ORIGINAL RESEARCH

Morbidity and Determinants of Health on Youth Expeditions

Anna Sadnicka, BSc; Roland Walker, BSc; Jon Dallimore, MSc, MRCP, DCH, DRCOG

From the University of Bristol, Bristol, United Kingdom (Miss Sadnicka and Mr Walker); and the Emergency Department, Bristol Royal Infirmary, Bristol, United Kingdom (Dr Dallimore).

Objective.—To document the prevalence of illness and injury on youth expeditions and analyze specific determinants of health.

Methods.—Two thousand nine hundred fifteen people, aged 15 to 18 years, traveled with a commercial company, World Challenge Expeditions Ltd, between June and September 2001. Adult team leaders were required to keep medical cards for each person. This study is a retrospective analysis of these medical cards.

Results.—Completed medical cards were available for 2402 people (82%). There were no medical problems in 36% of people. Illness or injury was reported by 64% (mean, 2.0 medical problems per person). Of the medical problems, 6% were defined as serious, and 1% were admitted to the hospital. One fatality occurred. The five most prevalent medical problems were diarrhea (22%), nausea and vomiting (20%), cold or sore throat (11%), headache (11%), and trauma (10%). Girls reported 19% more medical problems than the boys reported. Gastrointestinal illness was significantly increased at high altitude. Illness and injury were most prevalent in South America and least prevalent in Australasia.

Conclusions.—Our results demonstrate that in young people traveling to remote parts of the world, illness and injury are common. Serious incidents are rare; however, the death of one person does highlight the dangers present. This study may help risk assessment for young people considering taking part in an expedition.

Key words: expeditions, travel, trekking, morbidity, illness, injury, pediatrics

Introduction

Few studies have been published to help assess the risks of taking part in an expedition. Yet, an increasing number of young people are traveling from the UK to remote areas of the world. Claims have been made that youth expeditions are safe and that the health risks of participating in well-organized expeditions are similar to those encountered during normal active life.^{1,2} However, the deaths of a number of young travelers abroad have raised public awareness of the risks involved.

This investigation documents the prevalence of illness and injury among a large group of young people taking part in expeditions organized by a commercial company, World Challenge Expeditions Ltd. Specific determinants of health have also been analyzed.

Methods

Data for 2915 young people that took part in 250 expeditions to 34 different countries in 2001 were studied. The expeditions generally included a long-distance trek (often at high altitude) and a community work project. All the young people taking part were aged 15 through 18 years.

Expeditions lasted between 28 and 32 days. Accommodations were in tents, huts, and low-budget hostels or hotels. Diet was dependent on the destination being visited and consisted of local produce prepared by team members and local cooks. Drinking water was boiled or purified with iodine. No antibiotic prophylaxis was recommended, required, or provided.

Adult team leaders supervised expeditions and were required to keep medical cards for each young person. Leaders had all undergone a minimum of 4 days training, and many had additional first-aid expertise. The

Corresponding author: Anna Sadnicka, BSc, 50 Paines Lane, Pinner, Middlesex HA5 3DA, England (e-mail: asadnicka@aol.com).

Table 1. Summary data for World Challenge Expeditions 2001

Number of expeditions:	250
Number of people:	2915
Data included (% of total)	
Expeditions:	186 (74)
Mean expedition duration:	29.5 days
Mean expedition size:	14 people
Persons included:	2402 (82)
Person-days included:	70 583

medical kits contained a range of first-aid supplies, including dressings, needles, and IV fluid administration sets. Medications included antibiotics (ciprofloxacin, metronidazole, and amoxicillin), analgesics (paracetamol, aspirin, and co-proxamol), and antihistamines. Young people with asthma, diabetes, epilepsy, or any other chronic condition were not excluded from taking part in the expeditions as long as such conditions appeared to be well controlled and the individual was not subject to an unacceptable level of risk.

Completed medical report cards were received from 186 expeditions (74%), which included 2402 young people (82%) (Table 1). Adult team leaders were not entered. The medical cards that were not included had either been lost, not filled in, or were unavailable, such as in the case of the group in which there was a fatality. Data were anonymous on entry, coded by the authors, and entered onto a Microsoft Excel spreadsheet (Microsoft, Redmond, WA).

Illness and injury were entered under a narrow, descriptive title based on symptoms or diagnosis (eg, abdominal pain, insect bite, etc). Symptoms such as headache and nausea were only coded as acute mountain sickness (AMS) if it was indicated on the medical cards. For any one person, an illness or injury was recorded once, regardless of the length of illness. Subsequent episodes of the same illness or injury were not recorded because there was variation in the reporting of ongoing illnesses.

Titles were organized under general category headings (eg, gastrointestinal, fauna, etc). Persons had either no problem within that category or 1 or more problems within that category.

Altitude was grouped into 2 bands: low (<2500 m or <8250 feet) and high ($\geq$ 2500 m). Groups were coded by the highest altitude they reached. Countries visited were grouped by region (Table 2). Europe and the Middle East were not included in this analysis because the number of people in these groups was small (17 and 8 people, respectively).

All data were analyzed using Microsoft Excel. The

Table 2. Expedition destinations

	<i>Number of people (% total)</i>
South America	728 (30)
Argentina, Bolivia, Brazil, Ecuador, Guyana, Peru, Venezuela	
Africa	687 (29)
Botswana, Kenya, Madagascar, Malawi, Morocco, Namibia, South Africa, Tanzania, Uganda, Zambia	
Central Asia	472 (20)
India, Kyrgyzstan, Mongolia, Nepal, Pakistan, Tibet	
South East Asia	246 (10)
Borneo, Malaysia, Thailand, Vietnam	
Central America	188 (8)
Belize, Costa Rica, Honduras, Mexico	
Australasia	56 (2)
Australia	
Middle East	17 (<1)
Jordan	
Europe	8 (<1)
Spain	
Total	2402 (100)

significance of differences observed between groups was assessed using the χ^2 test.

Results

WORLD CHALLENGE EXPEDITIONS OVERSEAS OPERATIONS REVIEW

The World Challenge Expeditions Ltd company reported emergencies encountered by all expeditions in 2001 ($n = 2915$). One fatality occurred. This person slipped and fell while trekking along a mountain path and sustained fatal head injuries. That entire expedition and a number of people from the same school on another expedition returned home immediately after this occurrence.

SERIOUS MEDICAL PROBLEMS

Serious medical problems were experienced by 137 people (6%) (Figure 1). These were defined as problems requiring hospital admission, external medical advice, cessation of task-trek, or the possibility or presence of malaria. Twenty-four individuals required hospital ad-

Figure 1. Serious medical problems were defined as those requiring hospital admission, local medical advice, cessation of a task-trek, or the possibility or presence of malaria. There were 139 cases of serious illness. Incidents were grouped by category. The number of people in each category is given around the periphery of the chart.

mission—7 needed repatriation, and 6 had to be evacuated from remote regions for medical problems.

Gastrointestinal illness was the most common serious medical problem and usually manifested as prolonged diarrhea, vomiting requiring rehydration, or both. General medical and surgical complaints causing serious medical problems were varied but included severe headache and pyelonephritis. Within the injury category, 5 of the 27 cases were the result of a single car crash, and most other incidents were lacerations.

Malaria posed a small but significant risk, with 12 suspected and 6 confirmed cases. All confirmed cases of malaria occurred in Africa. Encounters with the local wildlife proved interesting in the fauna category. There were 3 dog bites that required rabies prophylaxis, 2 snakebites (anaconda and king brown), and 1 meerkat bite. In the environmental category, 1 person required emergency evacuation for AMS.

SUMMARY OF ALL ILLNESS AND INJURY

No medical problems were reported in 858 people (36%). The remaining 1544 people reported 3099 medical problems (2.0 medical problems per person) (Table 3). The 5 most prevalent medical problems were diarrhea (22%), nausea and vomiting (20%), cold or sore throat (11%), headache (11%), and trauma (10%).

When grouped into categories, gastrointestinal complaints were by far the largest category, with 36% of all young people suffering from one or more symptoms.

Injury (20%) and general medical/surgical problems (19%) were the next biggest groups.

SEX

There were approximately equal numbers of boys and girls (50.5% and 49.5%, respectively). Overall, girls reported 19% more medical complaints than the boys reported. When analyzed by category, significantly more girls complained of general medical/surgical-related and fauna-related problems ($P \leq .005$) (Figure 2).

Within the general medical/surgical category, psychological, dermatological, and urogenital complaints were twice as prevalent in girls than in boys. In the fauna category, the observed difference was largely caused by increased prevalence of insect bites in the girls.

ALTITUDE

Around two thirds of the expeditioners ($n = 1688$) reached altitudes greater than 2500 m above sea level. These young people reported 17% more illness and injury than those who did not reach this height (Figure 3). Only 1 case of AMS occurred in the group that did not reach this altitude compared with 116 in the group who trekked above 2500 m. Nausea and vomiting, diarrhea ($P \leq .005$), and headache ($P \leq .05$) were also increased in the high-altitude group, whereas sunburn, malaria, and animal bites were reduced ($P \leq .05$).

Table 3. Summary of illness and injury*

<i>Category</i>	<i>Illness or injury</i>	<i>Number of people</i>	<i>Prevalence (% of people)</i>	<i>Category prevalence (% of people)</i>
Gastrointestinal	Nausea and vomiting	489	20	36
	Diarrhea	529	22	
	Abdominal pain	167	7	
Upper respiratory tract	Cold/sore throat	264	11	11
Lower respiratory tract	Chest infection	44	2	2
	Asthma attack	9	0	
General medical/surgical	Headache	260	11	19
	Fever	63	3	
	Fainting	16	1	
	Urogenital	28	1	
	Ear	18	1	
	Eye	21	1	
	Dermatological	72	3	
	Dental	14	1	
	Psychological	13	1	
	Heat illness	46	2	
	AMS†	117	5	
	Sunburn	125	5	
	Dehydration	74	3	
Environmental	Insect bite	175	7	8
	Animal	25	1	
	Orthopaedic	173	7	
Injury	Trauma	241	10	20
	Back pain	37	2	
	Blisters	61	3	
Malaria	Suspected malaria	12	0	1
	Confirmed malaria	6	0	
Total		3099		

*Every significant medical card entry was recorded. Illness or injury was then grouped into eight categories. Category prevalence is the percentage of people reporting one or more of a related group of illness or injury. For example 36% of people reported one or more gastrointestinal complaints during their expedition.

†AMS indicates acute mountain sickness.

REGION

The prevalence of illness and injury in different regions differed considerably. For example, in South America, nearly twice the amount of illness and injury occurred as in Australasia (Table 4).

Gastrointestinal complaints were the most prevalent group of problems in every region except Australasia. Injury or general medical/surgical complaints were the next 2 largest groups, except in Australasia, where the ranking of complaints was injury, gastrointestinal, and then environmental.

Discussion

This study is the largest of its kind. It demonstrates that minor illness and injury are common. Serious incidents

were rare; however, the death of 1 person highlights the inherent danger.

This report differs from most previous papers in its methodology. We collated information on individuals from medical cards used to document medical problems as they happened. Despite this, our methods could not eliminate the variation in reporting of medical problems between leaders.

SERIOUS MEDICAL PROBLEMS

Approximately 1 in 20 people suffered serious illness or injury (defined as problems requiring hospital admission, external medical advice, cessation of task-trek, or evaluation for malaria). One in 100 people were admitted to the hospital.

Figure 2. Illness and injury by category in relation to gender. GI indicates gastrointestinal; URT, upper respiratory tract; LRT, lower respiratory tract; Med/Surg, medical/surgical; Env, environmental; and AMS, acute mountain sickness. $**P < .005$.

Figure 3. Illness and injury in relation to altitude. Environmental category is broken down into its elements in the dotted box to show the contribution of acute mountain sickness (AMS). GI indicates gastrointestinal; URT, upper respiratory tract; LRT, lower respiratory tract; Med/Surg, general medical/surgical; Env, environmental; and AMS, acute mountain sickness. $*P < .05$; $**P < .005$.

Table 4. Illness and injury by category in relation to region visited*

	<i>GI</i>	<i>URT</i>	<i>LRT</i>	<i>Med/Surg</i>	<i>Env</i>	<i>Fauna</i>	<i>Injury</i>	<i>Malaria</i>
S America	44	16	3	23	15	12	20	0
Africa	30	10	2	17	9	5	20	2
C Asia	40	6	2	16	14	5	18	0
SE Asia	30	6	0	17	14	14	24	0
C America	29	16	3	22	14	9	18	1
Australasia	11	5	2	9	13	9	20	0

*Each cell gives the percent of people with illness or injury in the category.

GI indicates gastrointestinal; URT, upper respiratory tract; LRT, lower respiratory tract; Med/Surg, general medical surgical; Env, environmental; S, south; C, central; and E, east.

Only 1 severe episode of AMS occurred, which contrasts with a recent paper in which 13 of 2381 expeditioners suffered severe AMS.² It was noticeable that most groups trekking to high altitude used acetazolamide to help prevent AMS, which probably contributed to the low prevalence.

Interestingly, in our study, the prevalence of malaria seemed to be less than that reported elsewhere.² Hopefully, this indicates increased awareness and adequate prophylaxis. However, in 1 expedition to Malawi, there were 4 suspected and 3 confirmed cases of malaria.

Expeditions can be emotionally stressful. In all, 13 episodes of psychological problems were documented, including 1 attempted suicide and 1 serious eating disorder. Other problems were panic attacks, anxiety, and depression. Expedition leaders need to be aware that there is a considerable amount of preexisting psychological morbidity among this age group.

Only 1 serious asthma attack was reported. This is surprising because the prevalence of asthma in 15 to 18 year olds is estimated to be 19% to 22% in boys and 18% to 19% in girls.³ There were 8 urinary tract infections included in the general medical/surgical category, highlighting the need for adequate hydration and hygiene.

ILLNESS AND INJURY

No medical problems were reported by 36% of the people. This is consistent with other studies that quote figures between 25% and 36%.^{1,2,4} Therefore, a significant proportion of travelers do not get ill on expeditions.

On average, the remaining 64% reported 2.0 medical problems per person. Gastrointestinal complaints made up approximately one third of these medical problems and were the biggest single category of illness, as reported in other studies.^{1,2,4} Headache, upper respiratory tract symptoms, and injury are also frequently reported.

SEX

Overall, girls reported more medical complaints than boys reported, a result that has been reported elsewhere.⁴ This was significant in both the general medical/surgical and fauna categories. It is difficult to say whether the increased level of illness and injury observed in girls is because of a true increase in prevalence or an increased tendency of girls to report problems.

ALTITUDE

There were interesting trends in the distribution of illness when grouped by altitude. The most striking result was that gastrointestinal problems were greatly increased in the high-altitude group. At high altitudes, food preparation is basic, and natural water sources are used. These factors could contribute to increased gastrointestinal illness. However, this interpretation must be treated with caution because there may be other confounding factors, such as the region visited.

Surprisingly, no significant differences in upper and lower respiratory tract problems, general medical/surgical problems, or injury were observed between the low- and high-altitude groups. Overall, it is possible that leaders and people from the high-altitude groups were better prepared. This may have helped to prevent many medical problems, such as injury, dehydration, and sunburn, which one might expect to be more prevalent in people participating in the more demanding high-altitude treks.

REGIONS

There was considerable variation in the distribution of illness and injury when analyzed by region. The most notable feature was the reduced prevalence of illness and injury in Australasia. This was largely caused by less gastrointestinal and general medical/surgical complaints, as one might expect in a more developed region.

The prevalence of injury was consistent across the different regions, whereas all other categories varied. Given the diverse social and cultural differences among the 34 countries visited, it is hard to pinpoint specific factors that explain these differences.

Conclusion

Medical problems are common in young people traveling to remote parts of the world; however, serious illness and injury are rare. This study is the largest of its kind and may help risk assessment for young people considering taking part in an expedition. The results presented here may also be used in the wider context to advise the young traveler abroad. Traveling to remote parts of the world is an enjoyable and rewarding experience for many young people. It is hoped that awareness of the risks estimated here together with sensible precautions may help reduce illness and injury in the future.

Acknowledgments

The authors wish to thank Mike Sadnicki and Dr Karen Forbes for their guidance and help and World Challenge Expeditions Ltd.

References

1. Dallimore J, Cooke F, Forbes K. Morbidity on youth expeditions to developing countries. *Wilderness Environ Med.* 2000;13:1–4.
2. Anderson S, Johnson C. Expedition health and safety: a risk assessment. *J R Soc Med.* 2000;93:557–562.
3. Department of Health, 2002. Health survey for England: the health of young people 1995–1997. Available at: <http://www.doh.gov.uk/stats/respic2.htm>. Accessed June 17, 2004.
4. Hill D. Health problems in a large cohort of Americans travelling to developing countries. *J Travel Med.* 2000;7: 259–266.