

Asthma in United States Olympic athletes who participated in the 1998 Olympic Winter Games

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Original articles

Asthma in United States Olympic athletes who participated in the 1998 Olympic Winter Games

John M. Weiler MD^a
Edward J. Ryan III MS, ATC^b

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From ^a the University of Iowa, Iowa City, and ^b the United States Olympic Committee, Colorado Springs.

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Reprint requests: John M. Weiler, MD, T307 GH, 200 Hawkins Dr, University of Iowa, Iowa City, IA 52242.

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Iowa City, Ia, and Colorado Springs, Colo

Background: About one of every 5 athletes who participated in the 1996 Summer Olympic Games in Atlanta had a past history of asthma, had symptoms that suggested asthma, or took asthma medications. No previous study has determined the prevalence of asthma in all US athletes who participated in an Olympic Winter Games.

Objectives: We sought to determine how many US athletes who participated in the 1998 Olympic Winter Games had a past history of asthma, had symptoms that suggested asthma, or indicated taking a medication used to treat asthma.

Methods: We evaluated responses to questions that asked about allergic and respiratory diseases in the United States Olympic Committee Medical History Questionnaire that was completed by all 196 athletes who represented the United States at the 1998 Olympic Winter Games in Nagano, Japan.

Results: Forty-three (21.9%) of the 196 athletes had a previous diagnosis of asthma, and 36 (18.4%) recorded use of an asthma medication at some time in the past. Forty-four (22.4%) reported use of an asthma medication, a diagnosis of asthma, or both (our basis for the diagnosis of asthma).

Thirty-four (17.4%) of the athletes were currently taking an asthma medication at the time that they completed the questionnaire or indicated that they took these medications on a permanent or semipermanent basis and were considered to have active asthma. Athletes who participated in Nordic combined, cross-country, and short track events had the highest prevalence of having been told that they had asthma or had taken an asthma medication in the past (60.7%) in contrast with only one (2.8%) of the 36 athletes who participated in bobsled, biathlon, luge, and ski jumping. Eighteen (24%) of 75 athletes who participated in alpine, long track, figure skating, snow boarding, and curling had a previous diagnosis of asthma or recorded use of an asthma medication.

Conclusions: We conclude that asthma appeared to have been more common in athletes who participated in the 1998 Winter Games than in athletes who participated in either the 1996 or 1984 Summer Games. Clearly, asthma rates vary widely among sports. This suggests that the environment in which exercise is performed is important in leading to a decrease in the amount of exercise required to trigger asthma and perhaps in causing injury to the airways. (J Allergy Clin Immunol 2000;106:267-71.)

Abbreviation used

USOC:
United States Olympic Committee

The prevalence of asthma appears to have increased over the past few decades.^[1] One manifestation of this may be an increase in the number of elite and Olympic athletes who appear to have asthma.^{[2] [3]} Voy^[4] reported that more than 11% of the athletes who represented the United States at the Olympic Games in Los Angeles in 1984 had exercise-induced asthma. We reported that more than 16% of the athletes who represented the United States at the Olympic Games in Atlanta in 1996 recorded a history of asthma or of taking an asthma medication.^[2] Other reports also suggest a high prevalence of asthma in populations of Olympic and elite athletes, as well as in highly competitive athletes.^{[5] [11]} Some of these studies suggest a higher prevalence of asthma in athletes who participate in winter sports than in those who participate in summer events.^{[7] [9] [11]} Unfortunately, no study has compared the prevalence of asthma in athletes who participate in cold- versus warm-weather sports. Moreover, no previous study has determined the prevalence of asthma in all US athletes who participated in an Olympic Winter Games.

Using the same design used to examine US athletes who participated in the 1996 Olympic Summer Games, we sought to determine the number of US athletes at the 13th Olympic Winter Games in Nagano who recorded a history of asthma or of taking an asthma medication. Our goal was to compare the data obtained from athletes who participated in the 1996 Summer Games^[2] with data from those who participated in the 1998 Winter Games.

Methods

All athletes who represented the United States at the 1998 Winter Games in Nagano were required to complete a medical history questionnaire that was designed by the United States Olympic Committee (USOC) Sports Medicine Division; this was the same questionnaire that was used in our previous study at the 1996 Atlanta Games.^[2] Briefly, questionnaires were given to the athletes by USOC medical staff at team processing in Nagano within 2 weeks before participation in the Winter Games. Athletes completed and signed the questionnaire, and USOC medical staff reviewed all of the questions on each form to eliminate missing entries and to clarify ambiguous responses. Sixteen of the 60 questions asked about allergic and respiratory disease (Table I).

Question	Yes/total responses
1. Are you allergic to any medicine (aspirin, penicillin, sulfa, etc)?	27/196 (13.8%)

Table I. Questions asked on the medical history questionnaire, total number of athletes who answered yes, and total number who responded to each question

Question	Yes/total responses
2. Are you allergic to any insect bites/stings or do you have any food allergies?	18/196 (9.2%)*
3. Do you take any medications (over the counter, herbs, supplements, vitamins)?	126/196 (63.3%)*
4. Do you take any prescribed medications on a permanent or semi-permanent basis (steroids, birth control pills, anti-inflammatories, antibiotics, etc)?	71/196 (36.2%)*
5. Have you ever been told that you have (had) asthma or exercise induced asthma?	43/196 (21.9%)
6. Do you ever have chest tightness?	18/196 (9.2%)
7. Do you ever have wheezing?	23/196 (11.7%)
8. Do you ever have itchy eyes?	29/196 (14.8%)
9. Do you ever have itching of the nose or throat or sneezing spells?	26/196 (13.3%)
10. Does running ever cause chest tightness or cough or wheezing or prolonged shortness of breath?	18/196 (9.2%)
11. Have you ever had chest tightness, cough, wheezing, asthma, or other chest (lung) problems, which made it difficult for you to perform in sports?	24/196 (12.2%)
12. Have you ever missed school, work, or practice because of chest tightness or cough or wheezing or prolonged shortness of breath?	3/196 (1.5%)
13. If you have been told you have asthma, what medications have you taken?	32 (16.3%)*†
14. Do you have trouble breathing or do you cough during or after activity?	23/194 (11.8%)
15. Do you have or have you ever had lung disease (pneumonia)?	7/194 (3.6%)
16. List current medications:	34/196 (17.3%)
††	

* If athlete marked yes, she or he was given a line on which to list a response.

† Athlete was provided a space to list medications.

Forms were processed by CompleWare Corporation (Iowa City, Iowa), as previously described.²

The basis for determining that an athlete had asthma was a history of having been told that she or he had asthma, the indication that she or he had taken an asthma medication, or both (Table II).

Table II. Response to question 5 and indication that athletes had taken an asthma medication on the medical history questionnaire

Response to question 5 (history of asthma)	Recorded asthma medications	No. of athletes
Yes	Yes	35
Yes	No	8
No	Yes	1
		44*
:		

* Total number of patients who had asthma.

This project was approved by the University of Iowa Institutional Review Board.

Results

One hundred ninety-six athletes represented the United States in Nagano, and all completed the questionnaire. Responses to the questions that asked about allergic and respiratory disease are presented in Table I. Almost 22% of the athletes had been told that they had asthma (question 5). About 16% (32/196) of the athletes listed having taken a medication specifically for asthma at some time (question 13). When we combined all questions on the questionnaire that asked athletes to list medications, we found that 36 (18.4%) had listed an asthma medication somewhere on the form or provided this information to USOC medical staff who recorded it on the questionnaire. Thus 4 athletes did not list an asthma medication as a response to question 13 but did so elsewhere on the questionnaire.

Forty-four (22.4%) either had been told that they had asthma (question 5) or had taken an asthma medication (Table II). One athlete answered question 5 with a no but listed an asthma medication (ie, a fluticasone inhaler) as a response to question 3. At the time of team processing, 17.3% (34/196) of the athletes recorded that they were currently taking an asthma medication (the athletes with

active asthma). Table III lists the categories of asthma medications that these athletes were taking.

Medication category	No. of athletes
Short-acting β_2 -agonist	30
Inhaled corticosteroids	8
Cromolyn-nedocromil	4
Long-acting β_2 -agonist	3
Prednisone	1
Ipratropium	1

Short-acting β_2 -agonists (primarily albuterol) were the drugs most commonly listed.

As was done for the athletes who participated in the 1996 Summer Games, we examined whether there were differences among sports in the numbers of athletes who recorded a history of asthma or listed having used asthma medications (Table IV).

Events	Asthma/total athletes (%)	Current asthma/total athletes (%)
Nordic combined, cross-country, short track	17/28 (60.7%)	16/28 (57.1%)
Alpine, long track, figure skating, snow boarding, curling	18/75 (24.0%)	12/75 (16.0%)
Freestyle, hockey	8/57 (14.0%)	6/57 (10.5%)
Luge, bobsled, biathlon, jumping	1/36 (2.8%)	0/36 (0%)

We combined sports with similar prevalence rates and again found that there were substantial differences among sports. Athletes who participated in Nordic combined, cross-country, and short track events had the highest prevalence of having been told that they had asthma or had taken an asthma medication in the past (60.7%) in contrast with only one (2.8%) of the 36 athletes who participated in bobsled, biathlon, luge, and ski jumping. Table IV displays the number of athletes with active asthma among the various sports.

We evaluated whether the athlete's sex had any influence on whether he or she reported asthma. We found that a significantly higher percentage of female

athletes (35.4% [29/82]) met our criteria for asthma than did male athletes (13.2% [15/114]; $P = .0044$, two-tailed Fischer exact test; SAS System, Cary, NC).

Finally, we also determined whether those with asthma won a similar proportion of medals compared with their nonasthmatic teammates. Of the 44 athletes with asthma, 5 (11.4%) athletes won medals, including both individual and team medals. Of the 152 athletes who did not have asthma, 27 (17.8%) won medals, again including both team and individual awards. Of the 34 athletes with active asthma, only 3 (8.8%) won medals.

Discussion

This study demonstrates that 44 (22.4%) of the 196 US athletes who participated in the Nagano Winter Games in 1998 had a history of asthma, took asthma medications, or both (Tables I and II) compared with 117 (16.7%) of the 699 athletes who participated in the Atlanta Summer Games in 1996.² On the medical history questionnaire, athletes were asked the following: "Have you ever been told that you have (had) asthma or exercise-induced asthma?"; 15.3% and 21.9% recorded positive responses in 1996 and 1998, respectively. When asked whether they had taken asthma medications, 13.9% and 18.4% recorded medications in 1996 and 1998, respectively.

We also evaluated responses to questions that asked about asthma symptoms in athletes who had not been told that they had asthma and had not recorded asthma medications. These additional questions asked about a history of chest tightness (question 6), a history of wheezing (question 7), symptoms with running (question 10), performance impairment from respiratory symptoms (question 11), missed school or work or practice because of respiratory symptoms (question 12), and respiratory symptoms after exercise (question 14). Positive responses were recorded by 3, 1, 0, 3, 0, and 7 athletes in 1998, respectively, who had not been told that they had asthma and had not recorded using any asthma medications. Overall, 24 athletes in 1996 and 11 in 1998 answered yes to at least one of these questions but were not included in the 117 and 44, respectively, who we concluded had asthma. We have no basis to determine whether these additional athletes did indeed have asthma, particularly exercise-induced asthma. However, if all of them had asthma, then the total number of US athletes with asthma who participated in the 1996 and 1998 Olympic Games would have been about 20% (141/699) and 28% (55/196), respectively, by using criteria that were similar to those used for the 1984 Summer Olympic Games.⁴

There were wide differences in prevalence rates among sports. In the 1996 Games, 29.8% of the cyclists, swimmers, and those who participated in canoe-kayak and sailing-yachting events met our criteria for asthma compared with only 8.5% of athletes who participated in basketball, field hockey, soccer, team handball, water polo, badminton, volleyball, table tennis, and tennis. In 1998,

athletes who participated in Nordic combined, cross-country, and short track events (Table IV) had the highest prevalence of having been told that they had asthma or had taken an asthma medication in the past (60.7%). These findings are consistent with the notion that some endurance sports have a higher prevalence of asthma than some speed and power sports.

More female than male athletes had asthma in 1996, and the difference was even greater in 1998. By our criteria in 1996 and 1998, 19.9% and 35.4% of female athletes and 14.3% and 13.2% of male athletes had asthma, respectively.

Do athletes who have symptoms in cold weather simply use this complaint to justify the use of medications to improve performance? Larsson et al^[42] examined whether inhaling a β_2 -agonist increased performance at low temperatures in 20 healthy, nonasthmatic, nonallergic athletes who did not have bronchial hyperresponsiveness. Each athlete performed a maximal exercise challenge on a treadmill at about -10°C in a cross-over study after receiving terbutaline or placebo inhaler. There were no significant differences in exercise time, oxygen uptake, maximal ventilation, or maximal heart rate between terbutaline-treated and placebo-treated athletes. Larsson et al concluded that although terbutaline increased FEV_1 after exercise, it did not lead to an increase in performance compared with placebo. Sandsund et al^[13] and Sue-Chu et al^[14] also reported that albuterol and salmeterol increased FEV_1 in cross-country skiers who exercised at an ambient temperature of -15°C but did not improve performance. These studies strongly suggest that β_2 -agonists do not enhance performance.

Larsson et al^[4] reported the prevalence of asthma in 42 elite cross-country skiers compared with 29 nonskiers. Skiers had more symptoms and bronchial hyperresponsiveness than nonskiers in summer and winter. Fifteen skiers took medications to treat asthma; 23 had bronchial hyperresponsiveness and asthma symptoms or a diagnosis of asthma. Larsson et al^[4] concluded that 33 (78.6%) of the 42 skiers had symptoms of asthma or bronchial hyperresponsiveness compared with only one control subject; no control subject had used drugs to treat asthma.

Mannix et al^[10] investigated the prevalence of exercise-induced asthma in professionally coached figure skaters by performing spirometry before and after a simulated long program of skating. This study showed a decrease in FEV_1 of at least 10% after exercise in 43 (35%) of the 124 skaters. In a follow-up study Mannix et al^[11] reported that 55% of figure skaters had either a positive exercise test response at the rink or a positive eucapnic voluntary hyperventilation test response. Provost-Craig et al^[9] found similar results in their study.

Sue-Chu et al^{[15] [18]} evaluated the high rate of asthma in cross-country skiers. In one report they describe a comparison of asthma in cross-country skiers in two regions, one in Norway and the other in Sweden.^[15] Asthma prevalence was similar in these athletes (46% and 51% in Norway and Sweden, respectively),

whereas the prevalence of bronchial hyperresponsiveness to methacholine was 14% and 43%, respectively. Self-reported respiratory allergy was 11% and 32%, respectively, and cough associated with training was 42% and 64%, respectively, in Norway and Sweden. In another report Sue-Chu et al^[17] described a comparison of 30 elite skiers with 10 nonasthmatic, nonatopic control subjects. Nine of the skiers were atopic, but all denied allergy symptoms. Bronchoscopy was performed, and there was considerably more evidence of inflammation in the lungs of the skiers compared with the control subjects.

These studies suggest that more athletes who participate in winter sports have asthma than those who participate in sports in warmer environments. The differences between the rates in athletes who participate in summer and winter events may suggest that the environment in which exercise is performed is indeed important in causing injury to the airways and in leading to a decrease in the amount of exercise required to trigger asthma. In addition, asthma (especially a childhood history of respiratory symptoms) may influence the sport that an athlete chooses.

What happens to athletes with asthma who participate in cold-weather sports over time? No study has been reported that directly examined this question by following a group of athletes over time. Using a questionnaire, Kujala et al^[19] retrospectively compared the lifetime occurrence of asthma, chronic bronchitis, and emphysema and the presence of current bronchitis symptoms in 1282 former elite male athletes who represented Finland from 1920 to 1965 in international competition in a wide variety of sports and in 777 control subjects. These authors also incorporated data from a nationwide reimbursable medication register and from death certificates. They found that pulmonary diseases were associated with age, smoking, occupation, and exposure to chemicals but not participation in sports. Lifetime occurrence rates of physician-diagnosed asthma, chronic bronchitis, and emphysema in cross-country skiers and ice hockey players were similar to the rates in athletes who participated in warm-environment sports, such as track and field, basketball, boxing, and soccer. Asthma was reported by 4.3% of former cross-country skiers and 2.7% of former ice hockey players compared with 3.0% of former basketball players, 2.0% of former long-distance runners, 3.8% of former boxers, and 3.5% of control subjects.

Our observations have limitations. Although the medical history questionnaire was completed by all athletes who represented the United States in Olympic competition, the quality of the data depends on whether the athletes provided accurate responses. It is possible that a diagnosis of asthma was made without adequate evidence for asthma or during an episode of transient bronchial hyperresponsiveness associated with a viral illness, but that would be true with many studies of asthma prevalence in which objective tests are not performed. It is also possible that an asthma medication was prescribed for reasons other than

asthma, even when the prescribing physician has been required to notify the USOC.

However, a study by Wilber et al^[20] published in 2000 reported the results of exercise challenges in 170 potential US Olympic athletes who participated in 7 of the sports, many of whom participated in the 1998 Olympic Winter Games. Findings from this study agree with our findings, including the differences between male and female athletes and the sports-specific rates of asthma for cross-country, short track, figure skating, hockey, and biathlon athletes. Using “sport and environmentally specific protocols,” Wilber et al found that 23% of the US winter athletes that they examined experienced exercise-induced drops in FEV₁ of at least 10%. Their study and our report, taken together, suggest that at least 20% of the 1998 Winter Olympic athletes had asthma.

In the end, we must conclude that asthma is very common in elite and Olympic athletes and that it occurs in athletes at all levels of competitiveness. This should reassure younger athletes who have asthma and who wish to be competitive athletes. Asthma should be viewed as a disability that, with proper therapy, can be overcome.

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