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Developed for the Global Initiative for Asthma

PREFACE

It is now estimated that as many as 300 million people of all ages, and all ethnic backgrounds, suffer from asthma and the burden of this disease to governments, health care systems, families, and patients is increasing worldwide.

In 1989 the Global Initiative for Asthma (GINA) program was initiated with the U.S. National Heart, Lung, and Blood Institute, NIH and the World Health Organization (WHO) in an effort to raise awareness among public health and government officials, health care workers, and the general public that asthma was on the increase. The GINA program recommends a management program based on the best available scientific evidence to allow doctors to provide effective medical care for asthma tailored to local health care systems and resources.

Working in continued collaboration with leaders in asthma care from many countries, and with GINA Sponsors, World Asthma Day (first Tuesday in May) has been extremely successful, increasing in numbers of participants each year. We are indebted to the vast number of people in many countries of the world who have made a commitment to bring awareness about the burden of asthma to their local health care officials, and to implement programs of effective asthma care.

In 2003, and again in 2004, the theme of World Asthma Day is the "Global Burden of Asthma." GINA commissioned Professor Richard Beasley, Wellington, New Zealand (and a member of the GINA Dissemination Committee) to provide available data on the burden of asthma. In this report, Professor Beasley and his colleagues obtained data on the burden of asthma in 20 different regions worldwide from literature primarily published through the International Study of Asthma and Allergies in Childhood (ISAAC) and the European Community Respiratory Health Survey (ECHRS). Methodologies differ in these studies, and epidemiological data on asthma are very difficult to collect, as Professor Beasley carefully describes in his segment on Methodological Issues. Nonetheless, this document provides a wealth of information, along with a large number of scientific references. The study regions have been grouped according to geographical, political, historical, and racial considerations based on official data from WHO, the United Nations (UN), and other sources, and to some extent, the availability of asthma epidemiological data within the study region. Using the United Nations World Population Prospect Population Database (http://esa.un.org/unpp) as a source within each region, all countries were included, and in some cases territories and dependencies if specific asthma epidemiological data were available. For simplicity some data from small territories have been omitted or lumped in a larger sub-regional unit. The report will be updated as new information becomes available and following feedback from individual countries and regions. (Additional references, data, and feedback may be submitted at www.ginasthma.com.)

The GINA Executive Committee is indebted to Professor Beasley and his colleagues for providing this report that will be an invaluable source of information for those who wish to explore available data on the burden of asthma by region. It will be extremely useful to develop background materials for World Asthma Day activities in 2004 and well into the future.

Tim Clark, MD
Chair, GINA Executive Committee

(Information about GINA can be found at www.ginasthma.com)

Global Burden of Asthma - Summary

1. Asthma is one of the most common chronic diseases in the world. It is estimated that around 300 million people in the world currently have asthma. Considerably higher estimates can be obtained with less conservative criteria for the diagnosis of clinical asthma.

2. The international patterns of asthma prevalence are not explained by the current knowledge of the causation of asthma. Research into the causation of asthma, and the efficacy of primary and secondary intervention strategies, represent key priority areas in the field of asthma research.

3. Asthma has become more common in both children and adults around the world in recent decades. The increase in the prevalence of asthma has been associated with an increase in atopic sensitisation, and is paralleled by similar increases in other allergic disorders such as eczema and rhinitis.

4. The rate of asthma increases as communities adopt western lifestyles and become urbanised. With the projected increase in the proportion of the world's population that is urban from 45% to 59% in 2025, there is likely to be a marked increase in the number of asthmatics worldwide over the next two decades. It is estimated that there may be an additional 100 million persons with asthma by 2025.

5. In many areas of the world persons with asthma do not have access to basic asthma medications or medical care. Increasing the economic wealth and improving the distribution of resources between and within countries represent important priorities to enable better health care to be provided.

(continued)

6. The number of disability-adjusted life years (DALYs) lost due to asthma worldwide has been estimated to be currently about 15 million per year. Worldwide, asthma accounts for around 1% of all DALYs lost, which reflects the high prevalence and severity of asthma. The number of DALYs lost due to asthma is similar to that for diabetes, cirrhosis of the liver, or schizophrenia.

7. The burden of asthma in many countries is of sufficient magnitude to warrant its recognition as a priority disorder in government health strategies. Particular resources need to be provided to improve the care of disadvantaged groups with high morbidity, including certain racial groups and those who are poorly educated, live in large cities, or are poor. Resources also need to be provided to address preventable factors, such as air pollution, that trigger exacerbations of asthma.

8. It is estimated that asthma accounts for about 1 in every 250 deaths worldwide. Many of the deaths are preventable, being due to suboptimal long-term medical care and delay in obtaining help during the final attack.

9. The economic cost of asthma is considerable both in terms of direct medical costs (such as hospital admissions and cost of pharmaceuticals) and indirect medical costs (such as time lost from work and premature death).

10. Until there is a greater understanding of the factors that cause asthma and novel public health and pharmacological measures become available to reduce the prevalence of asthma, the priority is to ensure that cost-effective management approaches which have been proven to reduce morbidity and mortality are available to as many persons as possible with asthma worldwide.

Barriers to Reducing the Burden of Asthma

1. Generic barriers including poverty, poor education, and poor infrastructure.

2. Environmental barriers including indoor and outdoor air pollution, tobacco smoking, and occupational exposures.

3. Low public health priority due to the importance of other respiratory illnesses such as tuberculosis and pneumonia and the lack of data on morbidity and mortality from asthma.

4. The lack of symptom-based rather than disease-based approaches to the management of respiratory diseases including asthma.

5. Unsustainable generalisations across cultures and health care systems which may make management guidelines developed in high-income countries difficult to implement in low and middle-income countries.

6. Inherent barriers in the organisation of health care services in terms of
- **a.** geography
- **b.** type of professional responding
- **c.** education and training systems
- **d.** public and private care
- **e.** tendency of care to be "acute" rather than "routine."

7. The limited availability and use of medications including
- **a.** omission of basic medications from WHO or national essential drug lists
- **b.** poor supply and distribution infrastructure
- **c.** cost
- **d.** cultural attitudes towards drug delivery systems, e.g. inhalers

(continued)

Barriers to Reducing the Burden of Asthma *(continued)*

8. Patient barriers including
- **a.** cultural factors
- **b.** lack of information
- **c.** underuse of self-management
- **d.** over-reliance on acute care
- **e.** use of alternative unproven therapies.

9. Inadequate government resources provided for health care including asthma.

10. The requirement of respiratory specialists and related organisations required to care for a wide variety of diseases, which has in some regions resulted in a failure to adequately promote awareness of asthma.

Actions Required to Reduce the Burden of Asthma

1. Recognise asthma as an important cause of morbidity, economic cost, and mortality worldwide.

2. Measure and monitor the prevalence of asthma, and the morbidity and mortality due to asthma throughout the world.

3. Identify and address the economic and political factors which limit the availability of health care.

4. Improve accessibility to essential drugs for the management of asthma in low- and middle-income countries.

5. Identify and address the environmental factors including indoor and outdoor pollution which affect respiratory morbidity including that due to asthma.

6. Promote and implement anti-tobacco public health policies to reduce tobacco consumption.

7. Adapt international asthma guidelines for developing countries to ensure they are practical and realistic in terms of different health care systems. This includes dissemination strategies for their implementation.

8. Integrate the GINA guidelines with other global respiratory guidelines for children and adults. In this respect, there is a requirement to merge the key elements of the different respiratory guidelines into an algorithm for use at the first point of entry of a respiratory patient's contact with health services.

9. Promote cost-effective management approaches which have been proven to reduce morbidity and mortality, thereby ensuring optimal treatment is available to as many persons as possible with asthma worldwide.

10. Research the causation of asthma, primary and secondary intervention strategies, and management programmes including those for use in developing countries.

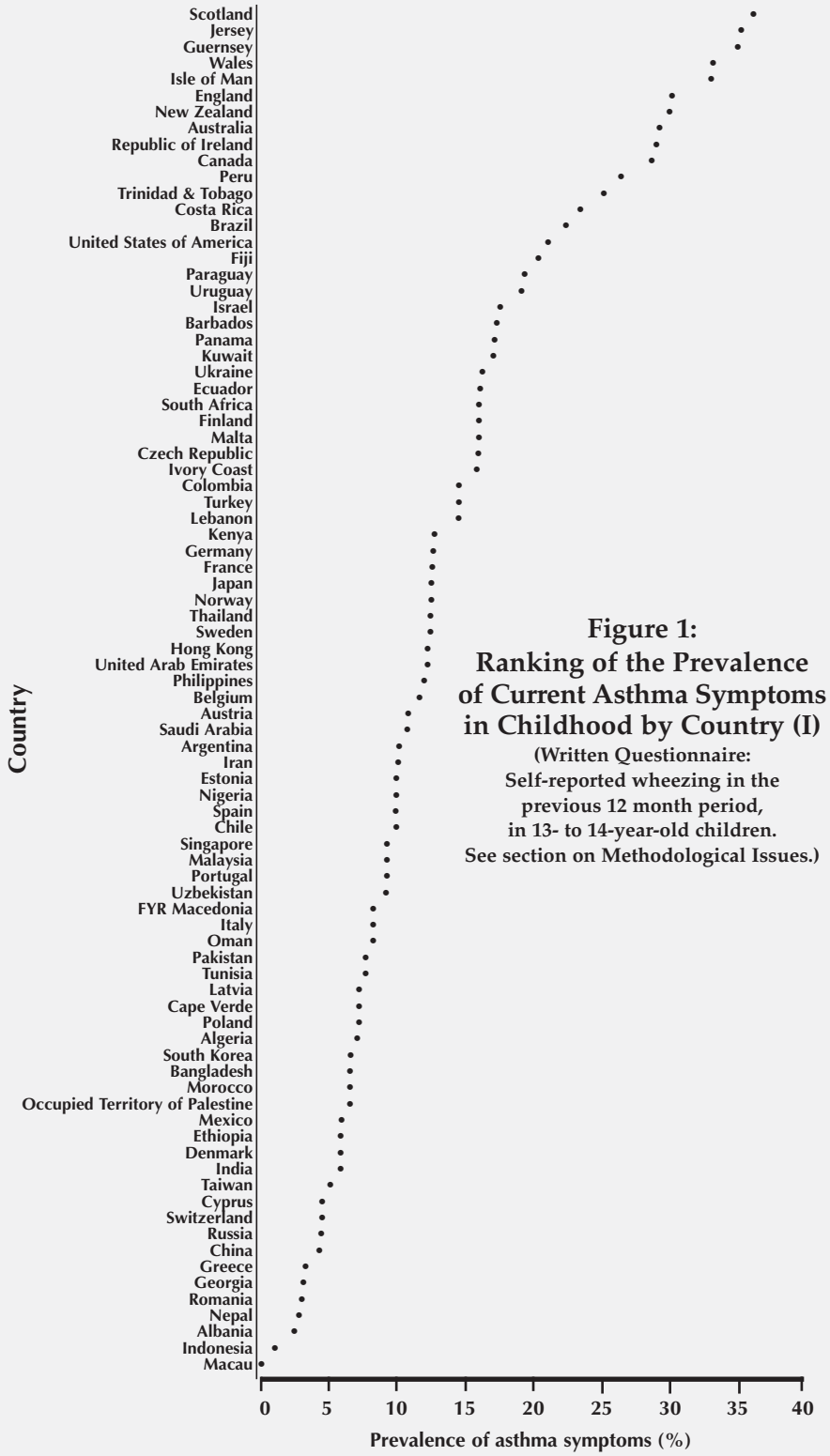


Figure 1:
Ranking of the Prevalence of Current Asthma Symptoms in Childhood by Country (I)
(Written Questionnaire: Self-reported wheezing in the previous 12 month period, in 13- to 14-year-old children. See section on Methodological Issues.)

Figure 2:
Ranking of the Prevalence of Current Asthma Symptoms in Childhood by Country (II)
(Video Questionnaire: Positive response to clinical asthma scene, in 13- to 14-year-old children. See section on Methodological Issues.)

Figure 3:
Ranking of the Prevalence of Current Asthma Symptoms in Adults by Country

(Written Questionnaire: Self-reported wheezing in the previous 12 month period, in 20- to 44-year-old adults. See section on Methodological Issues.)

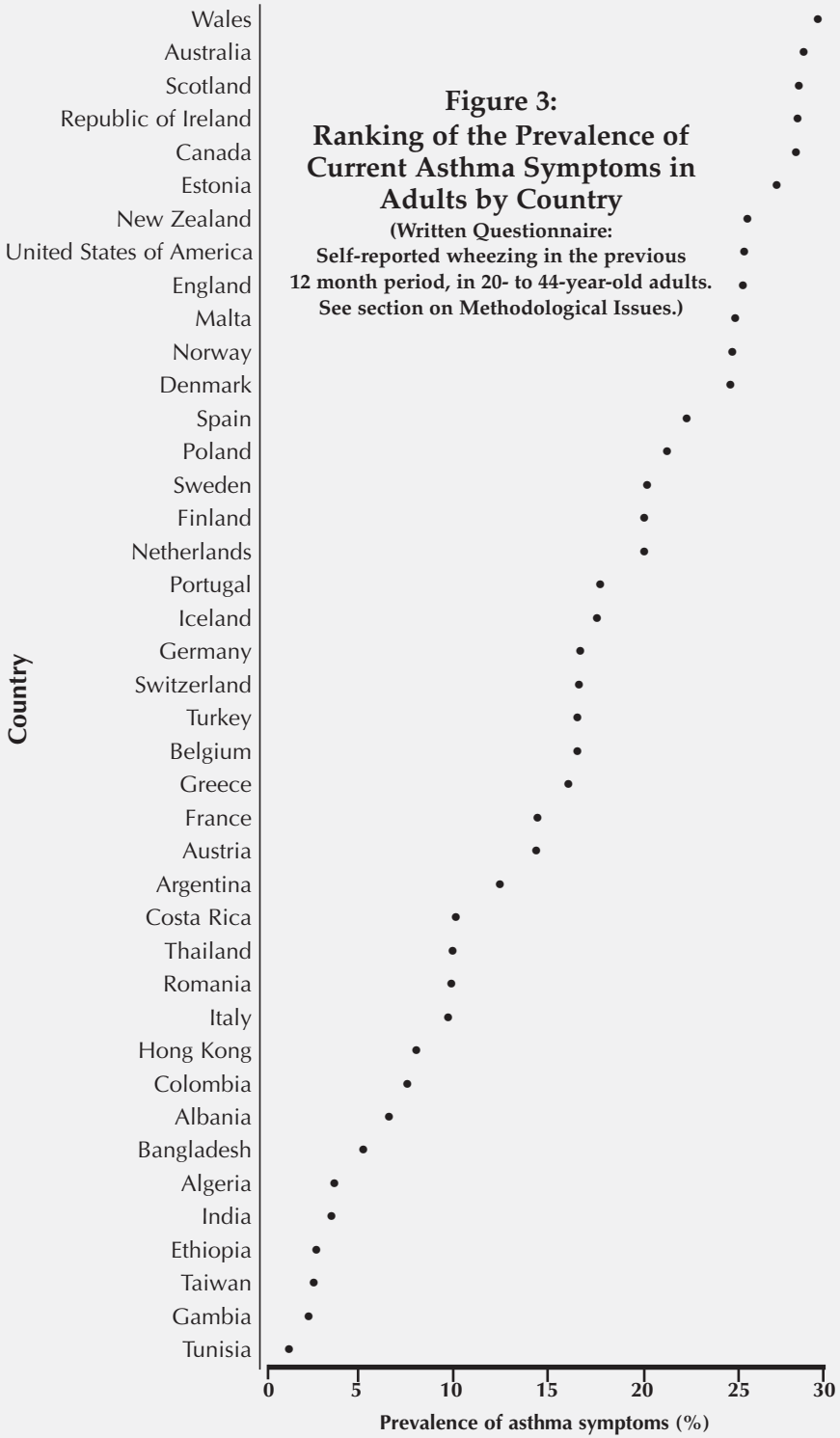
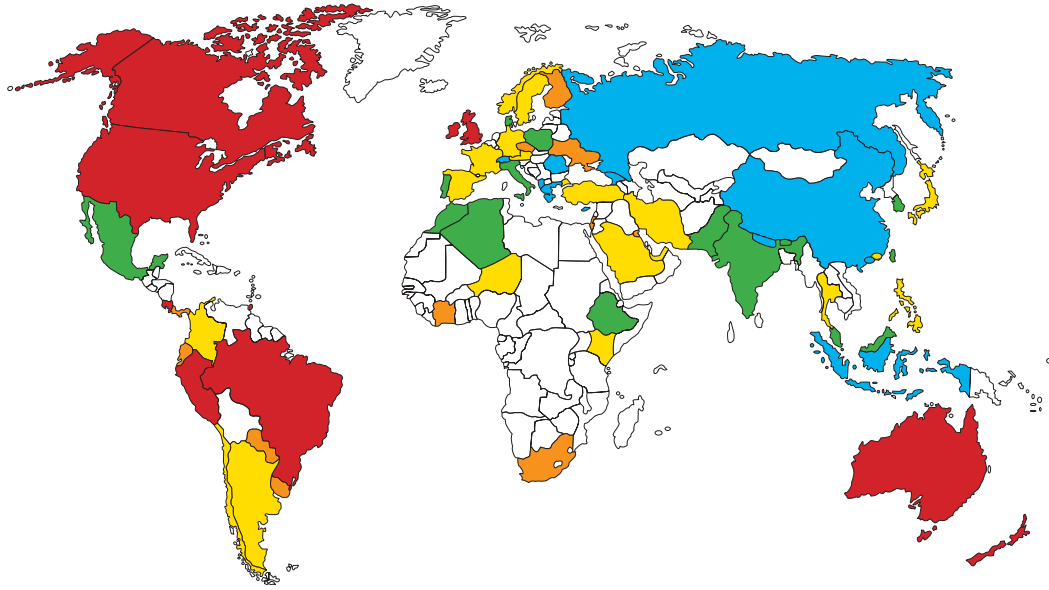


Figure 4:
World Map of the Prevalence of Clinical Asthma



Proportion of population (%)*

- ≥10.1
- 7.6-10.0
- 5.1-7.5
- 2.5-5.0
- 0-2.5
- No standardised data available

Scotland	18.4	Ivory Coast	7.8	Italy	4.5
Jersey	17.6	Colombia	7.4	Oman	4.5
Guernsey	17.5	Turkey	7.4	Pakistan	4.3
Wales	16.8	Lebanon	7.2	Tunisia	4.3
Isle of Man	16.7	Kenya	7.0	Cape Verde	4.2
England	15.3	Germany	6.9	Latvia	4.2
New Zealand	15.1	France	6.8	Poland	4.1
Australia	14.7	Norway	6.8	Algeria	3.9
Republic of Ireland	14.6	Japan	6.7	South Korea	3.9
Canada	14.1	Sweden	6.5	Bangladesh	3.8
Peru	13.0	Thailand	6.5	Morocco	3.8
Trinidad & Tobago	12.6	Hong Kong	6.2	Occupied Territory of Palestine	3.6
Costa Rica	11.9	Philippines	6.2	Mexico	3.3
Brazil	11.4	United Arab Emirates	6.2	Ethiopia	3.1
United States of America	10.9	Belgium	6.0	Denmark	3.0
Fiji	10.5	Austria	5.8	India	3.0
Paraguay	9.7	Spain	5.7	Taiwan	2.6
Uruguay	9.5	Saudi Arabia	5.6	Cyprus	2.4
Israel	9.0	Argentina	5.5	Switzerland	2.3
Barbados	8.9	Iran	5.5	Russia	2.2
Panama	8.8	Estonia	5.4	China	2.1
Kuwait	8.5	Nigeria	5.4	Greece	1.9
Ukraine	8.3	Chile	5.1	Georgia	1.8
Ecuador	8.2	Singapore	4.9	Nepal	1.5
South Africa	8.1	Malaysia	4.8	Romania	1.5
Czech Republic	8.0	Portugal	4.8	Albania	1.3
Finland	8.0	Uzbekistan	4.6	Indonesia	1.1
Malta	8.0	FYR Macedonia	4.5	Macau	0.7

See section on Methodological Issues.

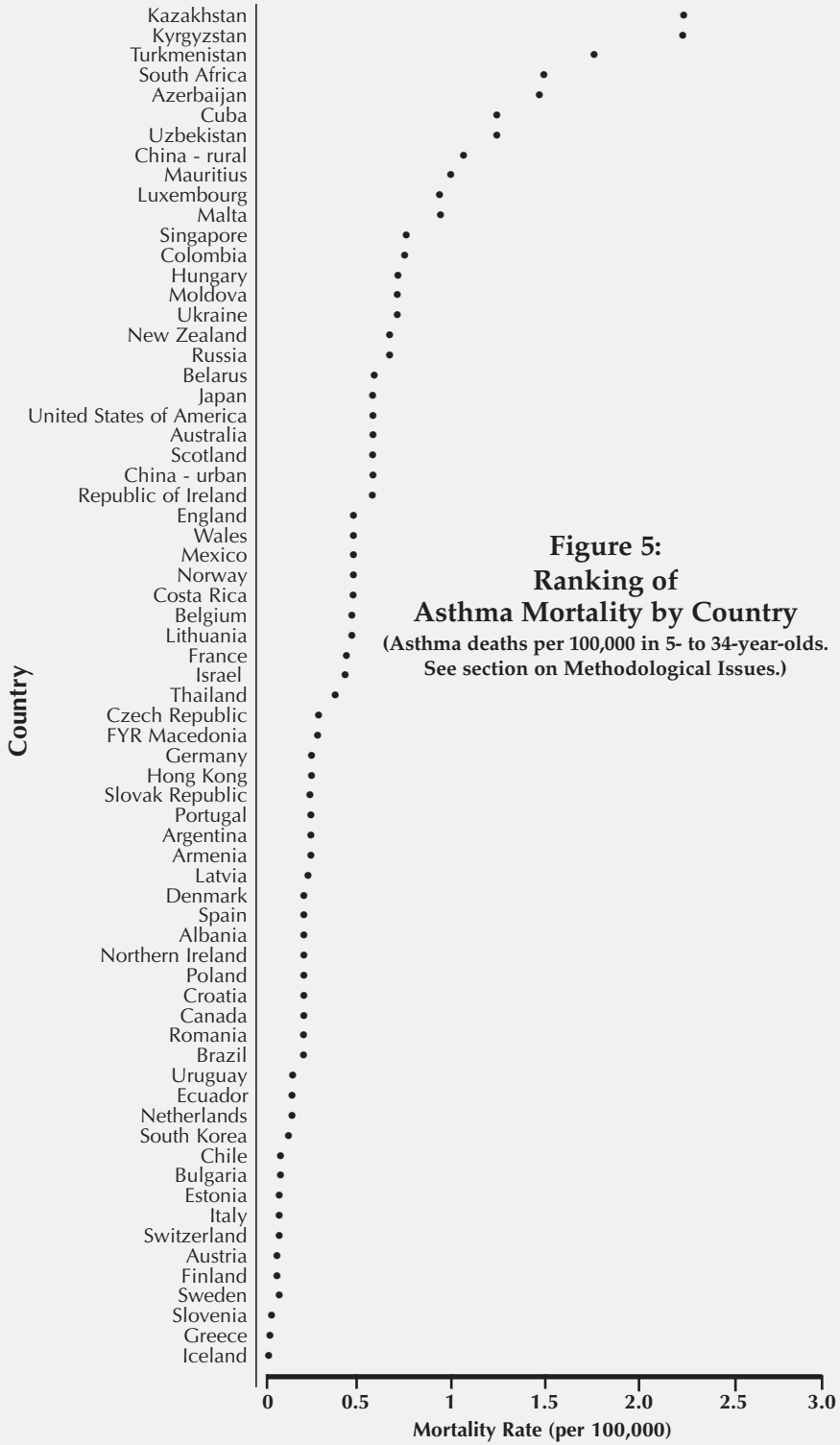
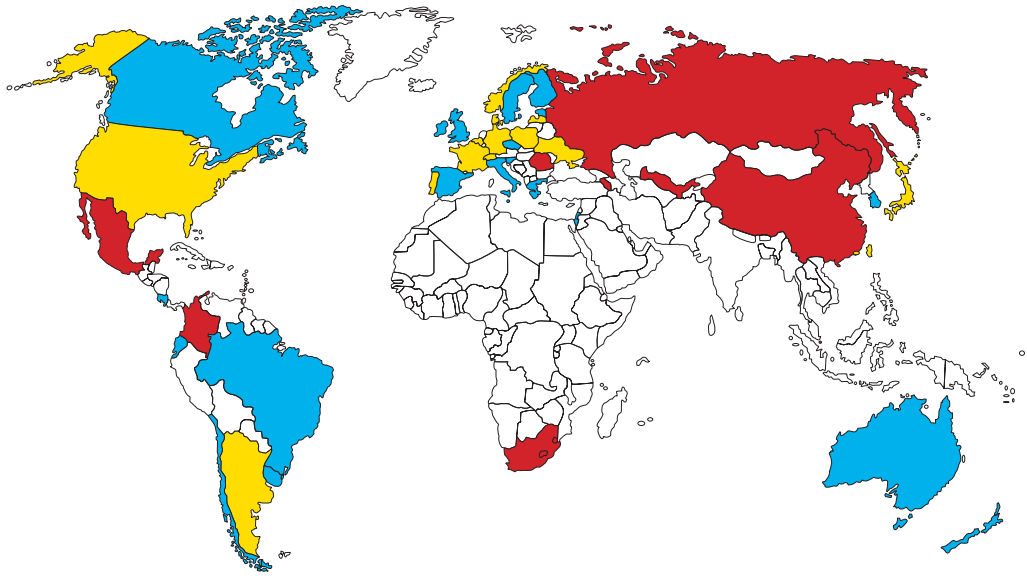


Figure 5:
Ranking of
Asthma Mortality by Country

(Asthma deaths per 100,000 in 5- to 34-year-olds. See section on Methodological Issues.)

Figure 6:
World Map of Asthma Case Fatality Rates
(Asthma deaths per 100,000 asthmatics.)



Countries shaded according to case fatality rate (per 100,000 asthmatics)*

- >10.0
- 5.1-10.0
- 0-5.0
- No standardised data available

China	36.7	Germany	5.1
Russia	28.6	Spain	4.9
Uzbekistan	27.2	South Korea	4.9
Albania	20.8	Czech Republic	4.8
South Africa	18.5	Israel	4.7
Singapore	16.1	New Zealand	4.6
Romania	14.7	Costa Rica	3.9
Mexico	14.5	Australia	3.8
Malta	11.6	Republic of Ireland	3.6
Colombia	10.1	Italy	3.6
Denmark	9.3	Chile	3.5
Ukraine	8.7	England	3.2
Japan	8.7	Scotland	3.0
FYR Macedonia	8.2	Estonia	3.0
Belgium	7.7	Wales	2.9
Latvia	7.1	Austria	2.6
Norway	7.1	Ecuador	2.3
Switzerland	7.0	Greece	2.1
Portugal	6.9	Uruguay	2.1
Poland	6.6	Sweden	2.0
France	6.5	Brazil	1.8
Thailand	6.2	Canada	1.6
Argentina	5.8	Finland	1.6
Hong Kong	5.6	Cape Verde	0.0
United States of America	5.2		

See section on Methodological Issues.

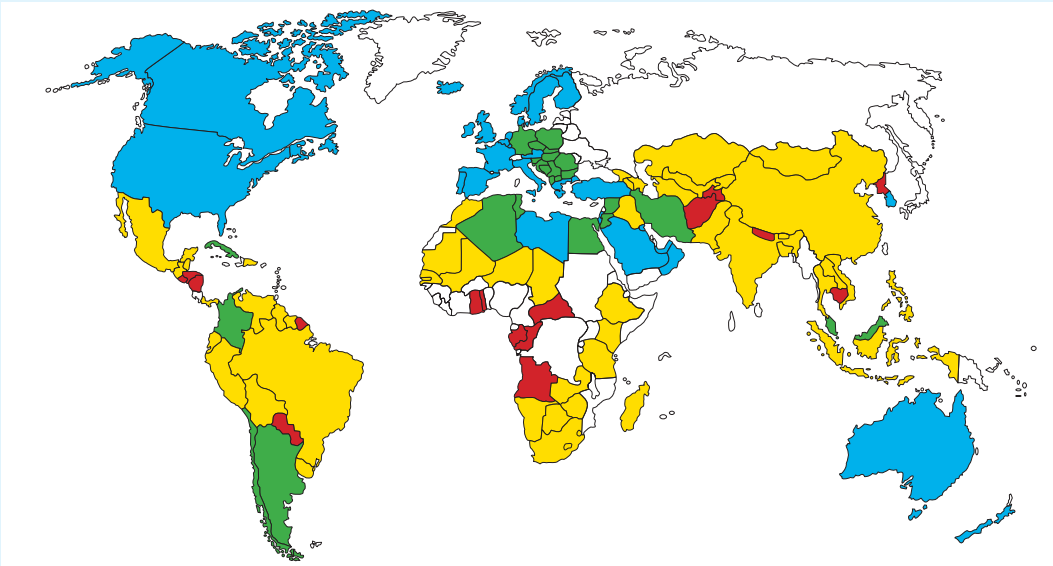
Figure 7:
Disability-Adjusted Life Years Lost Due to Asthma Worldwide – Ranking with Other Common Disorders

Asthma was the 25th leading cause of disability-adjusted life years (DALYs) lost worldwide in 2001.

Rank	Disorder	Number of DALYs ($x10^6$)
1	Perinatal conditions	98.4
2	Lower respiratory tract infections	90.7
3	HIV/AIDS	88.4
4	Unipolar depressive disorders	65.9
5	Diarrhoeal disease	62.5
6	Ischaemic heart disease	58.7
7	Cerebrovascular disease	45.9
8	Malaria	42.3
9	Road traffic accidents	37.7
10	Tuberculosis	36.0
11	Maternal conditions	30.9
12	Chronic obstructive pulmonary disease	29.9
13	Congenital abnormalities	28.1
14	Measles	26.5
15	Hearing loss - adult onset	25.9
16	Violence	20.2
17	Self-inflicted injuries	19.9
18	Alcohol use disorders	19.8
19	Protein-energy malnutrition	16.7
20	Osteoarthritis	16.4
21	Schizophrenia	15.9
22	Falls	15.7
23	Diabetes mellitus	15.4
24	Cirrhosis of the liver	15.1
25	**ASTHMA**	**15.0**
26	Bipolar affective disorder	13.8
27	Pertussis	12.5
28	Alzheimers and other dementias	12.4
29	Sexually transmitted diseases excluding HIV	12.4
30	Iron deficiency anaemia	12.0

(Note: Disability adjusted life years (DALYs) combine information about morbidity and mortality in numbers of healthy years lost. The calculation of disease-specific health loss in DALY's is the sum of years of life lost (YLLs) and years lived with disabilty (YLDs) weighted for severity. Each state of health is assigned a disability weighting by an expert panel on a scale from zero (perfect health) to one (death). To calculate the burden of a certain disease, the disbility weighting is multiplied by the number of years lived in that health state and is added to the number of years lost due to that disease.)

Figure 8:
World Map of the Proportion of the Population with Access to Essential Drugs



WHO Access to Essential Drugs

<50% | 81-95% | 50-80% | >95% | No standardised data available

>95%	81-95%	50-80%		<50%	No data
USA	Brunei	India	Panama	Paraguay	French Guinea
Canada	Malaysia	Turkmenistan	Guatemala	Guyana	Costa Rica
New Zealand	Singapore	Pakistan	Belize	Nicaragua	Western Sahara
Australia	Slovenia	Uzbekistan	Mexico	Honduras	
Libya	Albania	Kyrgyzstan	Dominican Rep	El Salvador	
UAE	Macedonia	China	South Africa	Mozambique	
Saudi Arabia	Bulgaria	Kazakhstan	Namibia	Malawi	
Oman	Serbia	Azerbaijan	Botswana	Angola	
Israel	Bosnia-Herzegovina	Armenia	Zimbabwe	Congo	
Turkey	Czech Rep	Georgia	Zambia	Dem Rep of Congo	
Kuwait	Poland	Russian Fed	Tanzania	Gabon	
Japan	Latvia	Mongolia	Kenya	Burundi	
S Korea	Estonia	Indonesia	Ethiopia	Rwanda	
UK	Romania	Philippines	Djibouti	Uganda	
France	Slovakia	Vietnam	Chad	Somalia	
Germany	Hungary	Thailand	Niger	Eritrea	
Spain	Croatia	Laos	Cameroon	Sudan	
Portugal	Argentina	Taiwan	Mali	Yemen	
Netherlands	Chile	Bangladesh	Togo	Central African Rep	
Denmark	Colombia	PNG	Cote D'Ivoire	Nigeria	
Finland	Cuba	Belarus	Senegal	Ghana	
Sweden	Tunisia	Ukraine	Mauritania	Burkina Faso	
Norway	Algeria	Moldova	Morocco	Liberia	
Italy	Egypt	Lithuania	Madagascar	Sierra Leone	
Belgium	Jordan	Uruguay	Lesotho	Guinea-Bissau	
Ireland	Syria	Bolivia	Gambia	Equatorial Guinea	
Austria	Iran	Peru	Iraq	Afghanistan	
Greece		Ecuador		Tajikistan	
Turkey		Venezuela		Burma	
Luxembourg		Suriname		Cambodia	
Iceland		Brazil		Nepal	
				N Korea	

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Methodological Issues

A. Prevalence of Current Asthma Symptoms

The large standardised international and national studies of the prevalence of asthma in both children and adults have utilised written questionnaires of asthma symptoms. These questionnaires have been based on the symptom of wheezing, which has been shown to be the most important symptom for the identification of individuals with asthma. Due to the intermittent nature of asthma symptoms, wheezing occurring at any time within the previous 12 months has been used to define current asthma symptoms. Responses to questions about self-reported wheezing in the previous 12-month period have been shown to have good specificity and sensitivity for both bronchial hyperresponsiveness and a diagnosis of asthma in both children and adults. This was the core question used in both the International Study of Asthma and Allergies in Childhood (ISAAC) and the European Community Respiratory Health Survey (ECRHS), the large standardised international studies which compared the prevalence of asthma symptoms in countries worldwide. For these reasons, "wheezing in the last 12 months" has been used in this report as the response to determine the prevalence of current asthma symptoms in each country.

In this report, data on this question have been preferentially obtained from ISAAC and ECRHS as data were collected in a standardised manner between centres in different countries in these studies. The ISAAC study obtained symptom prevalence data from children in the 13- to 14-year age group, whereas in the ECRHS the 20- to 44-year age group was studied. In countries where more than one centre participated in ISAAC or ECRHS, the mean symptom prevalence value for the country was used. For countries which did not participate in ISAAC or ECRHS, comparable data from published studies were used if self-reported wheezing in the previous 12-month period was obtained from written questionnaires in defined populations in children or adults.

Despite the general acceptance of this approach, a number of limitations need to be recognised in the interpretation of such standardised data. The first is that self-reported current wheezing is not diagnostic of asthma in an individual. Wheezing is not a symptom specific to the diagnosis of asthma and there is no agreed

way of grading the severity or frequency of wheezing symptoms to identify the presence of asthma. For example, the occasional transient episode of mild wheezing in an individual requiring no treatment would not necessarily be considered to be diagnostic of clinical asthma. From a clinical standpoint, a diagnosis of asthma is made on the basis of combined information from history, physical examination, and physiological tests, often over a period of time. There is no single test or clinical feature which defines the presence or absence of asthma, particularly from epidemiological studies of large populations. As a result, the prevalence of current asthma symptoms is not equivalent to the prevalence of clinical asthma.

Another issue is that in both children and adults, wide variations in the prevalence of current asthma symptoms are often observed between centres within the same country. This indicates that the asthma symptom prevalence rate reported for each country is dependent to some extent on the number of centres studied. The population sample chosen, on the basis of a defined geographical area, also influences the reported asthma symptom prevalence rates. In both ECRHS and ISAAC predominantly urban populations were studied, but it is recognised that the prevalence of asthma symptoms is generally higher in urban than in rural areas.

Despite the use of standardised simple written questionnaires, validated study protocols (including those for translation of questionnaires), and stringent quality control measures in both ISAAC and ECRHS, biases in the comparability of information were unavoidable. This is evident from the simple observation that in the studies data have been presented from standardised written questionnaires which have been translated into over 50 languages, some of which have no colloquial term for wheezing. In an attempt to reduce the biases inherent in international comparisons of asthma symptom prevalence data based on written questionnaires, a video questionnaire has been developed which shows rather than describes the symptoms and signs of asthma, thereby allowing comparisons between populations with different cultures and languages. While the video questionnaire probably provides the most accurate comparable estimates of asthma prevalence between populations worldwide, its use has been confined to the ISAAC programme and insufficient validation has been undertaken to date for it to be used as the primary outcome variable in this report.

B. Prevalence of "Clinical Asthma"

The true prevalence of asthma is difficult to determine due to the lack of a single objective diagnostic test, different methods of classification of the condition, differing interpretation of symptoms in different countries, as well as the uncertain influence of increasing public and professional awareness of asthma. In this report an arbitrary figure of 50% of the prevalence of "current wheezing" in children (self-reported wheezing in the previous 12-month period in 13- to 14-year-old children) has been used as the prevalence of "clinical asthma." In support of this approach, in different populations from high- and low-income countries:

1. The prevalence of "clinically important" (severe) asthma symptoms shows a similar degree of variation to mild wheezing, with a strong correlation at the national level. This indicates that the wide variation in prevalence of current wheezing is not explained by a relative over-reporting of mild symptoms in high-prevalence countries, and that current wheezing can be used as the basis for detecting the prevalence of "clinical asthma".

2. The proportion of individuals with bronchial hyperresponsiveness (BHR) plus current wheeze is around 40% to 60% of that reporting current wheeze. This criteria of BHR plus current wheeze has been proposed as the "gold standard" for identifying clinical asthma in population-based studies, having been shown to identify a group with greater severity of clinical and physiological measures and treatment requirements for asthma than alternative criteria.

3. In children the prevalence rate determined by a positive response to the video sequence of wheezing is about 50% of that of current wheezing from the written questionnaire.

4. In adults the prevalence rate of breathlessness with wheeze (indicative of clinically significant asthma) is about 50% of the prevalence rate of current wheezing.

5. There is a strong correlation observed between ISAAC and ECRHS asthma symptom prevalence data, with 74% of the variation in the prevalence of current wheezing in adults at the centre level explained by the variation in the childhood data. The mean

prevalence rate of current wheezing in children was 88% of that recorded in adults, in the countries which participated in both studies.

6. There is a close correlation between the ISAAC asthma prevalence data for teenagers (13- to 14-year age group) and young children (6- to 7-year age group). In the countries which studied both age groups in the ISAAC programme, the mean prevalence rate of current wheezing in the 6- to 7-year age group was 105% of that recorded in the 13- to 14-year age group.

The prevalence of doctor-diagnosed asthma, of asthma attacks, or of asthma medication use was avoided due to the marked variation in the recognition and presentation to a doctor by an individual with recurrent wheezing episodes, and the considerable differences in diagnostic labelling and treatment by doctors between populations.

As a result the prevalence rates for "clinical asthma" reported in this report represent a conservative estimate.

To determine the number of persons with asthma in each country, the mean prevalence of asthma calculated for each country was multiplied by the population of the country, which was derived from the WHO population statistics for 2001. For countries in which data on asthma symptom prevalence were not available, the mean prevalence of clinical asthma in the specific region was used. While the major limitations of this approach are evident, it does provide a crude estimate for the prevalence of clinical asthma in these countries. This approach enabled the total number of asthmatics in each region to be estimated and thereby the total number of persons with asthma worldwide.

C. Asthma Mortality

The asthma mortality comparison between countries has been made using the asthma mortality rates in the 5- to 34-year age group because the diagnosis of asthma mortality is firmly established in this group. It has been shown that in this age group false-positive reporting (i.e., deaths from other causes being falsely attributed to asthma) and false-negative reporting (i.e., asthma deaths being falsely assigned to other categories) are extremely low. However, the accuracy of this approach declines with increasing age, with false-positive reporting rates of >30% in those aged 65 years or more.

In this report, WHO country-specific mortality data for ICD codes 490 to 493 have been used. These codes incorporate mortality data from asthma, emphysema, chronic bronchitis, and bronchitis not specified as acute or chronic. In the 5- to 34-year age group, these mortality figures are similar to the asthma mortality rates, due to the rarity of mortality from chronic bronchitis or emphysema in this age group. This approach was supported by a validation study based on data from 14 countries in 7 regions, in which the asthma mortality rates in the 5- to 34-year age group as published by the national statistics were compared with the WHO mortality rates for ICD codes 490 to 493. This validation showed that the asthma mortality rates in the 5- to 34-year age group were on average 89% of the WHO-derived figures.

For each country, the mean mortality rate from the two most recent years in which it was available was presented. The mean period in which mortality data were available was 1996 to 1997; mortality data were not reported if they were only available prior to 1992.

When making international comparisons of asthma mortality it is necessary to also consider the asthma prevalence rates in the countries being compared. In this way a more accurate determination of the case fatality rate can be achieved and with this type of analysis a different perspective of the international differences in asthma mortality rates is obtained. In this report, case fatality rates have been derived for each country, in which the asthma mortality rate in the 5 to 34 year age group has been determined as a proportion of the prevalence of clinical asthma, where data were available. It is recognised that the case fatality rates represent a crude estimate, dependent on many factors including the accuracy of the mortality and prevalence statistics available in the different age groups, diagnostic coding, and the recognition and management of the condition. It has not been possible to document overall asthma mortality rates or the number of deaths due to asthma in each country as these data were not available from the WHO in a standardised format.

D. Disability-Adjusted Life Years

In considering the impact of a disease in terms of mortality, it is informative to extend the concept of life expectancy to that of health expectancy. In this way an attempt is made to generalise the concept

of years of life lost to that of years of healthy life lost, representing a health gap measure which incorporates both loss of life and the loss of quality of life. This allows a composite measure of the burden of both fatal and non-fatal disease. As a result, the years lost to disability (YLD) is added to the years of life lost to premature mortality (YLL) to yield an integrated unit of health - the "disability-adjusted life-year" (DALY), with one DALY representing the loss of one year of healthy life. The DALYs lost due to asthma worldwide in 2001 are presented, together with the 30 leading causes of DALYs. These data were obtained from the recently published WHO *World Health Report 2002*.

E. Populations with Regular Access to Essential Drugs

The world map documenting the percentage of the population in each country with regular access to essential drugs was reproduced from the WHO *World Health Report 1998*.