

Taking Aim at Asthma Around the World: Global Results of the Asthma Insight and Management Survey in the Asia-Pacific Region, Latin America, Europe, Canada, and the United States

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What is already known about this topic? Prior asthma surveys, conducted from 1998 to 2004 in various countries, reported levels of symptoms, activity limitations, and urgent treatment (eg, hospitalization) in patients with asthma, as well as the level of overall asthma control.

What does this article add to our knowledge? This examination of results from surveys conducted from 2009 to 2011 on patients with asthma in 20 countries provides new insight into regional differences and similarities in patients' asthma characteristics, and it reveals numerous unmet needs with regard to the current state of asthma care and overall patient expectations.

How does this study impact current management guidelines? The global Asthma Insight and Management surveys found patient-exhibited lack of conviction on asthma treatment recommendations and management guidelines and revealed an ongoing need for improvements in asthma care.

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Abbreviations used

AIM- Asthma Insight and Management

AIR- Asthma Insight and Reality

AP- Asia-Pacific

EPR-3- National Asthma Education and Prevention Program

Expert Panel Report 3

EUCAN- Europe and Canada

GINA- Global Initiative for Asthma

LA- Latin America

US- United States

BACKGROUND: Asthma, a worldwide health problem, can be controlled if properly diagnosed and managed. Multinational surveys conducted in patients with asthma from 1998 to 2003 indicated that asthma was inadequately controlled. The Asthma Insight and Management (AIM) study represents the largest survey conducted on patients with asthma since 2003.

OBJECTIVE: The objective of this study was to assess findings from the United States (US), Europe and Canada (EUCAN), Latin America (LA), and the Asia-Pacific (AP) region surveys to identify differences and similarities with earlier surveys on patients with asthma.

METHODS: The US, EUCAN, LA, and AP AIM surveys conducted from 2009 to 2011 all used a common set of questions. Responses to these are reported as proportions of patients with asthma for each country individually, and as totals for all regions. Results are presented as mean/median proportions for US, EUCAN, LA, and AP survey populations individually. Global medians and the range of regional response values are also described.

RESULTS: A total of 10,302 patients or parents of adolescents with asthma were interviewed. Approximately one-quarter reported daytime symptoms daily or on most days over the previous 4 weeks. Globally, a median of 67% (range, 27%-88%) of patients perceived their asthma as completely and/or well controlled, but a median of only 9% (range, 0%-29%) of patients had well-controlled asthma using criteria from asthma guidelines. A majority ($\geq 60\%$) of patients felt that quick-relief medication could be used daily if needed, contrary to guideline recommendations.

CONCLUSIONS: Patients exhibited a lack of knowledge and conviction for treatment recommendations and guidelines that was relatively uniform across the regions, similar to earlier survey findings. These results reveal an ongoing need for improvement in asthma care and education in most populations. © 2015 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2015;3:734-42)

Key words: Asthma; Control; Guidelines; Management; Symptoms; Survey; Treatment

Asthma is a major and growing public health problem across developed and developing countries. The World Health Organization has estimated that as many as 235 million people across the world have asthma.¹ Insights into real-life asthma management practices have been provided in the past by surveys conducted in the United States (1998),² Europe (1999),³ the Asia-Pacific region (2000),⁴ and Latin America (2003).⁵ Also, a global Asthma Insight and Reality (AIR) survey was reported in 2004.⁶ Prior asthma surveys reported levels of symptoms, activity

limitations, and urgent treatment (eg, hospitalization), as well as the level of overall asthma control.

The Asthma Insight and Management (AIM) survey, the largest survey of adults and adolescents with asthma conducted since 2003, reveals numerous unmet needs with regard to the current state of asthma care and overall patient expectations. The AIM survey was first completed in the United States in 2009,^{7,8} with subsequent AIM surveys completed in Canada, Germany, Italy, Spain, and the United Kingdom (EUCAN);⁹ 8 Asia-Pacific (AP) countries (Australia, China, India, Malaysia, Singapore, South Korea, Taiwan, and Thailand) and Hong Kong;¹⁰ as well as 5 Latin America (LA) countries and/or regions (Argentina, Brazil, Mexico, Puerto Rico, and Venezuela).¹¹ Although findings for each of the above regions have been reported,⁷⁻¹¹ an evaluation and comparison of the findings across worldwide regions has not been undertaken. We examined the similarities and differences in findings from the AP, LA, EUCAN, and US AIM surveys for patients' self-reported frequency of asthma symptoms and severe episodes; their perceived level of asthma control; their use of regular asthma medication; and their requirement for urgent treatment. Furthermore, we investigated what, if any, asthma-care characteristics have changed over the past decade since the global AIR survey⁶ was completed. The aim of our analysis was to get a better insight into regional differences in asthma management that may help identify effective asthma management strategies in the future. Although the results of AIM from different regions have been published individually, this examination offers insight into the differences and similarities across the globe.

METHODS

The AIM study was conducted from 2009 to 2011 in 20 countries in North America, Europe, Latin America, and the AP region. The details of the study designs and methodology have been published previously^{7,8,10,11} or presented online.¹² In the AP region, the original US AIM survey was translated from English to local languages, then back-translated to English, and compared with the original US version. In addition, the survey questions were pretested to increase the confidence that these questions were understood. This examination of global AIM survey findings was conducted to characterize the similarities and differences in the results from the US, EUCAN, AP, and LA AIM surveys. Responses to survey questions are reported as proportions of survey respondents for each country individually and as summated values for each of the EUCAN, AP, and LA surveys. As previously reported,^{7,10-12} screening for AIM survey respondents identified households in which at least 1 adult or adolescent (aged 12-17 years) had physician-diagnosed asthma and experienced symptoms or used asthma treatment during the previous year. Interviews following informed consent from patients with asthma or parents of adolescents with asthma were conducted by telephone in the United States,⁷ Europe, Canada,¹² Australia, China, and Hong Kong.¹⁰ Face-to-face interviews were used in India, Malaysia, Singapore, South Korea, Taiwan, and Thailand, and all countries of Latin America.^{10,11}

The AIM survey included 53 questions addressing asthma symptoms, exacerbations, control, and treatment as well as attitudes about asthma management. It was designed to evaluate whether patient perceptions and realities of asthma control are in accordance with the 2007 National Asthma Education and Prevention Program

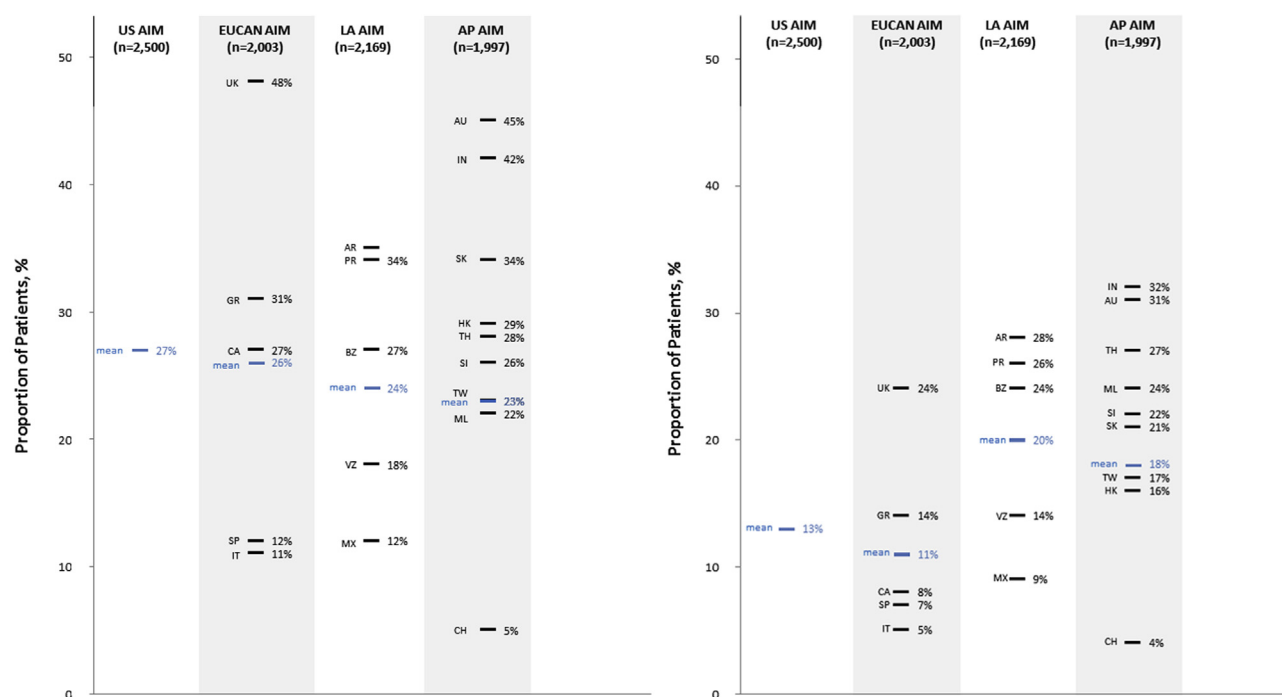


FIGURE 1. Patient reports of daytime and nighttime symptoms occurring every day or most days in the previous 4 wk.^{9-11,16,17} *AIM*, Asthma insight and management; *AP*, Asia-Pacific; *AR*, Argentina; *AU*, Australia; *BZ*, Brazil; *CA*, Canada; *CH*, China; *EUCAN*, Europe and Canada; *GR*, Germany; *HK*, Hong Kong; *IN*, India; *IT*, Italy; *LA*, Latin America; *ML*, Malaysia; *MX*, Mexico; *PR*, Puerto Rico; *SI*, Singapore; *SK*, South Korea; *SP*, Spain; *TH*, Thailand; *TW*, Taiwan; *UK*, United Kingdom; *US*, United States; *VZ*, Venezuela.

Expert Panel Report-3 (EPR-3) and the 2009 Global Initiative for Asthma (GINA).^{13,14}

The range of values for responses to key survey questions is presented in figures and the Online Repository (available at www.jaci-inpractice.org) for each region individually to allow for examination of differences and similarities across the region. Global median values and the range of values for responses across individual countries are also presented here.

RESULTS

Globally, 268,186 households were screened, and a total of 10,302 respondents completed the survey. The mean age of patients in the AP region was 45 years, which ranged from 33 years in Taiwan to 52 years in South Korea.¹⁰ In the LA region, the mean age of patients was 37 years, which ranged from 35 years in Venezuela to 43 years in Puerto Rico.¹¹ In the United States, 62% (1555 of 2499) of patients were ≥ 35 years of age and 38% (944 of 2499) of patients were < 35 years of age.¹⁵ In the EUCAN region, the mean age of patients was 47 years, which ranged from 42 years in Germany to 52 years in the UK (see [Table E1](#) in this article's Online Repository at www.jaci-inpractice.org).

Burden of asthma

Across all the regions, about 1 in 4 patients reported daytime symptoms every day or on most days over the previous 4 weeks, with little regional variability (23% [AP] to 27% [US]). The frequency of nighttime symptoms either every day or on most days ranged from 11% in the EUCAN region to 20% in Latin America ([Figure 1](#)).^{9-11,16,17} Globally, more than 10% of patients reported daytime or nighttime symptoms every day or on

most days over the previous 4 weeks, which signifies poor asthma control based on GINA and EPR-3 criteria. The greatest within-region variability in patients reporting daytime and/or nighttime symptoms on most days occurred in the AP region (see Burden of asthma and [Table E2](#) in this article's Online Repository at www.jaci-inpractice.org).^{7,9-11}

The emotional burden of asthma is evident in patients who report fear, depression, and frustration with their disease. Feelings of fear due to asthma were reported by 33% of LA patients overall and by 7% of patients each in the US and EUCAN regions.^{9,11} In the AP region, fear due to asthma was reported most commonly in China (17%), and depression was reported most commonly in India (12%).¹⁰ More than one-third of patients around the world (median 37%, range 18%-72%) reported that fear of having an asthma exacerbation kept them from doing things they wanted to do (see Burden of asthma and [Table E3](#) in this article's Online Repository at www.jaci-inpractice.org).

The economic burden of asthma is evident in the AIM survey findings of missed work or school days. In the AP, LA, EUCAN, and US regions, 66%, 40%, 19%, and 22% of patients, respectively, reported that they or their child missed days of work or school in the previous year due to asthma (see [Table E3](#) in this article's Online Repository at www.jaci-inpractice.org).

Regionally, between 43% and 64% of patients reported occasional times in the previous 12 months when their asthma symptoms were more frequent or more severe than normal ([Figure 2](#), [Table E2](#) in this article's Online Repository at www.jaci-inpractice.org).⁹⁻¹¹ The mean proportion of AP, LA, EUCAN, and US patients who reported an unscheduled or emergency visit to the doctor's office, hospital, or clinic for

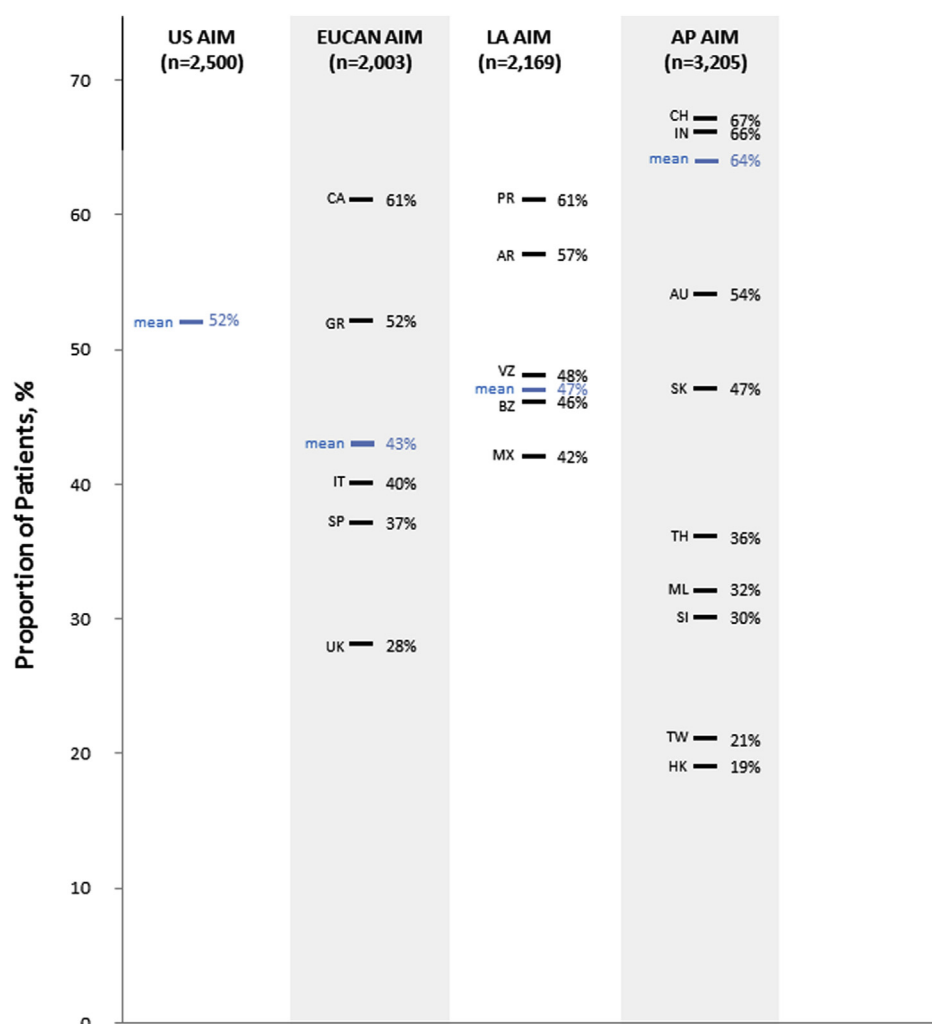


FIGURE 2. Patients reporting episodes in the previous year when symptoms were more frequent or more severe than normal.⁹⁻¹¹ *AIM*, Asthma insight and management; *AP*, Asia-Pacific; *AR*, Argentina; *AU*, Australia; *BZ*, Brazil; *CA*, Canada; *CH*, China; *EUCAN*, Europe and Canada; *GR*, Germany; *HK*, Hong Kong; *IN*, India; *IT*, Italy; *LA*, Latin America; *ML*, Malaysia; *MX*, Mexico; *PR*, Puerto Rico; *SI*, Singapore; *SK*, South Korea; *SP*, Spain; *TH*, Thailand; *TW*, Taiwan; *UK*, United Kingdom; *US*, United States; *VZ*, Venezuela.

treatment of asthma in the previous year was 30%, 44%, 21% and 33%, respectively (Figure 3). The mean reported rate of overnight hospitalization for urgent treatment of asthma was 23% in the LA region, in contrast to 10% or less in the other 3 regions (Figure 3).^{7,9,11,16}

Medication use

The mean proportions of patients reporting the use of controller medication over the previous 4 weeks in the AP, LA, EUCAN, and US regions were 62%, 45%, 57%, and 46%, respectively.⁹⁻¹¹ The proportion of patients reporting the daily use of a controller medication over the previous 4 weeks was highest in the United States (80%). In contrast, only 32%, 38%, and 52% of patients in the AP, LA, and EUCAN regions, respectively, reported daily controller medication use over the previous 4 weeks.^{8,9,16,17}

When asked if they had stopped asthma controller medication for a week or more in the previous 12 months, an affirmative response was obtained from 51%, 52%, 43%, and 42% of

patients in the AP, LA, EUCAN, and US surveys, respectively (see Medication use in this article's Online Repository at www.jaci-inpractice.org).^{8-11,16,17} About half (46%) of the patients in the AP region and 60% of patients in the LA region expressed concern about using inhaled steroids, a rate not much different from their concern about oral steroids (47% [AP] and 61% [LA]).^{10,11}

The mean proportions of patients reporting quick-relief medication use over the previous 4 weeks in the AP, LA, EUCAN, and US regions were 72%, 63%, 69%, and 46%, respectively (see Table E4 in this article's Online Repository at www.jaci-inpractice.org).⁸⁻¹¹

The proportion of patients reporting the use of an oral steroid (pill or liquid) to manage asthma symptoms in the previous year was 35% in US patients and ranged from 26% to 89% in the AP region, 29% to 53% in LA, and 21% to 50% in the EUCAN (see Table E4 in this article's Online Repository at www.jaci-inpractice.org). The median number of times an oral steroid was used for 3 days or longer in the previous year was 3 times in LA and 2 times in EUCAN.^{9,16}

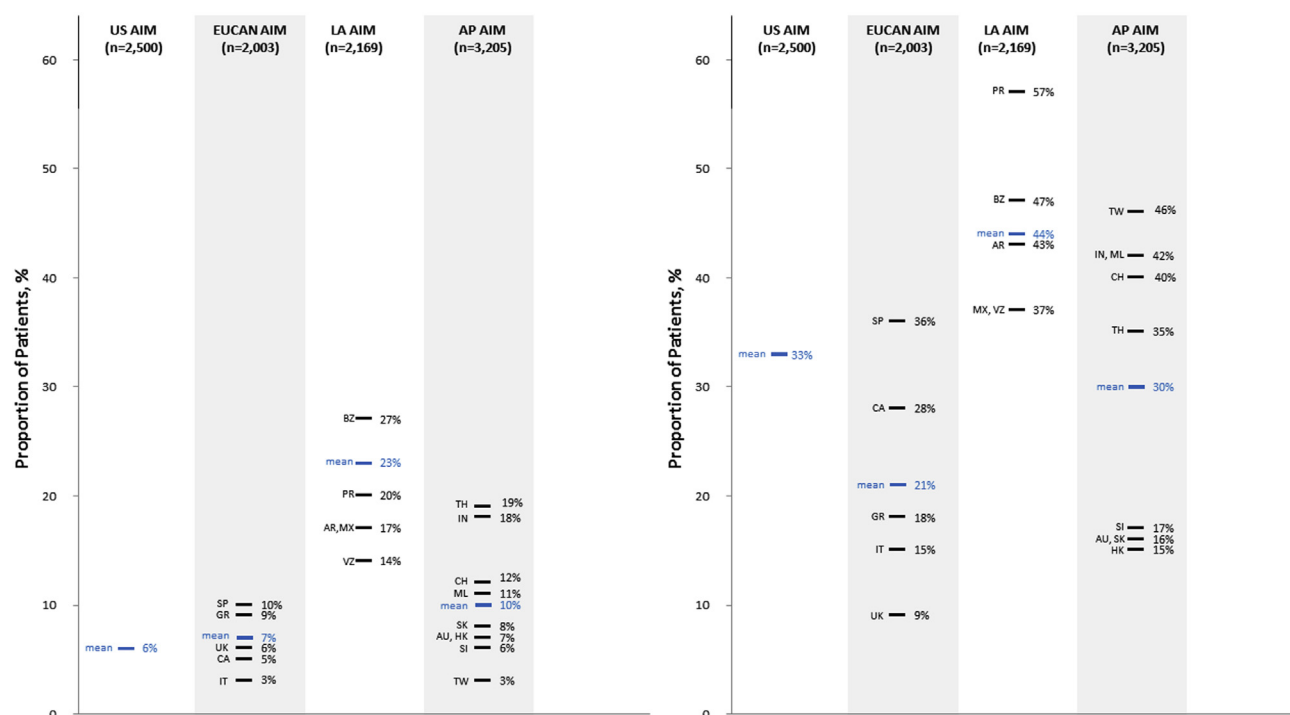


FIGURE 3. Patients who received acute treatment for asthma in the previous year.^{7,9,11,16} *AIM*, Asthma insight and management; *AP*, Asia-Pacific; *AR*, Argentina; *AU*, Australia; *BZ*, Brazil; *CA*, Canada; *CH*, China; *EUCAN*, Europe and Canada; *GR*, Germany; *HK*, Hong Kong; *IN*, India; *IT*, Italy; *LA*, Latin America; *ML*, Malaysia; *MX*, Mexico; *PR*, Puerto Rico; *SI*, Singapore; *SK*, South Korea; *SP*, Spain; *TH*, Thailand; *TW*, Taiwan; *UK*, United Kingdom; *US*, United States; *VZ*, Venezuela.

Asthma control

The percentage of patients who perceived their asthma as “completely or well controlled” in the previous 4 weeks in the AP, LA, EUCAN, and US surveys was 51%, 60%, 81%, and 71%, respectively (Figure 4).^{8-11,16} Globally, a median of 67% (range, 27%-88%) of patients perceived their asthma as completely and/or well controlled. In contrast, a median of 9% (range, 0%-29%) of patients across all 4 regions had well-controlled asthma based on the GINA or EPR-3 guidelines (Figure 4).^{8-11,16} These guidelines state that patients who experience symptoms ≤ 2 days per week have controlled asthma. Furthermore, the GINA and EPR-3 guidelines state that patients who experience 0 or ≤ 2 exacerbations per year, respectively, have controlled asthma.^{13,14}

Regionally, 42% to 63% of patients considered their asthma to be well controlled if exacerbations occurred only 3 or 4 times a year (see Table E5 in this article’s Online Repository at www.jaci-inpractice.org), and this frequency of exacerbations was higher than rates that would qualify for well-controlled asthma as defined by both the GINA and EPR-3 guidelines.^{13,14} The AP region had the widest range of values for this finding (30%-69%), with Australia being the only country with a higher proportion of respondents (69%) than reported for US patients (63%).^{8-10,16}

Asthma management

All of the AIM surveys included a question asking how the patient’s doctor usually assesses asthma (see Table E6 in this article’s Online Repository at www.jaci-inpractice.org). The

proportion of patients reporting that their doctor usually assesses asthma with a breathing test or spirometry was much higher in the EUCAN (42%) and US (74%) regions than in the AP (13%) and LA (14%) regions (see Asthma management in this article’s Online Repository at www.jaci-inpractice.org), clearly highlighting differences in the care delivered by their physicians. Patients who reported the use of doctor-developed written action plans across all regions ranged from 26% to 42%.^{8,9,11,16} In the AP and LA AIM surveys, over half of the patients reported that their doctor usually asked about the frequency of symptoms, whereas a third of patients reported that their doctor usually asked about the frequency of rescue treatment.^{16,17} The EUCAN and US surveys included a question asking if the doctor usually assesses asthma by having the patient fill out an asthma questionnaire, such as the Asthma Control Test.¹⁸ Only 7% of EUCAN patients and 25% of US patients reported that their doctor had them fill out an asthma questionnaire.^{8,9} No information in this regard was collected from the LA or AP regions.

The AIM surveys included questions about medication use and concerns about asthma burden and treatment to examine patients’ attitudes about asthma management (see Table E6 in this article’s Online Repository at www.jaci-inpractice.org). Regionally, 41% to 74% of patients reported that long-term controller medication should be taken every day, a finding that may seem to contradict the reported medication use. However, 40% to 65% reported that long-term controller medication is not necessary when asthma symptoms are not experienced regularly.^{8,9,11,16} In contrast to the variations between regions in attitudes about controller medication, more than 60% of patients

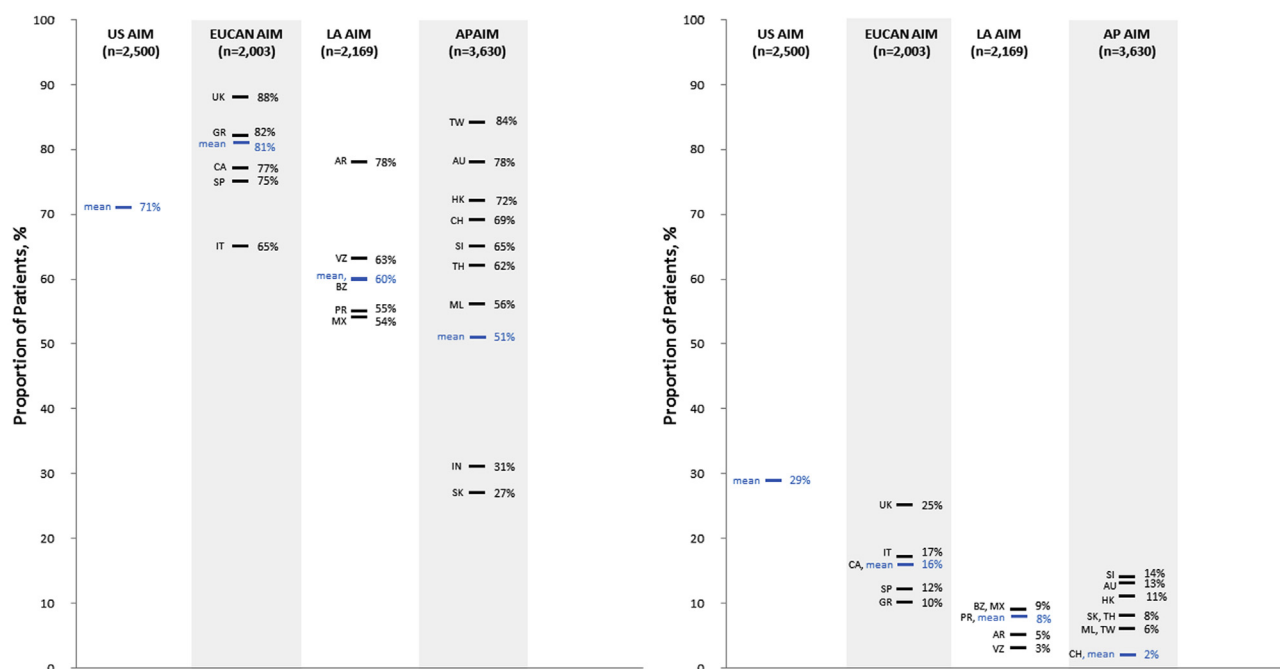


FIGURE 4. Symptom control classification of patients with asthma (GINA 2009; EPR-3).^{8-11,17} AIM, Asthma insight and management; AP, Asia-Pacific; AR, Argentina; AU, Australia; BZ, Brazil; CA, Canada; CH, China; EUCAN, Europe and Canada; GR, Germany; HK, Hong Kong; IN, India; IT, Italy; LA, Latin America; ML, Malaysia; MX, Mexico; NAEP, National Asthma Education and Prevention Program; PR, Puerto Rico; SI, Singapore; SK, South Korea; SP, Spain; TH, Thailand; TW, Taiwan; UK, United Kingdom; US, United States; VZ, Venezuela.

across the 4 global regions reported that quick-relief medicines can be used every day if required (Figure 5).^{8,9,11,16} Although quick-relief medicines may be used every day before exercise, only 7% to 26% of patients around the world (median 14%) reported exercise as a common asthma trigger (see Table E3 in this article's Online Repository at www.jaci-inpractice.org). For many patients, excessive use of quick-relief medicines signifies deteriorating asthma control.

DISCUSSION

The results of this study conducted in more than 10,000 patients with asthma offer a snapshot of real-life asthma management practices across different regions of the world, using 53 questions common to all of the regional surveys. The US and EUCAN surveys also included a question asking patients if their doctor or other health care practitioner ever had them fill out a questionnaire. Patients' acceptance of asthma burden is evident in the global AIM surveys, in which high proportions of patients reported that asthma is well controlled even when the frequency of symptoms and quick-relief medication use are not consistent with guideline criteria. The inaccurate perception of control by patients suggests that they have low expectations of asthma management, which is evident in the survey responses. Patients' self-reported classification of symptom control contrasts with guideline-based classification of control, and reveals that they have no real personal awareness or acceptance of what is poor control and suggests that they have little insight into how much better they could feel. This is likely to underpin many other observed patterns of behavior in terms of medication adherence and management of asthma.

Great variability was seen among the AIM survey responses across countries and within the 4 regions. For example, responses to AIM survey questions relating to perceived and guideline-based asthma control levels show that the AP region generally had more extreme (high or low) values than other regions. The reported use of asthma medication also varied across countries in each region and between regions globally. In the AP region, the proportion of patients reporting the use of a quick-relief medication over the previous 4 weeks was highest in India (83%) and lowest in Taiwan (37%).¹⁰ The ranges of quick-relief medication use in EUCAN region (59%-80%) are similar to those reported in LA (57%-82%). The diversity of medication availability and regulatory controls across regions and countries means that what is thought to be a preventative therapy in one part of the world is quite different from another. For example, oral therapies such as theophylline rather than inhaled steroids are used as preventers in some AP countries. Furthermore, the expense and relative availability of medications, as well as the capacity for individuals (or governments) to be able to afford better therapies, almost certainly underpins the use of asthma medication in a given country.

In contrast to responses that were variably observed across countries, the responders' lack of knowledge and conviction regarding treatment goals and recommendations was relatively uniform across all regions surveyed. A striking example is that the majority ($\geq 60\%$) of patients reported that quick-relief medication can be used everyday if needed. Similarly, 25% to 46% of patients believed that their asthma was well controlled if they had daytime symptoms only 3 days a week or if they used quick-relief medication only 3 times a week, a belief that is a poor target and not consistent with accepted treatment goals.

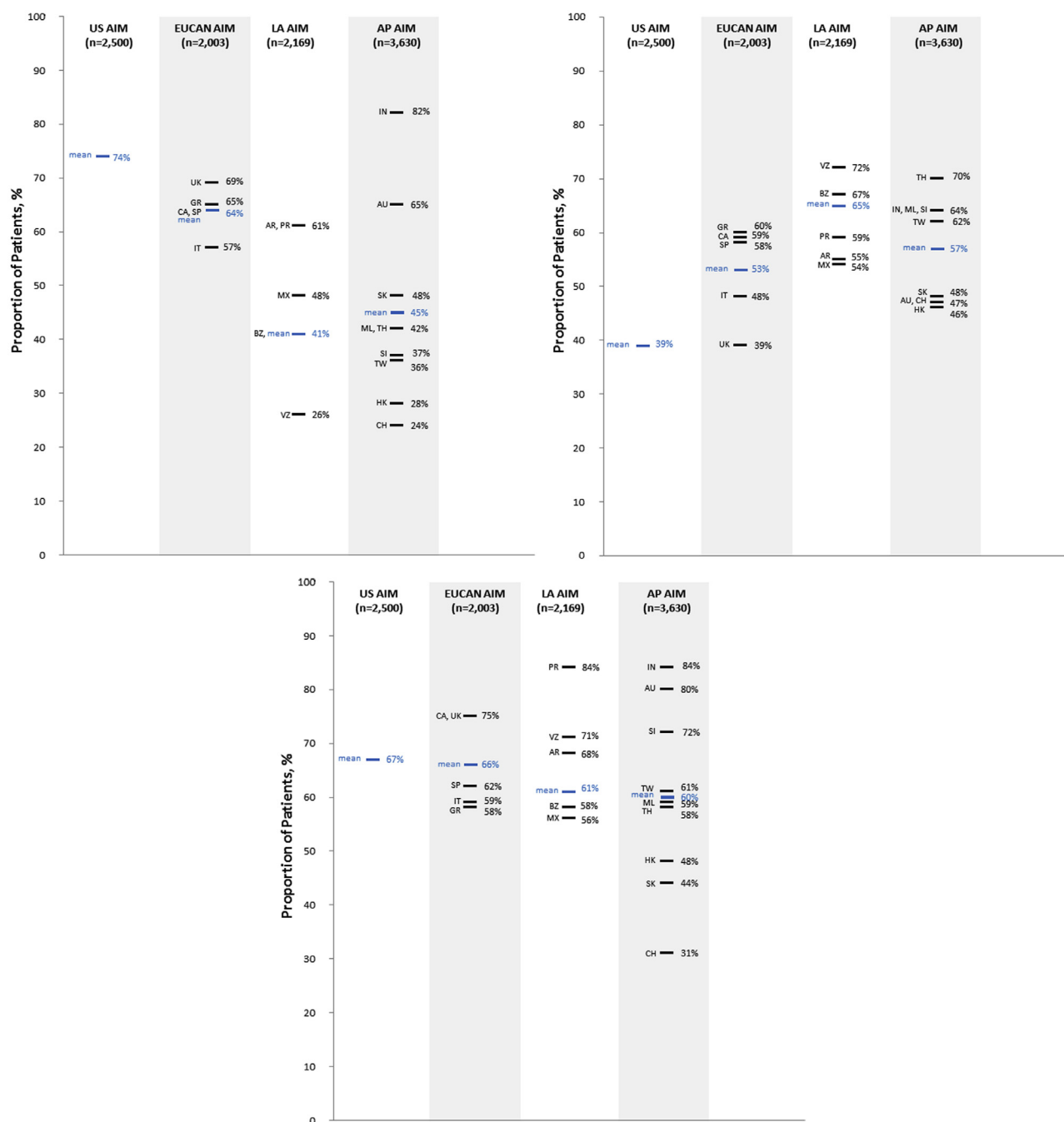


FIGURE 5. Patient attitudes about asthma and asthma treatment (strongly or somewhat agree).^{8,9,11,16} *AIM*, Asthma insight and management; *AP*, Asia-Pacific; *AR*, Argentina; *AU*, Australia; *BZ*, Brazil; *CA*, Canada; *CH*, China; *EUCAN*, Europe and Canada; *GR*, Germany; *HK*, Hong Kong; *IN*, India; *IT*, Italy; *LA*, Latin America; *ML*, Malaysia; *MX*, Mexico; *NAEPP*, National Asthma Education and Prevention Program; *PR*, Puerto Rico; *SI*, Singapore; *SK*, South Korea; *SP*, Spain; *TH*, Thailand; *TW*, Taiwan; *UK*, United Kingdom; *US*, United States; *VZ*, Venezuela.

The global use of controller medications reveals disagreement between physician recommendations and actual patient choices, which has also been observed in other chronic diseases.^{19,20} Many patients expressed concern about using inhaled steroids, which could lead to poor adherence with daily use of controller medication and subsequent episodes of worsening asthma requiring urgent care. Asthma management guidelines

recommend that controller medication should be taken every day, but as described previously, about half of the patients in countries around the world reported stopping controller treatment for a week or more over the previous year. The expressed fear of inhaled steroids and its alignment with fears of oral steroids may well be playing an important and understated role, although this survey did not explore the possibility that patients

who feel controlled could feel better if they maintained guideline-recommended treatments.

A majority of patients in Australia (69%) and the United States (63%) reported that they considered asthma to be well controlled if exacerbations occurred only 3 or 4 times a year. Both of these countries have access to good health systems and treatments, and yet are the very countries where respondents were accepting of rather than alarmed by frequent asthma exacerbations. That exacerbations are a problem is evident in surveys from the United States and Australia,^{21,22} as well as from the National Review of Asthma Deaths in the UK.²³

Similarities and differences between global AIM and the global AIR surveys and their results can illustrate how asthma management and control may have changed over the previous decade. The AIR surveys were completed from 1998 through 2001, whereas the AIM surveys were completed from 2009 through 2011. Practical differences are that AIM (N = 10,302) surveyed patients in 20 countries, whereas AIR (N = 10,939) surveyed patients in 29 countries.⁶ Neither AIM nor AIR surveyed patients in Africa or the Middle East, and only 20-29 countries were included, which limits their global applicability. The AIM and AIR survey questions are similar, asking patients about asthma symptoms, acute care, medication use, and asthma assessment.

Comparing the global AIM and AIR survey results should help determine whether changes have occurred over time in the areas of asthma management and control. Levels of complete control were lower in the AP (2%) and EUCAN (16%) AIM surveys than they were in the AIR survey of patients from the AP region (6%-8%) and Western Europe (14%-18%) for those with severe or moderate asthma.⁶ This suggests a likely reduction in the levels of complete control over the previous decade. The discordancy between patient-perceived asthma control and actual control is a consistent finding from both the AIM and AIR surveys, and its significance should not be underestimated.

Other consistent findings that exist for the current AIM surveys and earlier studies are in the realm of burden and management of asthma.^{2-6,15} For example, the AP AIM survey found 66% of patients reporting missed work or school days in the previous year due to asthma, whereas the global AIR survey found 64% of AP patients reporting missed work or school due to asthma.⁶ However, the proportions of patients reporting missed work or school days in the EUCAN and US AIM surveys were much lower than those reported in the AIR survey. Overall, the AIM findings show how asthma management has not resulted in much change over the past 10 years, and how some countries still have much work to do to improve asthma control. The absence of improved asthma control globally demonstrates an ongoing need for investment in real-life interventions that do not depend on patients' symptom-driven reliance on individual treatments.

CONCLUSION

In the AIM surveys, the burden of asthma was evident in the frequency of symptoms, in the episodes of worsening asthma, and more important, by the frequent need for hospital admission or acute intervention. The data from our studies strongly suggest that the level of control of asthma in real life is strikingly lower than the level of control recommended by guidelines.

Although about half of the patients across global regions reported that controller medication should be taken every day, daily controller use was inconsistent and interruption of controller medication use was common. These findings may help to explain why patients' perceived level of asthma control is higher than actual control based on guideline criteria. Furthermore, the global findings from the AIM surveys did not differ substantially from earlier global asthma surveys, suggesting that the development of treatment guidelines has not realized their goals and that there remains a need for better communication and implementation of treatment guidelines. Patients' apparent lack of conviction with respect to treatment recommendations and goals for asthma management was relatively uniform across the 4 regions surveyed. In conclusion, the global AIM surveys revealed an ongoing need for improvements in asthma care and a better understanding of what constitutes asthma control in the Asian, Australian, Latin American, North American, and European populations.

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METHODS

As reported previously, the AIM survey had a uniform methodology in which participants identified by random sampling were interviewed using a standardized questionnaire.^{E1-E3} Screening for AIM survey participants identified households in which at least 1 adult or adolescent (aged 12-17 years) had physician-diagnosed asthma and experienced symptoms or used asthma treatment over the previous year (Table E1). Face-to-face interviews were used in countries where telephone accessibility was deemed not uniform and was likely to result in an underrepresentation of population segments. Therefore, face-to-face interviews were used in all countries in Latin America as well as in India, Malaysia, Singapore, South Korea, Taiwan, and Thailand.

The quantitative framework for this evaluation of global AIM results is a presentation of mean and/or median values for each of the total US, EUCAN, LA, and AP survey populations, and tabulation of the range of values observed across the countries surveyed in each region. The total number of screened and surveyed patients across the US, EUCAN, LA and AP regions is presented, but it is important to note that results from the surveys in each region are not combined with each other. However, the range of values in each region for the response to each survey question is described.

RESULTS

Burden of asthma

Daytime symptoms occurring 1 to 2 times per week, a level consistent with partly controlled asthma, were reported most in the United States (60%) and least in LA (22%; Table E2).^{E1-E4} In most regions, the degree of nighttime symptom reporting of 1 to 2 times per week was at a level consistent with uncontrolled asthma and affected a smaller number of patients than those who reported daytime symptoms. In the AP region, however, patient reports of nighttime symptoms on 1 to 2 times per week (44%) were only slightly lower than reports of daytime symptoms on 1 to 2 times per week (47%; Table E2).^{E1-E5} The most common asthma trigger that patients reported in the AP region was change in weather (42%); in the LA region, dust (61%); and in the EUCAN and US regions, allergens (61% and 48%, respectively; Table E3).

The median number of episodes in the previous year when asthma symptoms were more frequent or more severe than normal in the previous year was 2 or 3 across all regions, although patients in Germany reported a median of 6 episodes in the last 12 months and patients in India reported a median of 4 (Table E2).^{E2} In the AP region, where the mean rate was 64%, episode rates were as low as 19% and 21% in Hong Kong and Taiwan, respectively, and as high as 66% and 67% in India and China, respectively.^{E3} In the LA and EUCAN regions, the highest reported rates of an episode with severe or frequent symptoms occurred in 61% of patients in both Puerto Rico and Canada.^{E2,E4} More than one-quarter of patients around the world reported ever having had an episode at some time perceived to be life-threatening (Table E2). Among patients who reported ever having a life-threatening episode of worsening asthma symptoms (27%-39%) were those who reported having a life-threatening episode in the previous year (10%-37%, Table E2). The economic burden of asthma is evident in the AIM survey findings of missed work or school days. Among these

patients, the median number of days missed ranged from 3 in the LA region to 7 in the EUCAN region (Table E3).

Surveys conducted in the United States^{E6} and Australia^{E7} found that up to 19% of patients had an unscheduled emergency visit due to asthma over the past year. In the UK, the National Review of Asthma Deaths^{E8} reported that, among 195 patients who died due to asthma between February 2012 and January 2013, 45% (87 of 195) had no medical assistance during the final episode. No record of seeking medical assistance existed for 75% (65 of 87) of these patients. For the overall group who died due to asthma, 34% (66 of 195) apparently were not taking appropriate asthma medication. With regard to the impact of asthma on quality of life, at least 10% of patients across all countries globally reported a lot or some limitation of daily activities, normal physical exertion, sports and recreation, social activities, and sleeping. At least 41% of patients across the global regions reported a lot or some limitation of sports and recreation, and at least 31% reported limitation of normal physical exertion (Table E3). The emotional burden of asthma is evident in reports from some patients that asthma often makes them feel tired or fatigued, embarrassed, frustrated, fearful, or depressed. Feelings of tiredness or fatigue were most common in the AP region (63%), although more than 1 in 4 patients in the EUCAN region and LA also reported that asthma often makes them feel tired or fatigued (Table E3).

Medication use

The ranges of reported controller medication use over the previous 4 weeks in the AP (26%-68%) and LA (24%-60%) regions were wider than the range observed in EUCAN (49%-61%; Table E4).^{E2-E4}

Most patients in the AP region reported taking their controller medication as a pill (80%), as compared to 30% who reported using an inhaler.^{E3} The percentage of patients from LA who reported using an inhaler to administer controller medication in the previous 4 weeks ranged from 45% to 92%.^{E4} Less than 25% of patients in the AP and LA regions reported the use of a nebulizer to administer their controller medication, although the rate of nebulizer use was >40% in China, Hong Kong, and Puerto Rico.^{E3,E4} In the US survey, 75% of patients from this region who used prescription controller medication administered it with an inhaler, whereas 30% used a pill and 11% used a nebulizer to administer controller medication.^{E5} The use of controller medication for regular and/or maintenance treatment administered by a pill or nebulizer was not reported in the EUCAN survey.

In the AP, LA, and EUCAN regions, the proportion of patients who reported the use of quick-relief medication over the past 4 weeks ranged from 46% to 72% (Table E4).^{E2-E4} The proportion of AP, LA, and EUCAN patients who reported use of quick-relief medication over the previous 4 weeks was at least 10% higher than the proportion of patients reporting controller medication use over this period. However, the proportion of US patients reporting use of quick relief medication over the previous 4 weeks (46%) was identical to the proportion of patients reporting use of controller medication over this period. Globally, one-third to two-thirds of patients said that they had used an inhaler for quick relief of asthma symptoms at least once a week over the previous year (Table E4).^{E2,E9,E10}

In the AP region, 2447 patients took controller medication in the previous year, and 1326 patients stopped controller

medication for a week or longer. Of these 1326 patients, 20% stopped this treatment for up to 2 weeks, and 63% of patients stopped for 1 month or longer.^{E9} In the LA region, 1461 patients took controller medication in the previous year, and 745 patients stopped controller medication for a week or longer. Of these 745 patients, 26% stopped this treatment for up to 2 weeks, and 61% of patients stopped for 1 month or longer.^{E4} In the EUCAN region, 1489 patients took controller medication in the previous year; 11% of these patients stopped controller medication for up to 2 weeks, 5% stopped for 3 to 4 weeks, 8% stopped for 1 to 2 months, and 15% stopped for 3 months or longer. In the US, 1369 patients took controller medication in the past year; 14% of these patients stopped controller medication for up to 2 weeks, 4% stopped for 3 to 4 weeks, 8% stopped for 1 to 2 months, and 14% stopped for 3 months or longer.^{E2}

Asthma control

Globally, 25% to 46% of patients reported that they considered asthma well controlled if they had daytime symptoms only 3 days a week or if they had to take quick relief medication only 3 times a week. The range of responses was large in the AP and LA surveys, where the maximum reported percentages were about twice as high as the mean reported percentages (Table E5).

Asthma management

All of the AIM surveys included a question asking how the patient's doctor usually assesses asthma (Table E6). For the entire LA population, 30% of patients who ever had a lung function test ($n = 1083$) had spirometry done within the past year.

Likewise, 35% of AP patients who ever had a lung function test ($n = 1790$) had spirometry done within the past year.

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TABLE E1. Global AIM survey characteristics (data adapted from ^{E1-E4})

Region/Country	Households screened	No. of asthmatics interviewed	Female (%)	Mean age (y)	Mean age at diagnosis (y)
US—2009	60,882	2,500	73	NA	23
EUCAN—2010					
Canada	7,405	401	67	45	22
Germany	22,293	402	67	42	27
Italy	13,620	400	69	50	25
Spain	24,404	400	65	44	25
UK	7,613	400	64	51	25
Total	75,335	2,003	66	47	25
LA—2011					
Argentina	16,321	436	66	40	19
Brazil	4,545	400	68	38	16
Mexico	24,495	532	62	36	18
Puerto Rico	2,193	401	64	43	19
Venezuela	3,654	400	65	35	11
Total	51,208	2,169	67	37	15
AP—2011					
Australia	6,892	403	64	45	19
China	17,247	402	53	38	28
Hong Kong	6,383	412	51	39	21
India	6,541	400	56	50	37
Malaysia	7,461	413	65	42	21
Singapore	7,100	400	63	35	14
South Korea	9,205	400	57	52	39
Taiwan	11,755	400	64	33	20
Thailand	8,177	400	62	46	29
Total	80,761	3,630	54	45	
Global total	268,186	10,302			

AIM, Asthma insight and management; AP, Asia-Pacific; EUCAN, Europe and Canada; LA, Latin America; NR, not reported; UK, United Kingdom; US, United States.

TABLE E2. Global asthma control and symptoms ^{E1-E5}

Survey questions	US AIM		EUCAN AIM		LA AIM		AP AIM	
	n	Proportion of responders	n	Proportion of responders (range)	n	Proportion of responders (range)	n	Proportion of responders (range)
Perceived asthma as completely or well controlled in the previous 4 wk	2499	71	2003	81 (65-88)	2169	60 (54-78)	3630	51 (27-84)
Control classification based on GINA/EPR-3 guidelines*	2499		2003		2169		3630	
■ Well controlled		29		16 (10-25)		8 (3-9)		2 (2-14)
■ Partly controlled		24		61 (51-66)		57 (48-65)		58 (55-73)
■ Uncontrolled		47		23 (20-25)		35 (32-57)		40 (16-42)
Had episodes in the previous 12 mo when asthma symptoms were more frequent or more severe than normal	2500	52	2003	43 (28-61)	2169	47 (42-61)	3630	64 (19-67)
■ Median number of episodes, n (range)		3		3 (2-6)		2 (2-3)	1355	3 (2-4)
Have ever had an asthma episode perceived as life threatening	2499	36	2003	36 (27-44)	2169	39 (34-47)	3205	27 (17-45)
■ Have in the previous year had an asthma episode perceived as life threatening	895	36	2003	10 (5-14)	844	37 (34-40)	859	37 (18-66)
Has daytime symptoms 1-2 times/wk	2499	60	2003	53 (48-65)	2169	22 (15-29)	1997	47 (22-64)
Has nighttime symptoms 1-2 times/wk	2499	33	2003	28 (22-31)	2169	16 (15-20)	1997	44 (28-58)

AIM, Asthma insight and management; AP, Asia-Pacific; EPR-3, expert panel report-3 (National Asthma Education and Prevention Program); EUCAN, Europe and Canada; GINA, global initiative for asthma; LA, Latin America; US, United States.

*Classes in EPR-3 are Well controlled, Not well controlled, and Very poorly controlled.

TABLE E3. Global asthma burden^{E1-E3,E9,E10}

Survey questions	US AIM		EUCAN AIM		LA AIM		AP AIM	
	n	Proportion of responders	n	Proportion of responders (range)	n	Proportion of responders (range)	n	Proportion of responders (range)
Missed work or school in the previous year due to asthma	2500	22	2003	19 (12-24)	2169	40 (38-47)	3630	66 (13-78)
■ Median number of times missed, n (range)	2500	5	2003	7 (5-10)	864	3 (3-8)	1351	5 (2-10)
Common asthma triggers	2500		2003		2169		3205	
■ Allergens		48		61 (52-77)		NR		NR
■ Environment		25		31 (17-41)		NR		NR
■ Pollen		NR		NR		7 (3-21)		15 (5-33)
■ Animals		NR		NR		27 (16-36)		15 (9-25)
■ Dust		NR		NR		61 (34-69)		35 (15-54)
■ Weather		32		28 (23-33)		41 (21-55)		44 (27-61)
■ Exercise		26		21 (14-25)		10 (8-22)		15 (7-26)
■ Viruses/colds		8		11 (7-15)		17 (9-25)		25 (12-41)
■ Emotional		6		11 (6-24)		NR		NR
Activity limitations (a lot or some)	2072		2003		2169		3205	
■ Daily activities		34		25 (13-36)		42 (32-51)		30 (10-68)
■ Normal physical exertion		42		31 (23-35)		49 (41-58)		41 (28-70)
■ Sports and recreation		47		41 (29-58)		49 (45-65)		47 (30-64)
■ Social activities		28		19 (12-25)		34 (23-43)		25 (13-56)
■ Sleeping		29		23 (16-30)		56 (36-61)		34 (21-62)
Asthma often makes me feel...	2500		2003		2169		3205	
■ Tired or fatigued		NR		28 (25-35)		26 (18-38)		63 (41-86)
■ Embarrassed		8		6 (3-8)		12 (2-16)		23 (12-54)
■ Frustrated		NR		13 (9-19)		8 (2-11)		36 (18-76)
■ Fearful		7		7 (3-12)		11 (10-16)		31 (19-74)
■ Depressed		10		9 (4-13)		12 (10-17)		28 (14-53)

AIM, Asthma insight and management; AP, Asia-Pacific; EUCAN, Europe and Canada; LA, Latin America; NR, not reported; US, United States.

TABLE E4. Global medication use^{E1-E7}

Survey questions	US AIM		EUCAN AIM		LA AIM		AP AIM	
	N	Proportion of responders	n	Proportion of responders (range)	n	Proportion of responders (range)	n	Proportion of responders (range)
Used controller medication for asthma in previous 4 wk	2500	46	2003	57 (49-61)	2169	45 (24-60)	3630	51 (27-84)
■ Takes controller by pill	1331	30			1459	29 (26-45)	2760	80 (4-87)
■ Takes controller by nebulizer	1331	11		NR	1459	20 (10-48)	2760	20 (10-48)
■ Takes controller by inhaler	1331	75			1459	57 (45-92)	2760	30 (15-94)
Frequency of controller use over the previous year	1331		2003		1526		2314	
■ Daily		80		52 (41-64)		38 (33-60)		32 (10-55)
■ At least once a week*		4		7 (2-10)		22 (12-23)		26 (13-47)
■ At least once a month†		2		4 (2-8)		6 (2-9)		10 (5-12)
Used quick relief medication for asthma in previous 4 wk	2500	46	2003	69 (59-80)	2169	63 (57-76)	3630	72 (37-83)
■ Used inhaler for quick relief of asthma symptoms at least once a week over the previous year	2500	33	2003	43 (34-56)	1360	67 (62-77)	1532	55 (30-90)
Used an oral steroid (pill or liquid) to manage asthma symptoms in the previous year	2500	35	2003	36 (21-50)	2169	43 (29-53)	3205	50 (26-89)

AIM, Asthma insight and management; AP, Asia-Pacific; EUCAN, Europe and Canada; LA, Latin America; NR, not reported; US, United States.

*Reported as 1-6 times a week in the EUCAN and US surveys.

†Reported as less than once a week in the EUCAN and US surveys.

TABLE E5. Global asthma beliefs and attitudes^{E1-E3,E9,E10}

Survey questions	US AIM	EUCAN AIM	LA AIM	AP AIM
	Proportion of n responders	Proportion of n responders (range)	Proportion of n responders (range)	Proportion of n responders (range)
Asthma is considered well controlled if...	2500	2003	2169	3630
■ Daytime symptoms occur only 3 d a week	46	NR	26 (18-52)	26 (14-40)
■ Quick relief medicine has to be taken only 3 times a week	46	42 (34-47)	28 (20-51)	25 (15-50)
■ Exacerbations occur only 3 or 4 times a year	63	51 (45-62)	44 (42-52)	42 (30-69)
Agree with the following statements	2500	2003	2169	
■ Controller medicines should be taken every day	74	64 (57-69)	41 (26-61)	3,205 45 (24-82)
■ Controller medicines are not necessary when asthma symptoms are not experienced regularly	39	53 (39-60)	65 (54-72)	3,205 57 (46-70)
■ Rescue medicines can be used every day if needed	67	66 (58-75)	61 (56-84)	3,205 60 (31-84)
■ Fear of asthma exacerbations keeps me from doing the things I want to do	29	29 (18-36)	43 (35-57)	3,630 65 (19-72)
■ I worry about using oral steroids, like prednisone	57	38 (30-54)	61 (51-79)	3,630 47 (26-81)

AIM, Asthma insight and management; AP, Asia-Pacific; EUCAN, Europe and Canada; LA, Latin America; US, United States.

TABLE E6. Global asthma management^{E1-E3,E9,E10}

Survey questions	US AIM	EUCAN AIM	LA AIM	AP AIM
	Proportion of n responders	Proportion of n responders (range)	Proportion of n responders (range)	Proportion of n responders (range)
How the doctor usually assesses asthma	2499	2003	2169	3205
■ Has the patient fill out a questionnaire	25	7 (2-7)	NR	NR
■ Asks about frequency of symptoms	NR	NR	57 (47-75)	61 (39-81)
■ Asks about frequency of rescue treatment	NR	NR	34 (20-63)	34 (14-58)
■ Gives the patient a breathing test or spirometry	74	42 (24-59)	14 (8-21)	13 (4-23)
■ Has a doctor developed written action plan for asthma treatment	74	29 (15-45)	42 (33-56)	26 (7-37)

AIM, Asthma insight and management; AP, Asia-Pacific; EUCAN, Europe and Canada; LA, Latin America; NR, not reported; US, United States.

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