

# Chronic respiratory diseases in developing countries: the burden and strategies for prevention and management

Nadia Ait-Khaled,<sup>1</sup> Donald Enarson,<sup>2</sup> & Jean Bousquet<sup>3</sup>

**Abstract** In developing countries, chronic respiratory diseases represent a challenge to public health because of their frequency, severity, projected trends, and economic impact. Health care planners, for example, are faced with a dramatic increase in tobacco use and must establish priorities for the allocation of limited resources. Nevertheless, smoking prevention and standardized management programmes for asthma and chronic obstructive pulmonary disease should be implemented in developing countries whenever possible. International measures will be required to reverse tobacco smoking trends, and international agencies could define essential drugs and equipment and encourage the use of generic drugs, particularly for corticosteroids inhaled at high dosages. For such programmes to be effective, producers of high-quality generics will need to be identified, and the medications added to national lists of essential drugs and included in procurement procedures. Other recommendations for alleviating the burden of chronic respiratory diseases in developing countries are: adapting guidelines to local contexts and ensuring their distribution; upgrading equipment at district level; purchasing high-quality drugs at low prices; routine training and supervision of health services personnel; and regular monitoring of performance. Social mobilization by professional societies, nongovernmental organizations, and the mass media will also increase government commitment to tobacco control and standardized case management.

**Keywords** Lung diseases, Obstructive/economics/prevention and control/epidemiology; Asthma/economics/prevention and control/epidemiology; Cost of illness; Smoking cessation; Essential drugs; Developing countries (*source: MeSH*).

**Mots clés** Bronchopneumopathies obstructives/économie/prévention et contrôle/épidémiologie; Asthme/économie/prévention et contrôle/épidémiologie; Coût maladie; Sevrage tabagique; Médicaments essentiels; Pays en développement (*source: INSERM*).

**Palabras clave** Neumopatías obstructivas/economía/prevenición y control/epidemiología; Asma/economía/prevenición y control/epidemiología; Costo de la enfermedad; Cese del tabaquismo; Medicamentos esenciales; Países en desarrollo (*fuelle: BIREME*).

*Bulletin of the World Health Organization*, 2001, **79**: 971–979.

Voir page 977 le résumé en français. En la página 977 figura un resumen en español.

## Introduction

Chronic respiratory diseases represent a public health challenge in both industrialized and developing countries because of their frequency (1) and economic impact. In developing countries, where poverty and noncommunicable respiratory disease

have long been linked (2, 3), most patients have poor access to health care; this is even true of the poorest minorities in industrialized countries. In developing countries, however, an additional problem is that health planners have limited resources (4). The burden and trend of chronic respiratory diseases and their economic impact are highlighted in this paper, and practical strategies for improving patient management in developing countries are suggested.

<sup>1</sup> Professor of Respiratory Medicine, Chief of Asthma Division, International Union Against Tuberculosis and Lung Disease (IUATLD) Asthma Division, 68 Boulevard Saint Michel, Paris 75 006, France (email: Naitkhaled@iuatld.org). Correspondence should be addressed to this author.

<sup>2</sup> Professor of Respiratory Medicine, Director of Scientific Activities, IUATLD Tuberculosis Division, Paris, France.

<sup>3</sup> Professor of Respiratory Medicine, Allergie Clinique des Maladies Respiratoires, Montpellier, France, and Institut National de la Santé et de la Recherche Médicale (INSERM) Researcher, INSERM, Montpellier, France.

Ref. No. 01-1281

## Prevalence and distribution of chronic respiratory disease

### Chronic obstructive pulmonary disease

In 1990, the WHO/World Bank global burden of disease study (5, 6) estimated the global prevalence of chronic obstructive pulmonary disease (COPD) to be 9.33 per 1000 people for men and 7.33 per 1000

for women. The prevalence was higher in industrialized countries, except for China — although this has been disputed (7) — and was already high in sub-Saharan Africa (4.41 per 1000 for men and 2.49 per 1000 for women). The lowest prevalence was in the Middle Eastern Crescent (2.69 per 1000 for men and 2.83 per 1000 for women) (6).

In middle-income countries, such as Algeria, COPD and asthma are emerging as public health problems (4; Table 1). However, the prevalence of COPD is probably underestimated, since it is not usually diagnosed until it is clinically apparent and moderately advanced. COPD affects men more frequently than women, usually appears after 45 years of age, and increases in frequency with age. Tobacco smoking is the single most important factor in the genesis of COPD and is responsible for more than 75% of cases worldwide (8–10), but other environmental risk factors are also known. A number of studies in Africa, for example, have shown that COPD is associated with workplace pollution (11–14), and indoor air pollution from biomass fuel appears to contribute to COPD in women in developing countries (15–17). In addition, COPD is associated with acute respiratory infections in children (18, 19) and low socioeconomic status (3). Substantial impairment of lung function is also often found in patients cured of tuberculosis, but with extensive residual fibrosis (20).

The rate of tobacco consumption is increasing throughout the developing world. Between 1985 and 1990, for example, the rates rose by 3.4%, and were predicted to rise by 2.7% between 1995 and 2000 (21). Africa is likely to be particularly hard hit, because of an ageing population and because tobacco use is rising faster there than in any other country. Consumption increased by 2.4% between 1985 and 1990 and was predicted to rise by 3.2% between 1995 and 2000 (22). If nothing is done to stop this rate of growth, Africa will have one of the world's highest levels of tobacco consumption (23). Rising tobacco consumption is due in part to aggressive marketing campaigns by international tobacco companies, which are effective in men and boys (24). Because smoking rates are low in women in Africa and Asia, they are likely to be targeted next by the tobacco industry (25).

Some of the expected trends in COPD prevalence can be explained by changes in life expectancy at birth, which varies widely between countries, and the age structure of the population (with COPD being most frequent in people over 65 years of age). In China, for example, the life expectancy for men in 1998 was 68 years, but only 49 years for men in Africa. The corresponding figures for women were 72 and 51, respectively (21). The age structure of the population also differs between countries (26). In 1995, 44% of the population in Africa was under 5 years of age, compared to only 26% of the population in China; and the proportion of the population over 65 years old was 3% in Africa, 7% in China, 8% in the USA, and 14% in Europe.

## Asthma

In 1986, the International Union Against Tuberculosis and Lung Disease (IUATLD) published a questionnaire that is currently used in most epidemiological surveys on asthma (27). The first international survey to use this questionnaire studied adults aged 20–44 years, in 48 centres in 22 countries (28), and found substantial variation in the prevalence of asthma from one centre to another (Table 2), even within the same country. Another international survey used a standardized protocol, the International Study of Asthma and Allergies in Childhood, and calculated the cumulative prevalence of asthma in children aged 13–14 years in 155 centres in 58 countries (29). Although asthma was more frequent in industrialized countries, in 1998 it was already frequent in Latin America and Africa (Table 3).

In industrialized countries the main risk factors for asthma are exposure to house mites, pollens, pets, and other sources of allergens. Other risk factors include acute respiratory infections, dietary factors, “western” lifestyle, and genetic factors. Asthma is more prevalent in urban areas and in adults younger than 40 years of age. Asthma is even more prevalent in children than adults, with boys being 1.5–3.3 times more frequently affected than girls. Since 1960, the prevalence of asthma in children has risen by about 6–10% annually in most industrialized countries (30), and by almost 50% in 10 years in the USA, mainly among minorities and poorer communities (31). The increase is probably linked in large part to environmental factors (32), as observed in 1998 in Papua New Guinea, where the prevalence of asthma rose from 0.2% to 7.3% in 15 years, following the introduction of blankets.

## Evaluating the global burden of chronic respiratory diseases: the DALY approach

Recently, the burden of diseases, injuries, and risk factors in human populations has been measured in disability-adjusted life years (DALYs). The DALY approach is grounded on economic and ethical principles and can guide policies towards more cost-effective and equitable health care. However, the DALY measurement obscures disease distributions and their impact in terms of disability, and includes social and economic value judgements (33), which undermine its use in the rational allocation of health resources. Moreover, the DALY approach does not solve the problems of prioritization and resource allocation (34).

Nevertheless, an analysis of DALYs lost is useful a useful way to compare the relative importance of chronic respiratory diseases. Using this approach, it was estimated that respiratory diseases caused 15% of the global burden of disease in 1999, with COPD contributing 2.7% of the burden, asthma 0.9%, and tuberculosis 2.3% (35).

However, there were differences from one region of the world to another (Table 4). It has been projected that between 1990 and 2020 the burden of different diseases (measured in DALYs) will change in rank (5), with lower respiratory tract infection falling from first to sixth rank and COPD rising from twelfth to fifth. The disease burden of tuberculosis is projected to remain unchanged at seventh.

## Mortality, morbidity, and poverty

Although COPD is associated with poverty (2, 3), it is less frequent in developing countries because of younger populations and lower tobacco consumption compared to industrialized countries. In Africa, for example, COPD prevalence in patients hospitalized in specialized services ranged from 2.7% in Guinea to 14% in Morocco (36). However, COPD mortality and morbidity are projected to increase in all countries, including those in Africa (37). In sub-Saharan Africa, deaths are projected to increase threefold, from 57 000 in 1985 to 145 000 in 2015, simply from demographic changes. If epidemiological changes are considered, COPD mortality would rise to 243 000 cases in 2015, nearly a fivefold increase (Fig. 1), and higher than the predicted changes in the global average.

Asthma death rates per 100 000 population from 1985 to 1987 varied from 2 (Hong Kong Special Administrative Region of China and USA), to 7 (New Zealand), and to more than 9 (in Germany), although the rates for disadvantaged groups were much higher in all countries (38, 39). These deaths occurred mainly in the young, and at the patient's home (in 50–60% of cases), after the severity of the asthma attack was underestimated and undertreated; and usually, the patient had been inadequately treated prior to the fatal attack. Since 1990, the rising trend in mortality has stopped or reversed in some industrialized countries (40), despite a rise in asthma prevalence, and is probably linked to better use of inhaled corticosteroids among those with access to such medication (41).

In many countries, the rising trend in asthma morbidity in the last 20 years (42) has been reflected in an increase in hospitalization. With the promulgation of consensus recommendations, however, this trend seems to have been stemmed (43). In industrialized countries, unplanned use of health services is higher among the poor (44–47), particularly in inner cities (48) and is linked to deficiencies in patient management, lack of access to care, absence or underutilization of inhaled corticosteroids (49), and lack of patient health education (50).

## Financial and economic costs of chronic respiratory disease

As new health care strategies compete for limited resources, economic analyses are being used to inform choices for health care delivery (51, 52). Unfortun-

Table 1. **Respiratory diseases in Algeria, 1990**

Respiratory disease	Cases per 100 000 people
<b>Acute respiratory infections, annual incidence</b>	
All forms	20 375
Pneumonia	611
<b>Asthma, prevalence</b>	
All forms	800
Severe	80
<b>Chronic bronchitis, prevalence over 40 years of age</b>	
All forms	500
Chronic obstructive pulmonary disease	125
<b>Tuberculosis, annual incidence</b>	
All forms	46
Pulmonary smear positive	23

Source: ref. 4.

Table 2. **The European Community Respiratory Health Survey (ECRHS) estimate of asthma prevalence in adults aged 20–44 years, 1996**

Town, region, or country	Prevalence (%)
Australia and New Zealand	6.8–9.7
USA and Northern Europe	>5
Western Europe and Mediterranean countries	1–4
Alger, Algeria	2.4
Bombay, India	2.6

Source: ref. 28.

Table 3. **The International Study of Asthma and Allergies in Childhood (ISAAC) estimation of asthma prevalence in children 13–14 years old, 1998**

Region	Estimated prevalence (%)
Oceania	25.9
North America	16.5
Latin America	13.4
Western Europe	13.0
Eastern Mediterranean	10.7
Africa	10.4
Pacific Asia	9.4
South-east Asia	4.5
Eastern Europe	4.4

Source: ref. 29.

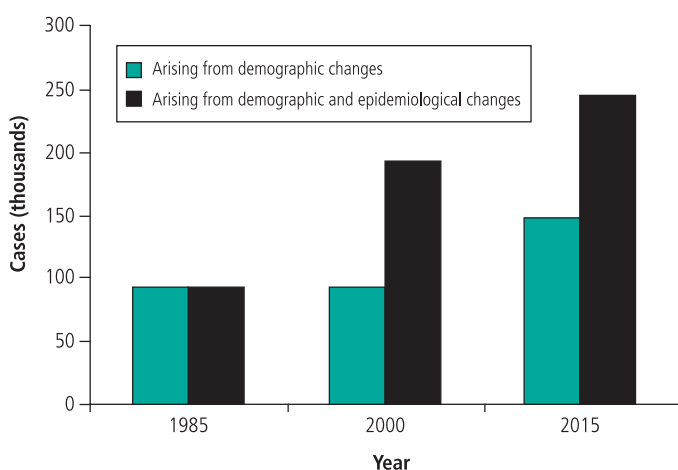
nately, there is a lack of data from developing countries and the cost of disease can only be estimated using data from industrialized countries. In 1993, for example, the annual economic burden of COPD in the USA was estimated to be US\$ 23.9 billion (53), and the estimated annual cost of COPD varies from US\$ 813 per patient in the Netherlands (54) to US\$ 1522 per patient in the USA.

In 1990, it was estimated that annual asthma costs in the USA were US\$ 640 per patient and that they represented 0.5–1.0% of all USA health

Table 4. World Bank estimates of the burden of respiratory diseases in DALYs<sup>a</sup>, 1999

Region	Tuberculosis	COPD <sup>b</sup>	Asthma
Africa	2.3	0.5	0.6
Southeast Asia	3.4	1.5	0.8
Western Pacific	2.2	8.5	1.3
Eastern Mediterranean	1.8	1.3	0.9
Europe	1.4	4.0	1.6
The Americas	0.9	1.8	1.0
<b>World</b>	<b>2.3</b>	<b>2.7</b>	<b>0.9</b>

Source: ref. 35.

<sup>a</sup> DALYs = disability-adjusted life years.<sup>b</sup> COPD = chronic obstructive pulmonary disease.Fig. 1. Projected COPD<sup>a</sup> mortality changes for sub-Saharan Africa

Source: ref. 37.

<sup>a</sup> COPD = chronic obstructive pulmonary disease.

WHO 01.216

expenditure. Although annual asthma costs vary worldwide, from US\$ 326 per patient in Australia in 1991 to US\$ 1315 in Sweden in 1975, it has been estimated that 80–90% of national health expenditure for asthma are allocated to fewer than 10% of asthma patients — i.e. those with severe asthma (55, 56). Moreover, costs increase for asthma patients with rhinitis as a comorbidity (57). Recently, the costs associated with asthma have increased in industrialized countries. In 1998, for example, asthma costs in the USA were estimated at US\$ 12.7 billion annually, more than twice the 1990 costs (51).

However, costs associated with asthma can be reduced by appropriate management. The introduction of high-dose inhaled corticosteroids for severe asthma patients, for example, reduced the number of hospital days by 80% for these patients, as well as reducing health costs (58). Other studies in industrialized (59, 60) and developing (61) countries have also demonstrated the cost-effectiveness of inhaled corticosteroids.

## Prevention and management approaches in developing countries

Most developing countries have no standard protocols for assessing and managing chronic non-communicable respiratory disease. The services that exist do not reach most of the population afflicted by “human poverty”. These people are usually illiterate, have no access to health services, and die before the age of 40 years. They comprise 15% of the population in Latin America, 34% of the population in Arab countries, and more than 40% of those in sub-Saharan Africa and south-east Asia (62).

The objectives of chronic respiratory disease prevention and management for developing countries are to decrease the burden of illness, prevent avoidable deaths, and increase the quality of life of patients. These ways in which these objectives may be accomplished are outlined in Box 1.

### Prevention and management of COPD

International measures will be required to reduce tobacco smoking and counteract the influence of tobacco companies. The Director-General of WHO made tobacco control a priority by creating a new cabinet project, the Tobacco Free Initiative, aimed at focussing international attention and resources on the tobacco epidemic. An important result was the international treaty, the Framework Convention on Tobacco Control (63). To decrease national tobacco consumption, governments must increase taxes, ban sales of single cigarettes, establish smoke-free areas, ban advertising and other promotional tactics, and specify the warnings for and content of tobacco products.

Secondary measures, such as smoking cessation programmes, can reinforce the above approaches. In 1998, the IUATLD published a guide for low-income countries to help health workers and other professionals to establish such programmes (64). The guide provides a framework for implementing smoking cessation activities in primary health care services; for assessing tobacco use and its consequences in the population; for assessing legislation and advocacy needs; and for implementing prevention programmes. Chronic respiratory disease is completely reversible if a patient stops smoking before the onset of airflow obstruction. Once obstruction is established, however, stopping smok-

#### Box 1. The objectives of chronic respiratory disease prevention and management may be achieved by:

- reducing tobacco smoking in the whole population
- encouraging smoking cessation for patients who have access to services
- improving the quality of services through standardized case management
- improving access to affordable essential medications
- improving efficiency by avoiding ineffective and costly care

ing is the only intervention capable of decreasing the loss of lung function. A change of outlook and behaviour of medical personnel (who are frequently smokers) is thus urgently needed in low-income countries to discourage people, particularly the young, from taking up smoking and to encourage patients who are smokers to quit as early as possible. A first step will be smoke-free care facilities. Other prevention activities include reducing pollution from biomass fuel smoke in the environment and workplace.

Guidelines for the standardized management of COPD have been proposed for industrialized countries (65–67) and a global initiative for managing obstructive lung disease was recently published (68). There are also guidelines for COPD in South Africa and Malaysia (69, 70) and for the long-term management of COPD in Africa (36). These guidelines include early recognition of the disease by questionnaire, confirmation of diagnosis, and assessment of disease severity by clinical evaluation and spirometry. The recommended approach to chronic management (36, 69) is a stepwise approach according to disease severity (Fig. 2), using only inexpensive bronchodilators. For example, inhaled  $\beta$ -2 short action and/or inhaled ipratropium bromide on demand, or continuously with or without low doses of slow-release theophylline. Inhaled steroids are reserved for cases where a clear response to a standardized trial of steroids has been demonstrated. Long-term oxygen therapy and rehabilitation programmes are recommended for severe COPD but are not generally available in low-income countries, nor will be in the near future. A number of current interventions are not justifiable and should be stopped, including periodic courses of antibiotics, long-term oral steroids, and mucolytics.

Despite the availability of guidelines, many low-income countries may be unable to implement them, since resources would have to be redirected from higher-priority activities. One unfortunate consequence of this is that COPD may not be properly diagnosed and patients may be inappropriately treated for tuberculosis.

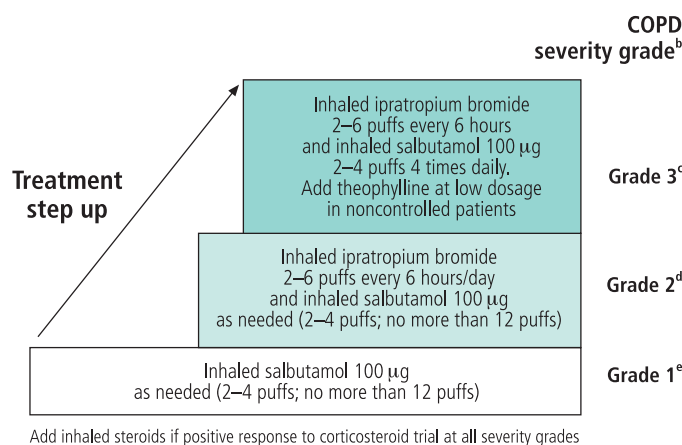
### Prevention and management of asthma

Effective primary interventions for asthma do not exist, although the publication of international consensus reports (71, 72) is an important advance. National consensus documents have also been published in some middle-income countries, and in 1996 the IUATLD published a guide for managing asthma in low-income countries (73). Nevertheless, the benefits of these interventions have yet to reach patients in many developing countries.

The IUATLD guide proposes that international guidelines should be adapted for developing countries. The components of the intervention include a technical package for management and an information system for continuous evaluation. The technical package recommends standardized diagnosis,

treatment, and health education. Evaluation is based on a standardized treatment card and a register of new cases of persistent asthma. Diagnosis, evaluation of severity, and follow-up are based only on clinical history and measurement of peak expiratory flow. Disease severity, for example, is based on a clinical evaluation of symptoms and a functional evaluation based of the best peak expiratory flow. Long-term treatment is stepwise (Fig. 3), using two cost-effective drugs (inhaled salbutamol 100 $\mu$ g; and inhaled beclomethasone 250  $\mu$ g). Patient education is adapted to the socio-

Fig. 2. Stepwise approach to treatment for COPD<sup>a</sup> in developing countries



Source: ref. 36.

<sup>a</sup> See footnote a, Fig. 1.

<sup>b</sup> Based on patient forced vital capacity (FVC), patient forced expiratory volume in one second (FEV<sub>1</sub>), and on patient symptoms severity.

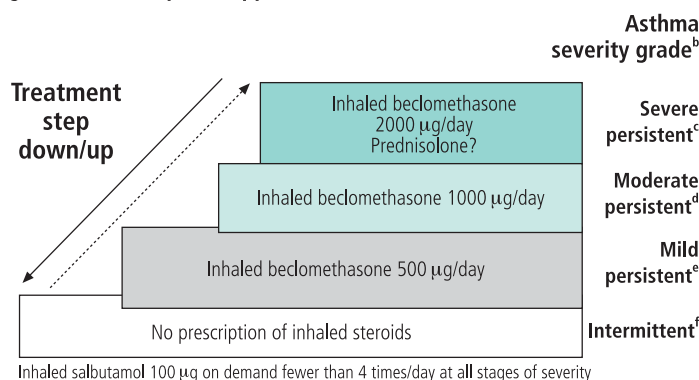
<sup>c</sup> FEV<sub>1</sub>/FVC < 70% and FEV<sub>1</sub> < 40% predicted and/or continuing symptoms with unsatisfactory response to step 2.

<sup>d</sup> FEV<sub>1</sub>/FVC < 70% and FEV<sub>1</sub> = 40–59% predicted and continuing symptoms.

<sup>e</sup> FEV<sub>1</sub>/FVC < 70% and FEV<sub>1</sub> = 60–79% predicted and variable symptoms.

WHO 01.217

Fig. 3. IUATLD<sup>a</sup> stepwise approach to asthma treatment



Source: ref. 73.

<sup>a</sup> IUATLD = International Union Against Tuberculosis and Lung Disease.

<sup>b</sup> Based on patient peak expiratory flow (PEF) grade and patient symptoms severity.

<sup>c</sup> Best PEF < 60% predicted whatever symptoms severity or severe symptoms (continuous) whatever best PEF grade.

<sup>d</sup> Best PEF 60–80% predicted and symptoms less than severe.

<sup>e</sup> Best PEF%  $\geq$  80% predicted and mild symptoms (weekly).

<sup>f</sup> Best PEF%  $\geq$  80% predicted and intermittent symptoms (monthly).

WHO 01.218

Table 5. **Affordability of asthma treatment and national policies in developing countries, 1998**

Country	Cost of IB <sup>a</sup> (US\$)	Inclusion in essential drug list	Generics available	Treatment cost <sup>b</sup> (US\$)	Nurse's salary (US\$ per month)	% of the population with health insurance
Algeria	5	Yes	Yes	52	120	100
Viet Nam	6	Yes	No	60	35	0
Syrian Arab Republic	12	No	No	104	65	0
Côte d'Ivoire	13	No	No	128	100	70
Mali	15	No	No	132	200	0
Turkey	16	Yes	Yes	136	300	0
Guinea	17	No	No	152	81	Very small
Burkina Faso	27	No	No	244	70	0

Source: ref. 76.

<sup>a</sup> IB = Inhaled beclomethasone 250 µg per puff, 200 puffs.

<sup>b</sup> International Union Against Tuberculosis and Lung Disease (IUATLD) standardized treatment for a case of moderate persistent asthma for one year.

cultural context and aims to explain the disease and the role of the two drugs. Patients are taught to identify and avoid factors that trigger asthma, and to take responsibility for adjusting their treatment. Follow-up must be well organized to assure compliance with long-term treatment and an information system for evaluating the intervention is essential. Chronic rhinitis is common (29) and often associated with asthma. If affordable, nasal beclomethasone 50 µg and/or oral H1 antihistaminic can be added to the asthma treatment (74).

A number of costly interventions are not recommended for use in developing countries, including allergy skin tests, measurement of total and specific IgE, nonspecific bronchial challenge, mucolytics, and antibiotics. Immunotherapy is not recommended in these countries (73–75) because in addition to high cost and limited indications, many allergens are not well identified and rare side-effects might be severe.

## Discussion

A number of obstacles in developing countries prevent asthma and COPD guidelines from being effectively implemented, including the availability and affordability of inhaled drugs, availability of equipment, and difficulty of implementing a new health intervention in poorly functioning services. In many developing countries, inhaled high-dose beclomethasone is often not available or affordable. In a 1998 study, inhaled beclomethasone was consistently available in only four of eight countries surveyed (76), and the cost of inhaled beclomethasone varied more than fivefold and that for inhaled salbutamol more than threefold. In all but two countries, the cost of one year of treatment for a case of moderate persistent asthma exceeded the monthly salary of a nurse (Table 5). Another survey in eastern Europe showed that inhaled beclomethasone (250 µg) was unavailable in many regions of Azerbaijan, Georgia, and the Russian Federation. In six other countries, however, drugs were available and affordable (77) (Table 6). This was particularly true in Poland, where a one-year course of treatment for persistent asthma with drugs made in Poland was only US\$ 20, 10 times lower than in Burkina Faso. Lower-priced, high-dose inhaled beclomethasone was most available in countries which used the generic version and included it in national lists of essential drugs, and which published a national consensus.

As national tuberculosis programmes are well developed in most developing countries, it may be possible to integrate standardized management programmes for COPD and asthma into tuberculosis programmes using the existing information system and extending its use to other chronic diseases (78). At primary level, chronic respiratory disease might be suspected from patient history and clinical symptoms. At secondary district level, peak-flow meters are needed to diagnose and manage asthma, and spirometers for COPD. It may be feasible to introduce peak-flow meters because of their low

Table 6. **Relative cost of essential asthma drugs in eastern European countries, 2000**

Country	Cost of IB <sup>a</sup> (US\$)	Inclusion in essential drug list	Generics available	Treatment cost <sup>b</sup> (US\$)	Nurse's salary (US\$ per month)
Poland	1.7 <sup>c</sup>	Yes	Yes	20	100
The former Yugoslav Republic of Macedonia	5–10	Yes	Yes	52	60
Romania	6.8	Yes	Yes	64	207
Hungary	7	Yes	Yes	70	58
Czech Republic	8.3	Yes	Yes	73	145
Bulgaria	8.3	Yes	Yes	78	80

Source: ref. 77.

<sup>a</sup> See footnote a, Table 5.

<sup>b</sup> See footnote b, Table 5.

<sup>c</sup> Drugs made in Poland.

price and easy use, but spirometers are more expensive and need technical maintenance.

Due to limited resources, decision-makers in developing countries must choose between national health priorities. Nevertheless, international and national actions to control tobacco is the highest priority for reducing respiratory disease in all countries. In middle-income countries, an approach using affordable drugs for the standardized management of asthma and COPD, with recommendations to stop costly and ineffective practices, should be cost-effective and might be considered a second priority. In low-income countries, where spirometers are less available, the first step might be the introduction of standardized asthma management.

## Conclusion

In light of the projected burden of COPD in developing countries, programmes to prevent tobacco smoking are urgently needed. Government commitment is fundamental and may be increased by signing the Framework Convention for Tobacco Control. Each country must also consider whether to implement standardized management programmes for

asthma and/or COPD, based on national priorities. International agencies could assist by defining essential drugs and equipment, and encouraging the use of generics. Inhaled beclomethasone 250 µg, for example, has been added to the essential drugs list recommended by WHO (79). There is also a need to identify producers of high-quality generic drugs, to enable international tenders to be effectively applied. National governments should add these medications to their essential drugs list and include them in their procurement procedures. If adequate asthma drugs were made available in developing countries for about US\$ 20 per patient for one year's treatment, these would be affordable for the majority of patients.

Other measures include adapting guidelines to the local context and distributing them; upgrading equipment at district level; purchasing high-quality drugs at low prices; routine training and supervision of health services personnel; and permanently evaluating performance using clear indicators. Mobilization of professional societies, nongovernmental organizations, and the media will also increase government commitment to controlling tobacco use and implementing standardized case management. ■

**Conflicts of interest:** none declared.

## Résumé

### Maladies respiratoires chroniques dans les pays en développement : poids de la morbidité et stratégies de prévention et de prise en charge

Dans les pays en développement, les maladies respiratoires chroniques constituent un grave problème de santé publique en raison de leur fréquence, de leur gravité, de leur impact économique et aussi des tendances prévues. Les planificateurs sanitaires sont par exemple confrontés à une très forte augmentation du tabagisme tout en devant établir des priorités pour l'attribution de ressources limitées. Néanmoins, la prévention du tabagisme et la prise en charge normalisée de l'asthme et des bronchopneumopathies chroniques obstructives devraient être mises en place dès que possible dans ces pays. Des mesures internationales seront nécessaires pour inverser les tendances en ce qui concerne le tabagisme, et les agences internationales pourraient définir les médicaments essentiels et l'équipement de base, et encourager l'utilisation des médicaments génériques notamment pour les corti-

coïdes en inhalation à forte dose. Pour que de tels programmes soient efficaces, il faudra identifier des fabricants de génériques de haute qualité, ajouter les produits en question aux listes nationales de médicaments essentiels et les inscrire dans les procédures d'achat. Pour alléger le fardeau des maladies respiratoires chroniques dans les pays en développement, on peut également recommander d'adapter les directives au contexte local et en assurer la distribution, d'améliorer l'équipement au niveau du district, d'acheter des médicaments de qualité à bas prix, d'assurer la formation et la supervision courantes des personnels de santé, et de suivre régulièrement les résultats. De plus, la mobilisation sociale par le biais des associations professionnelles, des organisations non gouvernementales et des médias renforcera l'engagement des pouvoirs publics en matière de lutte contre le tabac et de prise en charge des cas.

## Resumen

### Enfermedades respiratorias crónicas en los países en desarrollo: carga y estrategias de prevención y manejo

En los países en desarrollo las enfermedades respiratorias crónicas representan un enorme reto para la salud pública, debido a su frecuencia, gravedad, evolución previsible e impacto económico. Los planificadores de la atención sanitaria, por ejemplo, están afrontando un aumento espectacular del consumo de tabaco y deben

establecer prioridades para asignar unos recursos limitados. Así y todo, en los países en desarrollo hay que emprender siempre que sea posible programas de prevención y tratamiento normalizado del tabaquismo, a fin de combatir el asma y la enfermedad pulmonar obstructiva crónica. Se requerirán medidas internacio-

nales para invertir la tendencia de aumento del tabaquismo, y los organismos internacionales podrían señalar el equipo y los medicamentos esenciales necesarios y alentar el uso de medicamentos genéricos, en particular por lo que se refiere a la inhalación de altas dosis de corticosteroides. Para que esos programas sean eficaces, habrá que identificar a los fabricantes de genéricos de alta calidad, e incluir los fármacos en las listas nacionales de medicamentos esenciales y en los procedimientos de adquisición. Otras recomendaciones para aliviar la carga de enfermedades respiratorias

crónicas en los países en desarrollo consisten en adaptar las directrices a los contextos locales y asegurar su distribución; mejorar los equipos disponibles a nivel de distrito; adquirir medicamentos de alta calidad a bajo precio; adiestrar y supervisar de forma sistemática al personal de los servicios de salud, y vigilar regularmente el desempeño. La movilización social por parte de asociaciones profesionales, organizaciones no gubernamentales y medios de comunicación también fomentará el compromiso de los gobiernos en la lucha anti-tabáquica y el manejo normalizado de los casos.

## References

- Lopez AD.** Causes of death in industrial and developing countries: estimates for 1985–1990. In: Jamison DT et al., eds. *Disease control priorities in developing countries*. Washington, DC, Oxford Medical Publications, 1993: 35–50.
- Colley JRT, Reid DD.** Urban and social origins of childhood bronchitis in England and Wales. *British Medical Journal*, 1970, **2**: 213–217.
- Prescott E, Lange P, Vestbo J.** Socioeconomic status, lung function and admission to hospital for COPD: results from the Copenhagen City Heart Study. *European Respiratory Journal*, 1999, **13** (5): 1019–1014.
- Chaulet P.** After health sector reform, whither lung health. *International Journal of Tuberculosis Lung Disease*, 1998, **2** (S): 349–359.
- Murray CJL, Lopez AD, eds.** *The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020*. Cambridge, MA, Harvard University Press, 1996.
- Murray CJL, Lopez AD.** Evidence-based health policy-lessons from the global burden of disease study. *Sciences*, 1996, **274**: 740–743.
- Xian Sheng Chen et al.** Analysis of basic data of the study on prevention and treatment of COPD. *Chinese Journal of Tuberculosis Respiratory Disease*, 1998, **21** (12): 749–752 (English abstract available).
- Burchfiel CM et al.** Effects of smoking and smoking cessation on longitudinal decline in pulmonary function. *American Journal of Respiratory Critical Care Medicine*, 1995, **151**: 1778–1785.
- Kerstjens HAM et al.** Decline of FEV1 by age and smoking status: facts, figures and fallacies. *Thorax*, 1997, **52**: 820–827.
- Gross NJ.** The Lung Health Study. Disappointment and triumph. Editorial. *Journal of the American Medical Association* 1994, **272**: 1539–1541.
- El Meziane A et al.** *Prévalence de la bronchite chronique en milieu industriel au Maroc. [Chronic bronchitis in industrial areas in Morocco.]* 13<sup>e</sup> Congrès Médical Maghrébin [13th Medical Congress of Maghreb], Casablanca, Morocco, 13–14 May 1994.
- Ballal SG.** Respiratory symptoms and occupational bronchitis in chromite ore miners, Sudan. *Journal of Tropical Medicine and Hygiene*, 1986, **89**: 223–228.
- Messadi M.S.** *Prévalence de la bronchite chronique chez les travailleurs de la zone industrielle de Annaba. [Chronic bronchitis prevalence in an industrial area of Annaba (Algeria).]* 5<sup>e</sup> Congrès de la Fédération Maghrébine des Maladies Respiratoires [5th Respiratory Diseases Federation Congress of Maghreb], Casablanca, Morocco, January 1997.
- Yach D et al.** A respiratory epidemiological survey of grain mill workers in Cape Town, South Africa. *American Journal of Respiratory Critical Care Medicine*, 1985, **131**: 505–510.
- Pandey MR.** Domestic smoke pollution and chronic bronchitis in a rural community of Hill Region of Nepal. *Thorax*, 1984, **39**: 337–339.
- Perez-Padilla R et al.** Exposure to biomass smoke and chronic airway disease in Mexican Women. *American Journal of Respiratory Critical Care Medicine*, 1996, **154**: 701–706.
- Behera D, Jindal SK.** Respiratory symptoms in Indian women using domestic cooking fuels. *Chest*, 1991, **100** (2): 385–388.
- Samet M, Tager IB, Speizer FE.** The relationship between respiratory illness in childhood and chronic airflow obstruction in adulthood. *American Journal of Respiratory Critical Care Medicine*, 1983, **127**: 508–523.
- Menezes AMB, Victoria CG, Rigatto M.** Prevalence and risk factors for chronic bronchitis in Pelotas, RS, Brazil: a population based study. *Thorax*, 1994, **49**: 1217–1221.
- Leitch AG.** Pulmonary tuberculosis: clinical features. In: Crofton J, Douglas AC, eds. *Respiratory diseases*, 5th ed. Oxford, Blackwell Science, 2000: 507–527.
- The World Health Report. Making a difference.* Geneva, World Health Organization, 1999.
- Tobacco or health: a global status report.* Geneva, World Health Organization, 1997.
- Yach D.** Le tabac en Afrique. [Tobacco in Africa.] *Forum Mondial de la Santé*, 1996, **17**: 30–38.
- Mackay J, Crofton J.** Tobacco and the developing world. *British Medical Bulletin*, 1996, **52**: 206–221.
- Amos A.** Women and smoking: a global issue. *World Health Statistics Quarterly*, 1996, **49**: 127–133.
- World health statistics annual 1995.* Geneva, World Health Organization, 1996.
- Burney PGJ et al.** Validity and repeatability of the IUATLD (1984) bronchial symptoms questionnaire: an international comparison. *European Respiratory Journal*, 1989, **2**: 940–945.
- Burney P et al.** Variations in the prevalence of respiratory symptoms, self-reported asthma attacks, and use of asthma medications in the European Community Respiratory Health Survey (ECRHS). *European Respiratory Journal*, 1996, **9**: 687–695.
- Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee. *Lancet*, 1998, **351** (9111): 1225–1232.
- Michel FB et al.** L'asthme — problème mondial de santé publique. [Asthma — a worldwide public health problem.] *Bulletin de l'Académie Nationale de Médecine*, 1995, **179** (2): 279–297.
- From the Centers for Disease Control and Prevention. Asthma — United States, 1980–1990. *Journal of the American Medical Association*, 1992, **268** (15): 1995–1999.
- Turner KJ et al.** Relationship between mite densities and the prevalence of asthma, comparative studies in two populations in the Eastern Papua New Guinea. *Clinical Allergy*, 1998, **18** (4): 331–340.
- Cohen J.** The Global Burden of Disease Study: a useful projection of future global health? *Journal of Public Health Medicine*, 2000, **22**: 518–524.
- Sayers BM, Fliedner TM.** The critique of DALYs: a counter-reply. *Bulletin of the World Health Organization*, 1997, **75**: 383–384.



35. *Rapport sur la santé dans le monde 2000. Pour un système de santé plus performant. [The World health report 2000. Health systems: improving performance.]* Geneva, World Health Organization, 2000.
36. **Ait-Khaled N et al.** Epidemiology and management of stable chronic obstructive pulmonary disease in Africa. In: Similowski T, Derenne P, eds. *Clinical management of clinical obstructive pulmonary disease*. New York, Marcel Dekker (in press).
37. **Bumgarner JR, Speizer FE.** Chronic obstructive pulmonary disease. In: Jamison et al., eds. *Disease control priorities in developing countries*. New York, Oxford University Press, 1993: 595–608.
38. **Sly RM.** Increase in deaths from asthma. *Annals of Allergy*, 1984, **53**: 20–25.
39. **Sears MR et al.** Asthma mortality in New Zealand: a two-year national study. *New Zealand Medicine*, 1985, **98**: 271–275.
40. **Campbell MJ et al.** Age specific trends in asthma mortality in England and Wales, 1983–95: results of an observational study. *British Medical Journal*, 1997, **314**: 1439–1441.
41. **Suissa S et al.** Low-dose inhaled corticosteroids and the prevention of deaths from asthma. *New England Journal of Medicine*, 2000, **343**: 332–336.
42. **Anderson HR.** Increase in hospital admission for childhood asthma: trends in referral severity, and readmissions from 1975 to 1985 in a health region of the United Kingdom. *Thorax*, 1989, **44**: 614–619.
43. **Garren J et al.** Major reduction in asthma morbidity and continued reduction in mortality in New Zealand: what lessons have been learned? *Thorax*, 1995, **50**: 303–311.
44. **Burr LM, Verral C, Kaur B.** Social deprivation and asthma. *Respiratory Medicine*, 1997, **91**: 603–608.
45. **Gilthorpe MS et al.** Variations in hospitalization rates for asthma among black and minorities ethnic communities. *Respiratory Medicine*, 1998, **92**: 642–648.
46. **Mark V et al.** Inadequate literacy is a barrier to asthma knowledge and self care. *Chest*, 1998, **114**: 1008–1015.
47. **Partridge MR.** In what way may race, ethnicity or culture influence asthma outcomes? *Thorax*, 2000, **55**: 175–176.
48. **Platts-Mills TA.** Asthma among inner city children. *Pediatric Pulmonology*, 1997, **24**: 231–233 (editorial).
49. **Eggleston PA et al.** Medications used by children with asthma living in the inner city. *Pediatrics*, 1998, **101**: 349–354.
50. **Crain EF et al.** Reported difficulties in access to quality care for children with asthma in the inner city. *Pediatric Adolescent Medicine*, 1998, **152**: 333–339.
51. **Weiss KB, Sullivan SD.** The health economics of asthma and rhinitis. I. Assessing the economic impact. *Journal of Allergy and Clinical Immunology*, 2001, **107**: 3–8.
52. **Sullivan SD, Weiss KB.** Health economics of asthma and rhinitis. II. Assessing the value of interventions. *Journal of Allergy and Clinical Immunology*, 2001, **107** (2): 203–210.
53. *Morbidity and mortality: 1998 chartbook on cardiovascular, lung, and blood diseases*. Bethesda, MD, US Department of Health and Human Services, 1998 (Internet communication at [www.nhlbi.nih.gov/nhlbi/seiin/other/cht-book/htm](http://www.nhlbi.nih.gov/nhlbi/seiin/other/cht-book/htm)).
54. **Rutten-Van Mólken MP et al.** Current and future medical cost of asthma and chronic obstructive pulmonary disease in the Netherlands. *Respiratory Medicine*, 1999, **93** (11): 779–787.
55. **Weiss KB, Gergen PJ, Hodgson TA.** An economic evaluation of asthma in the United States. *New England Journal of Medicine*, 1992, **326**: 862–866.
56. **Weiss KB, Sullivan SD.** The economic costs of asthma: a review and conceptual model. *Pharmacoeconomics*, 1993, **4**: 14–30.
57. **Yawn BP et al.** Allergic rhinitis in Rochester, Minnesota residents with asthma: frequency and impact on health care charges. *Journal of Allergy and Clinical Immunology*, 1999, **103**: 54–59.
58. **Adelroth E, Thomson S.** Advantages of high-dose inhaled budesonide. *Lancet*, 1988, **2**: 476 (letter).
59. **Rutten-Van Mólken MP et al.** Cost effectiveness of inhaled corticosteroids plus bronchodilator therapy versus bronchodilator monotherapy in children with asthma. *Pharmacoeconomics*, 1993, **4**: 257–270.
60. **Sullivan SD et al.** National asthma education and prevention program. Working group report on the cost-effectiveness of asthma care. *American Journal of Respiratory Critical Care Medicine*, 1996, **154**: 584–595.
61. **Perera BJ.** Efficacy and cost effectiveness of inhaled steroids in asthma in a developing country. *Archives of Diseases in Childhood*, 1995, **72**: 312–316.
62. **United Nations Development Programme.** *Rapport mondial sur le développement humain 1997 au service de l'éradication de la pauvreté. [Human development report 1997. Human development to eradicate poverty.]* Paris, Editions Economica, 1997 (available at <http://www.undp.org/hdro/97.htm>).
63. *Framework convention on tobacco control*. Geneva, World Health Organization, 1999 (WHO unpublished document, Technical Briefing Series, WHO/NCD/TF1/99.1–7).
64. **Slama K.** *Tobacco control and prevention. A guide for low-income countries*. Paris, IUATLD, 1998 (Internet communication at <http://www.ihatld.org>).
65. Standards for the diagnosis and care of patients with chronic obstructive pulmonary disease (COPD). *American Journal of Respiratory Critical Care Medicine*, 1995, **152** (5): S78–S121.
66. BTS guidelines for the management of chronic obstructive pulmonary disease. *Thorax*, 1997, **52** (Suppl. 5): S1–S28.
67. **Pauwels RA et al.** Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. NHLBI/WHO Global Initiative for Chronic Obstructive Lung Disease (GOLD). *American Journal of Respiratory Critical Care Medicine*, 2001, **163** (5): 1256–1276.
68. **Siakafas NM et al.** Optimal assessment and management of chronic obstructive pulmonary disease (COPD). European respiratory society consensus statement. *European Respiratory Journal*, 1995, **8**: 1398–1420.
69. Guidelines for the management of chronic obstructive pulmonary disease. Working Group of the South African Pulmonology Society. *South African Medical Journal*, 1998, **88** (8): 999–102.
70. Guidelines in the management of chronic obstructive pulmonary disease. A consensus statement. *Medical Journal of Malaysia*, 1999, **54** (3): 387–401.
71. *International consensus report on diagnosis and treatment of asthma*. Bethesda, MD, National Heart, Lung, and Blood Institute, National Institutes of Health, 1992 (Publication No. 92-3091).
72. *Global strategy for asthma management and prevention. Workshop report*. Bethesda, MD, National Heart, Lung, and Blood Institute, National Institutes of Health, 1995 (Publication No. 95-3659).
73. **Ait-Khaled N, Enarson DA.** *Management of asthma in adults. A guide for low-income countries*. Paris, IUATLD, 1996 (Internet communication at <http://www.ihatld.org>).
74. **Bousquet J et al.** *Allergic rhinitis and its impact on asthma Initiative. A pocket guide for physicians and nurses*. Geneva, World Health Organization, 2001.
75. **Sterk PJ et al.** The message from the 1998 world asthma meeting. *European Respiratory Journal*, 1999, **14**: 1435–1453.
76. **Ait-Khaled N et al.** Affordability of inhaled corticosteroids as a potential barrier to treatment of asthma in some developing countries. *International Journal of Tuberculosis and Lung Disease*, 2000, **4** (3): 268–271.
77. **Ait-Khaled N.** Asthma in adults: management and economic barriers. Paper presented at the First European Conference of IUATLD, Budapest, Hungary, 12–13 April 2000.
78. **Scherpbier R, Raviglione M, Hanson C.** *Report on the adult lung health initiative. Basis for the development of algorithms for assessment, classification and treatment of respiratory illness in school-age children, youths and adults in developing countries*. Recommendations of a WHO consultation, Geneva, 4–15 May 1998 (WHO unpublished document WHO/TB/98.257).
79. *Recommended initial list of 39 international non-proprietary names for pharmaceutical substances*. *WHO Drug Information*, 1998, **12** (1): 34.