El Sharif - Al Quds University (North Gaza, Ramallah); Panama: G Cukier -
26 Hospital Materno Infantil Jose Domingo de Obaldia (David-Panamá); Peru: W Checkley -
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29 Manila); Poland: G Lis - Polish-American Institute of Pediatrics (Kraków); Polynésie
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32 Kabengele Obel - University of Kinshasa (Kinshasa); Réunion Island: I Annesi-Maesano -
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35 Russia: E Kamaltynova - The Siberian State Medical University (Tomsk), EG Kondiourina -
36 Novosibirsk State Medical University (Novosibirsk); Samoa: L Esera-Tulifau - Moto'otua
37 Hospital / National Health Services (Apia); Saudi Arabia: BR Al-Ghamdi - King Khaled
38 University (Abha), A Yousef - University of Dammam / King Fahd Hospital of the University
39 (Alkhobar); Senegal: NO Toure - Université Cheikh Anta DIOP, (Dakar); Serbia: M
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43 - National University of Singapore (Singapore); South Africa: R Masekela - University of
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3 Coruña), C Luna - Sección de Neumología y Alergia Infantil (Madrid), MM Morales Suárez-
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7 Ministry (Cádiz), J Wörnberg - University of Málaga (Málaga); Sri Lanka: KD Gunasekera -
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12 (Lattakia); Taiwan: YL Guo - National Taiwan University (Tainan), J-L Huang - Chang Gung
13 Memorial Hospital and Chang Gung University (Taipei); Thailand: S Phumethum -
14 Prapokkiao hospital (Chantaburi), J Teeratakulpisarn - Khon Kaen University (Khon Kaen),
15 M Trakultivakorn - Chiang Mai University (Chiang Mai), P Vichyanond - Mahidol University
16 (Bangkok); Togo: O Tidjani - CHU Tokoin (Lome); Tokelau: T Iosefa - Ministry of Health
17 (Tokelau); Tonga: G Aho - Vaiola Hospital (Nuku'alofa); Trinidad and Tobago: D Dookeeram
18 - Sangre Grande Hospital (Trinidad and Tobago); Tunisia: A Hamzaoui - Abderrahmen Mami
19 Hospital (Ariana); Turkey: A Yorgancioglu - Celal Bayar University School of Medicine
20 (Ankara); Tuvalu: N Ituaso-Conway - Princess Margaret Hospital (Funafuti); Uganda: W
21 Worodria (Kampala); Ukraine: O Fedortsiv - Ivan Horbachevsky Ternopil State Medical
22 University (Ternopil); United Arab Emirates: B Mahboub - University of Sharjah (Sharjah);
23 United Kingdom: AH Mansur - University of Birmingham and Heartlands Hospital
24 (Birmingham); United States: M Akpınar-Elci - Old Dominion University (Virginia), RP Doshi -
25 Parkview Hospital (Fort Wayne), GJ Redding - Seattle Children's Hospital (Seattle), K Yeatts
26 - University of North Carolina at Chapel Hill (North Carolina); Uruguay: M Valentin-Rostan -
27 Hospital Pereira Rossell (Montevideo); Vanuatu: G Harrison - Vila Central Hospital (Port
28 Vila); Vietnam: LT Le - University Medical Centre (Ho Chi Minh); Zambia: S Wa Somwe -
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References

1. Global Burden of Disease Study 2013 Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2015;386:743-80.
2. Asher I, Ellwood P, Bissell K, Strachan D, Pearce N, McAllister J, et al. *The Global Asthma Report 2014*. Auckland, New Zealand: Global Asthma Network; 2014.
3. GBD 2013 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990–2013: quantifying the epidemiological transition. *The Lancet*. 2015;386:2145-91.
4. Pearce N, Ait-Khaled N, Beasley R, Mallo J, Keil U, Mitchell E, et al. Worldwide trends in the prevalence of asthma symptoms: phase III of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax*. 2007;62(9):758-66.

5. Haahtela T, Selroos O, Ellwood P, Ait-Khaled N. National Asthma Strategies. In: Asher I, Ellwood P, Bissell K, Strachan D, Pearce N, McAllister J, et al., editors. The Global Asthma Report 2014. Auckland, New Zealand: Global Asthma Network; 2014. p. 44-7.
6. Haahtela T, Klaukka T, Koskela K, Erhola M, Laitinen L, on the behalf of the Working Group of the Asthma Programme in Finland 1994–2004. Asthma programme in Finland: a community problem needs community solutions. *Thorax*. 2001;56:806–14.
7. Haahtela T, Tuomisto LE, Pietinalho A, Klaukka T, Erhola M, Kaila M, et al. A 10 year asthma programme in Finland: major change for the better. *Thorax*. 2006;61(8):663-70.
8. Kauppi P, Linna M, Martikainen J, Mäkelä M, Haahtela T. Follow-up of the Finnish Asthma Programme 2000–2010: reduction of hospital burden needs risk group rethinking. *Thorax* 2013;68(3):292-3.
9. Selroos O, Kupczyk M, Kuna P, Łacwik P, Bousquet J, Brennan D, et al. National and regional asthma programmes in Europe. *Eur Respir Rev*. 2015;24:474–83.
10. Pascal L, Fuhrman C, Durif L, Nicolau J, Charpin D, Dujols P, et al. Trends in hospital admissions for asthma in France, 1998–2002. *Rev Mal Respir*. 2007;24:581-90.
11. Bugalho de Almeida A, Covas A, Prates L, Fragoso E. Asthma hospital admissions and mortality in mainland Portugal 2000-2007. *Rev Port Pneumol*. 2009;15:367-83.
12. Barcala F, Viñas J, Cuadrado L, Bourdin A, Dobaño J, Takkouche B. Trends in hospital admissions due to asthma in north-west Spain from 1995 to 2007. *Allergol Immunopathol*. 2010;38:254-8.
13. McCaul K, Wakefield M, Roder D, Ruffin R, Heard A, Alpers J, et al. Trends in hospital readmission for asthma: has the Australian National Asthma Campaign had an effect? *Med J Austr*. 2000;172:62-6.
14. Cruz A, Souza-Machado A, Franco R, Souza-Machado C, Ponte E, Santos P, et al. The impact of a program for control of asthma in a low-income setting. *World Allergy Organ J*. 2010;3:167-74.
15. To T, Cicutto L, Degani N, McLimont S, Beyene J. Can a community evidence-based asthma care program improve clinical outcomes? A longitudinal study. *Med Care*. 2008;46:1257–66.
16. Soto-Martinez M, Avila L, Soto N, Chaves A, Celedon JC, Soto-Quiros ME. Trends in hospitalizations and mortality from asthma in Costa Rica over a 12- to 15-year period. *J Allergy Clin Immunol Pract*. 2014;2(1):85-90.
17. Chong P, Tan N, Lim T. Impact of the Singapore national asthma program (SNAP) on preventor-reliever prescription ratio in polyclinics. *Ann Acad Med Singapore* 2008;37:114-7.
18. Foliaki S, Fakakovikaetau T, D'Souza W, Latu S, Tutone V, Cheng S, et al. Reduction in asthma morbidity following a community-based asthma self-management programme in Tonga. *Int J Tuberc Lung Dis*. 2009;13(1):142-7.
19. Yorgancıoğlu A, Cruz A, Bousquet J, Khaltaev N, Mendis S, Chuchalin A, et al. The Global Alliance against Respiratory Diseases (GARD) country report. *Prim Care Respir J* 2014;23:98-101.
20. Pearce N, Asher I, Billo N, Bissell K, Ellwood P, El Sony A, et al. Asthma in the global NCD agenda: A neglected epidemic. *The Lancet Respiratory Medicine*. 2013;1(2):96-8.
21. World Bank. Country incomes [cited 2015]. Available from: <http://data.worldbank.org/about/country-and-lending-groups> accessed July 2015
22. Lai K, Beasley R, Crane J, Foliaki S, Shah J, Weiland S, et al. Global variation in the prevalence and severity of asthma symptoms: Phase Three of the International study of Asthma and allergies in Childhood (ISAAC). *Thorax*. 2009;64:476-83.
23. Preacher KJ. Calculation for the chi-square test: An interactive calculation tool for chi-square tests of goodness of fit and independence [Computer software] 2001. Available from: <http://quantpsy.org>
24. United Nations. World Population Prospects: United Nations; [updated 201523 August 2016]. Available from: <https://esa.un.org/unpd/wpp/>
25. National Asthma Council Australia. Australian Asthma Handbook Version 1.1 April 2015 2015 [cited 2016 7 June]. Available from: www.nationalasthma.org.au/handbook

26. Swedish National Board of Health and Welfare. National guidelines for treatment of asthma and chronic obstructive pulmonary diseases (COPD) (in English). 2016.
27. GBD 2013 Mortality and Causes of Death Collaborators. Global, regional, and national age–sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2014;385:117-71.
28. Strachan D, Limb E, Pearce N, Marks G. Asthma mortality. In: Asher I, Ellwood P, Bissell K, Strachan D, Pearce N, McAllister J, et al., editors. *Global Asthma Report 2014*. Auckland, New Zealand: Global Asthma Network; 2014. p. 28-32.
29. World Health Organisation. Cause of Death Query online: World Health Organisation; 2014 [23 August 2016]. Available from: http://www.who.int/healthinfo/mortality_data/en/
30. Lalloo UG, Walters RD, Adachi M, de Guia T, Emelyanov A, Fritscher CC, et al. Asthma programmes in diverse regions of the world: challenges, successes and lessons learnt. *Int J Tuberc Lung Dis*. 2011;15(12):1574-87.
31. Bissell K, Chiang C-Y, Ait-Khaled N, Perrin C. Asthma management in low-income countries. In: Asher I, Ellwood P, Bissell K, Strachan D, Pearce N, McAllister J, et al., editors. *The Global Asthma Report 2014*. Auckland, New Zealand: Global Asthma Network; 2014. p. 61-4.
32. Ade G, Gninafon M, Tawo L, Ait-Khaled N, Enarson DA, Chiang C-Y. Management of asthma in Benin: the challenge of loss to follow-up. *Public Health Action*. 2013;3(1):76-80.
33. Kan XH, Chiang C-Y, Enarson DA, Rao HL, Chen Q, Ait-Khaled N, et al. Asthma as a hidden disease in rural China: opportunities and challenges of standard case management. *Public Health Action*. 2012;2(3):87-91.
34. El Sony AI, Chiang C-Y, Malik E, Hassanain SA, Hussien H, Khamis AH, et al. Standard case management of asthma in Sudan: a pilot project. *Public Health Action*. 2013;3(3):247-52.
35. Castillo F, Garay J. El Salvador: Improving asthma management at the primary care level. In: Asher MI, Ellwood P, Ellwood E, Bissell K, Boatwright A, editors. *The Global Asthma Report 2011*. Paris, France: The International Union Against Tuberculosis and Lung Disease; 2011. p. 43.
36. Fitzgerald J, Bateman E, Hurd S, Boulet L, Haahtela T, Cruz A, et al. The GINA asthma challenge: reducing asthma hospitalisations. *Eur Respir J*. 2011;38(5):997-8.
37. Kauppi P, Peura S, Salimäki J, Järvenpää S, Linna M, Haahtela T. Reduced severity and improved control of self-reported asthma in Finland during 2001–2010. *Asia Pacific Allergy*. 2015;5:32-9.
38. Ellwood P, Asher MI, Beasley R, Clayton TO, Stewart AW, Comm IS. The International Study of Asthma and Allergies in Childhood (ISAAC): Phase Three rationale and methods. *International Journal of Tuberculosis and Lung Disease*. 2005;9(1):10-6.
39. Asher MI, Montefort S, Björkstén B, Lai CK, Strachan DP, Weiland SK, et al. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. *Lancet*. 2006;368(9537):733-43.
40. Ellwood P, Asher MI, Ellwood E, and the Global Asthma Network Steering Group. *The Global Asthma Network Manual for Global Surveillance: Prevalence, Severity and Risk Factors*. August 2015 ed2016.

Table. Responses to national asthma strategy questions by country, age group and country income.

Country Name	National Strategy Child	National Strategy Adult	World Bank
Albania	No	No	LMIC
Algeria	No	No	LMIC
Argentina	No	No	LMIC
Armenia	No	No	LMIC
Australia	Yes	Yes	HIC
Austria	No	No	HIC
Belarus	No	No	LMIC
Belgium	Don't know	Don't know	HIC
Benin	No	No	LMIC
Bolivia	No	No	LMIC
Bosnia and Herzegovina	No	Don't know	LMIC
Brazil	No	No	LMIC
Bulgaria	No	No	LMIC
Burkina Faso	No	No	LMIC
Cameroon	No	No	LMIC
Canada	Yes	Yes	HIC
Channel Islands	No	Don't know	HIC
Chile	Don't know	Don't know	HIC
China	Don't know	No	LMIC
Colombia	No	No	LMIC
Congo Dem Rep	No	No	LMIC
Costa Rica	Yes	Yes	LMIC
Croatia	Don't know	Don't know	HIC
Cyprus	No	No	HIC
Denmark	Don't know	Don't know	HIC
Ecuador	No	No	LMIC
Egypt	No	No	LMIC
El Salvador	Yes	Yes	LMIC
Ethiopia	Don't know	Don't know	LMIC
Faroe Islands	No	No	HIC
Fiji	No	No	LMIC
Finland	Yes	Yes	HIC
France	Yes	Yes	HIC

French Polynesia	No	No	HIC
Gambia	No	No	LMIC
Georgia	Yes	Yes	LMIC
Germany	No	No	HIC
Ghana	No	No	LMIC
Greece	No	No	HIC
Grenada	No	No	LMIC
	Don't	Don't	
Hong Kong	know	know	HIC
Hungary	No	No	HIC
India	Yes	No	LMIC
Indonesia	No	No	LMIC
Iran	Yes	Yes	LMIC
Ireland	Yes	Yes	HIC
Israel	No	No	HIC
Italy	No	No	HIC
	Don't	Don't	
Jamaica	know	know	LMIC
Japan	Yes	Yes	HIC
Jordan	No	No	LMIC
Kenya	No	No	LMIC
Korea, South	Yes	Yes	HIC
Kosovo	No	No	LMIC
		Don't	
Kuwait	Yes	know	HIC
Latvia	No	No	HIC
Libya	No	No	LMIC
Macedonia	No	No	LMIC
Malawi*	Yes	Yes	LMIC
Malaysia	No	No	LMIC
Mali	No	No	LMIC
Malta	No	No	HIC
Mexico	No	No	LMIC
	Don't	Don't	
Netherlands	know	know	HIC
New Caledonia	No	No	HIC
New Zealand	No	No	HIC
Nicaragua	No	No	LMIC
Nigeria	No	No	LMIC
	Don't	Don't	
Niue	know	know	LMIC
Norway	No	No	HIC
Oman	No	No	HIC
Pakistan	No	No	LMIC
Palau	No	No	LMIC
Palestine	No	No	LMIC
Panama	Yes	Yes	LMIC

Peru	Yes	Yes	LMIC
Philippines	No	No	LMIC
	Don't	Don't	
Poland	know	know	HIC
Portugal	Yes	Yes	HIC
Reunion Island	No	No	HIC
Romania	No	No	LMIC
Russia	Yes	No	HIC
Samoa	No	No	LMIC
Saudi Arabia	Yes	Yes	HIC
Senegal	No	No	LMIC
Serbia	Yes	Yes	LMIC
Sierra Leone	No	No	LMIC
		Don't	
Singapore	No	know	HIC
South Africa	No	No	LMIC
Spain	No	No	HIC
Sri Lanka	No	No	LMIC
Sudan	No	Yes	LMIC
Syrian Arab Republic	No	No	LMIC
		Don't	
Taiwan	Yes	know	HIC
Thailand	No	No	LMIC
	Don't		
Togo	know	No	LMIC
Tokelau	No	No	LMIC
		Don't	
Tonga	No	know	LMIC
Trinidad and Tobago	No	No	HIC
Tunisia	No	No	LMIC
Turkey	Yes	Yes	LMIC
Tuvalu	No	No	LMIC
Uganda	No	No	LMIC
Ukraine	No	Yes	LMIC
United Arab Emirates	Yes	Yes	HIC
United Kingdom	Yes	Yes	HIC
United States	Yes	Yes	HIC
Uruguay	No	No	HIC
Vanuatu	No	No	LMIC
Vietnam	Yes	Yes	LMIC
Zambia	No	No	LMIC
Zimbabwe	No	No	LMIC

* LMIC = Low or Medium Income Country (by World Bank assessment).

#HIC = High Income Country (by World Bank assessment).

