

Conferences and Reviews

Morbidity and Mortality in the Wilderness

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The medical literature is limited regarding current wilderness morbidity and mortality statistics. Available studies concentrate on selected wilderness activities. This study retrospectively examines wilderness injuries, illnesses, and mortality based on case incident report files from eight National Park Service parks within California over a three-year period. Data were extracted regarding type of illness or injury, body area affected, age, gender, month in which the event occurred, and activity in which the victim was involved at the time of the event. The overall occurrence of nonfatal events was 9.2 people per 100,000 visits. More than 70% of all nonfatal events were related to musculoskeletal or soft-tissue injury. The most frequently involved body area was the lower limbs (38%). Seventy-eight mortalities occurred during the three years studied, resulting in an overall mortality rate of 0.26 deaths per 100,000 visits. Men accounted for 78% of the deaths. Heart disease, drowning and falls were the most common causes of death. The information and statistics on morbidity and mortality in California wilderness areas that this study provides may be used to guide future wilderness use, education, and management. A standardized, computerized database would greatly facilitate future evaluations, decisions, and policies.

(Montalvo R, Wingard DL, Bracker M, Davidson TM. Morbidity and mortality in the wilderness. *West J Med* 1998; 168:248–254)

As our society becomes increasingly involved in outdoor and wilderness recreational activities, there is an inevitable rise in the number of associated injuries and fatalities. The growing tourism industry, abundance of commercial recreational businesses, and improved technology such as off-road vehicles have allowed once hostile, wild terrain to be explored by people, many of whom do not have requisite wilderness skills. Where only a few wilderness enthusiasts with at least some wilderness experience and skill once ventured, novices, people with impaired health or disabilities, and whole families now travel.

An extensive search on Medline uncovered a limited number of epidemiological studies of wilderness injuries, illnesses, and fatalities. Each of these studies had selective parameters. First, the data often rely on resources such as national sporting or recreational associations, which can only provide general estimates. Second, most information given in the reports is dated before 1989, with the majority from the 1960s and 1970s.¹ Third, the data are from localized geographic areas, such as one highly utilized mountain area. Additionally, the data often focus on specific wilderness activities such as rock climbing or skiing. Gentile and

colleagues completed a five-year prospective project in 1991 that appears to be one of the most comprehensive wilderness injury studies to date.² That study used participants from a wilderness training school, however, and thus represented a selected population segment.

Current statistics are needed on the occurrence of injuries, illnesses, and fatalities in the general public who enter wilderness areas. This information is necessary to guide future wilderness access, education, and health care planning. This project investigates detailed morbidity and mortality data from eight national parks within California.

Methods

In this study, nonfatal events are classified into two categories: illnesses and injuries. Instances in which a preexisting condition manifested itself or in which no overt trauma occurred are considered illnesses. Injuries are defined as any morbidity or mortality not preexisting and presumably a consequence of being in the wilderness environment. The term "traumatic morbidity" is used to identify an inflicted injury, such as a laceration or fracture. Wilderness refers to all lands and bodies of

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ABBREVIATIONS USED IN TEXT

CIR = case incident report
 ERS = emergency medical services
 NPS = National Park Services
 SAR = search and research

water within the jurisdiction of the eight United States Department of the Interior's National Park Service (NPS) parks in California that we refer to in our study.

The land under the supervision of the NPS has discrete borders and entry and exit points. The NPS is therefore able to maintain reliable statistics and establish emergency and medical agencies for visitors. Using a copy of *The Complete Guide to America's National Parks*, published by the National Park Foundation,³ we chose California parks within the NPS system to gather the information necessary for this study.

From an official listing of 22 California land areas managed by the NPS the eight that represented the most wilderness type environment were selected.³ The following parks were contacted and included in the study: Channel Islands National Park; Lassen Volcanic National Park; Point Reyes National Seashore; Redwood National Park; Santa Monica Mountains National Recreation Area; Sequoia and Kings Canyon National Parks; Whiskeytown-Shasta-Trinity National Recreation Area; and Yosemite National Park.

Santa Monica Mountains and Channel Islands were not able to produce records regarding morbidities for the year 1993; however, data on fatalities were available. Yosemite, the most visited of the parks, was unable to provide information on nonfatal injuries. They did, however, furnish fatality information. Thus, injury data from seven California NPS parks and fatality data from eight California NPS parks are included in this study. Throughout the study, reference to the "seven parks" denotes all the parks listed above minus Yosemite; reference to the "eight parks" denotes all parks including Yosemite.

Each park was visited, and data were extracted from the parks' case incident report (CIR) files.⁴⁻¹¹ The CIR files include the emergency medical services (EMS) reports filled out by paramedics, the search and research (SAR) reports, and the standard CIR forms used by all NPS parks for any incident in which a park ranger is involved. We extracted the following data from the CIR files: type of illness or injury (such as laceration, fracture, or abrasion), body area injured, age, gender, month in which the event occurred, and the activity in which the victim was involved at the time of the event.

It is necessary to note that because a person may have experienced more than one significant illness or event, he or she may be listed in more than one category. Also, only the most serious injuries were counted, leaving out less serious symptoms or injuries. Thus, a person with an open fracture with pain and a laceration would be reported as a fracture and not a laceration.

More than one type of report—for instance, an EMS and a SAR—was filed in some cases. To avoid data duplication, the case number assigned to each incident was cross-referenced on each of the different reports. It is the policy of many NPS parks to respond to nearby incidents that surround the particular park boundary, even though they do not occur within the jurisdiction of the NPS. These instances are labeled "assist to an outside agency" and were not included in the present study. Other excluded cases involved people who actually live within park boundaries or in neighboring communities (excluded on the basis of "location where the injury occurred" correlating with "address of residence") and employees of the NPS or other company operating on official park business.

When available, coroners' reports were used as part of the fatality data. Yosemite fatality data were gathered from K. Cunningham-Summerfield in their Office of Public Information (oral communication, March 7, 1996). Morbidity and mortality data from Santa Monica Mountains were collected from a conversation with B. Sutteron, Ranger (February 26, 1996).

Data for the number of people visiting each park were extracted from the NPS's annual National Park Service Statistical Abstract.¹²⁻¹⁴ The NPS technically counts the number of "visits" to the parks, not the actual number of people entering the parks. According to C. Wadlington, Data Secretary of the NPS's Socio-Economic Studies Division, however, there is a one-to-one correlation of "visit" to "person", which makes the number of visits equal to the number of people entering the parks (oral communication, April 9, 1996).

The data were arranged and analyzed with means and standard deviations.

Results

For the seven parks, the annual number of people with morbidities were 691 in 1993, 528 in 1994, and 489 in 1995, totaling 1,708 people. For the eight parks, there were 78 fatalities. This information is summarized in Table 1. A greater proportion of incidents occurred from June to September. Figure 1 shows nonfatal illnesses and injuries per month per year.

Table 2 is a summary of nonfatal illnesses and injuries experienced by park visitors in the seven parks. Table 3 summarizes the type of activity victims were involved in at the time of their illness or injury. Each victim was counted only once.

Figure 2 shows a percentage breakdown of injuries that were musculoskeletal- or soft tissue-related. The graph illustrates the number of body areas, not people, affected. Thus, a person who had more than one body area injured was counted more than once. A total of 1,388 musculoskeletal and soft tissue injuries occurred at the seven parks. Head and neck injuries accounted for 27% of the injuries—13% involved the eye/periorbital area and 7% involved the mouth (including lips and any structures in the oral cavity). The torso accounted for 8% of the injuries; the upper limbs accounted for 27% of the

TABLE 1.—Overall Occurrence of Fatal and Nonfatal Injuries and Illnesses at National Park Service Parks in California, 1993–1995

	Seven Parks*	Eight Parks [‡]
Nonfatalities	1,708	—
Fatalities	27	78
Total visits	18,580,509	30,340,615
Nonfatality rate9.2/100,00 visits	—
Fatality rate0.15/100,000 visits	0.26/100,000 visits

* Channel Island National Park, Lassen Volcanic National Park, Point Reyes National Seashore, Redwood National Park, Santa Monica Mountains National Recreation Area, Sequoia and Kings Canyon National Parks, and Whiskeytown-Shasta-Trinity National Recreation Area.
[‡] Includes all parks listed above, plus Yosemite National Park.

injuries, 56% of which involved the wrist or hand (including fingers); and the lower limbs accounted for 38% of the injuries, 24% of which were knee injuries and 31% of which were ankle injuries.

In the eight parks over the three-year period, there was a total of 78 deaths, reflecting an overall mortality rate of 0.26 per 100,000 visits (Table 1). Table 4 shows the causes of death and combines the causes for all three years. Cardiac deaths (17%), drowning (15%), falling (15%), and motor vehicle accidents (10%) were the most frequent causes of death. Table 5 shows the number of fatalities according to the type of activity in which the victim was involved at the time of death (for the three years combined). Men accounted for approximately 78% of the deaths; women, for approximately 18%. The remaining 4% were of unspecified gender.

Discussion

The overall rate of illnesses or injuries in the seven parks included in this study is fairly low—9.2 per 100,000 visits. For the most part, specific illnesses, injuries, or activities leading to the reported event have no particular age-group association. Certain subgroups, however—substance abuse, rock climbing, and scuba-

related illness—were seen primarily in the 20 to 40 age group, predominantly in men.

The 20 to 50 age group appeared to have the highest number of dislocations, ascent decompressions, and vaginal bleeding. The 10 to 40 age group more often encountered hypothermia, diarrhea, intoxication, and noninsect anaphylaxis. As is true in the population at large, older men in our study experienced more cardiac-related events.

Men appeared to dominate categories involving injuries from the use of a sharp object, substance abuse, rock climbing, and scuba, and they seemed to sustain more lacerations than women. Women experienced more injuries from horseback riding.

Figure 1 shows that there is a clear increase in morbidities during the summer months. This would make sense, given that people use California parks to a greater extent in the summer. Because a monthly breakdown of park attendance was not available, this study could not control for the variation in public attendance per month. It thus cannot be determined if the summer increase in morbidities is merely a result of greater park attendance or if participation in some activities is more common in the summer.

Of the morbidity-related events, more than 70% involved musculoskeletal or soft-tissue injury. The most common site of musculoskeletal and soft-tissue injuries was the lower limbs (Figure 2), a great majority of these involving ankles and knees. The upper limbs were the second most common site of injury, with the hand and wrist accounting for most of the upper limb trauma, and the head and neck region was the third most common body area injured.

The value of this research lies in the fact that it is recent and involves a large geographical area. One of the key findings, although contrary to popular belief and media attention, is that most wilderness injuries in California are not due to exotic causes (wild animal attacks, rock climbing, hang gliding, and so on). Rather, they are due to common activities such as hiking, walking, skiing, and driving. Fighting and substance abuse, for example, account for more than three times as many injuries as rock climbing.

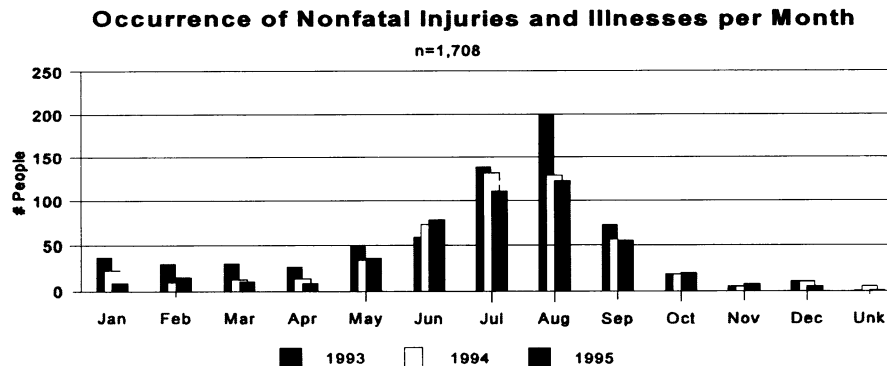


Figure 1.—This figure shows the occurrence of nonfatal injuries and illnesses by month.

TABLE 2.—Nonfatal Injuries and Illnesses by Type and Gender for Seven National Park Service Parks in California, 1993–1995

	Male	Female	Total (%)	Male			Female		
				Age	Average	SD (range)	Age	Average	SD (range)
Illnesses									
Pain (no trauma)	16	16	33 (1.9)	40.3	23.1	(8–84)	33.9	20.5	(11–69)
Dizzy	12	20	32 (1.8)	41.0	21.7	(12–70)	32.0	18.8	(12–72)
Short of breath	15	17	32 (1.8)	46.9	21.3	11–76)	29.1	16.3	(12–68)
Vomit	9	19	28 (1.6)	31.6	21.8	(1–71)	25.7	17.5	(5–82)
Dehydration/heat stroke	11	15	26 (1.5)	36.2	18.4	(12–65)	26.8	14.5	(13–54)
Anaphylaxis—insect	10	12	22 (1.2)	17.7	11.7	(9–46)	27.7	13.5	(7–49)
Headache	6	13	19 (1.1)	38.3	21.0	(12–60)	27.0	15.1	(12–65)
Seizure	12	7	19 (1.1)	35.9	21.6	(7–72)	24.7	19.7	(6–58)
Altitude sickness*	11	6	18 (1.0)	35.5	15.3	(14–69)	41.5	20.7	(23–80)
Cardiac distress	10	7	17 (1.0)	59.3	10.5	(44–76)	44.5	11.9	(22–59)
Hypothermia	11	5	16 (<1)	26.1	19.1	(2–67)	21.3	6.1	(16–28)
Chest pain	9	6	15 (<1)	53.2	13.7	(38–74)	49.0	16.0	(20–75)
Diabetic exacerbation	5	8	13 (<1)	32.6	17.2	(29–66)	44.7	21.7	(13–81)
Asthma	5	7	12 (<1)	26.8	15.2	(12–50)	25.4	20.9	(6–63)
Diarrhea	6	6	12 (<1)	35.5	21.1	(8–60)	29.5	13.2	(14–51)
Anaphylaxis—other	3	7	10 (<1)	22.4	9.3	(3–27)	24.4	7.72	(13–34)
Intoxication	7	3	10 (<1)	25.8	9.4	(16–43)	24.3	7.0	(18–32)
Rash (not insect)	4	2	6 (<1)	24.8	19.2	(6–52)	36	—	—
Vaginal bleed	—	5	5 (<1)	—	—	—	33.2	6.4	(27–43)
Psychiatric	2	2	4 (<1)	41.5	21.9	(26–57)	15	—	—
CVA	2	—	2 (<1)	68.3	19.5	(48–87)	—	—	—
Food poisoning	1	1	2 (<1)	67	—	—	50	—	—
Myocardial infarct	2	—	2 (<1)	69.5	4.9	(66–73)	—	—	—
Appendicitis	—	1	1 (<1)	—	—	—	10	—	—
CHF	1	—	1 (<1)	86	—	—	—	—	—
TIA	1	—	1 (<1)	63	—	—	—	—	—
Miscellaneous	36	52	88 (5.0)	—	—	—	—	—	—
Unknown	2	1	3	(<1)	—	—	—	—	—
Subtotal*	209	238	449 (25.4)	—	—	—	—	—	—
Injuries									
Laceration	185	119	304 (17.2)	25.2	17.8	(2–82)	28.3	22.4	(1–81)
Pain (traumatic)	132	117	249 (14.1)	28.5	18.8	(2–84)	33.2	18.9	(2–81)
Bite—insect*	68	76	146 (8.3)	20.7	16.2	(1–64)	24.3	16.9	(2–70)
Sprain/strain	59	76	135 (7.6)	28.9	14.1	(9–67)	34.4	17.6	(8–81)
Abrasion	53	43	96 (5.4)	23.7	14.7	(1–69)	27.4	21.7	(1–79)
Fracture*	42	34	77 (4.4)	28.6	16.9	(7–73)	41.9	18.6	(9–83)
Contusion	30	41	71 (4.0)	20.6	13.5	(2–50)	29.9	24.0	(1–81)
Burn—thermal	30	16	46 (2.6)	25.6	23.0	(2–73)	29.9	24.0	(1–81)
Foreign object	20	15	35 (2.0)	24.7	15.6	(2–52)	19.2	13.3	(4–49)
LOC	12	12	24 (1.4)	35.7	23.1	(1–80)	24.5	19.1	(7–77)
Dislocation	12	7	19 (1.1)	36.7	16.2	(12–67)	37.1	6.9	(27–49)
Avulsion	10	7	17 (1.0)	30.5	20.1	(10–57)	21.1	18.1	(3–48)
Bite—animal	8	7	15 (<1)	22.5	15.7	(5–53)	28.0	21.1	(4–55)
Near drown	11	2	13 (<1)	29.0	10.6	(14–50)	48	—	—
Ascent decompression	8	—	8 (<1)	34.7	9.1	(22–52)	—	—	—
Burn—chemical	4	1	5 (<1)	10	7.6	(3–23)	11	—	—
Lightning	1	1	2 (<1)	24	—	—	20	—	—
Gunshot	—	1	1 (<1)	—	—	—	29	—	—
Rape	—	1	1 (<1)	—	—	—	12	—	—
Miscellaneous*	17	7	25 (1.4)	—	—	—	—	—	—
Unknown*	11	15	31 (1.8)	—	—	—	—	—	—
Subtotal*	713	598	1,320 (74.6)	—	—	—	—	—	—
Total*	922 (52.1)	836 (47.3)	1,769 [§] (100.0)	—	—	—	—	—	—

§Refers to number of injuries, not people. One person may have several injuries. Not all people have age data available. *No gender specified. avg = average. SD = standard deviation. Anaphylaxis—insect = anaphylaxis caused by an insect bite. Anaphylaxis—other = anaphylaxis caused by an agent other than an insect. CHF = congestive heart failure. CVA = cerebral vascular accident. Pain (no trauma) = pain without an associated activity, such as vague abdominal pain. TIA = transient ischemic attack. Ascent decompression = "the bends" occurring when ascending too rapidly from a deep dive. LOC = loss of consciousness without a known etiology.

TABLE 3.—Nonfatal Injuries and Illnesses by Activity and Gender for Seven National Park Service Parks in California, 1993–1995

	Male	Female	Total (%)	Age	Male Average	SD (range)	Age	Female Average	SD (range)
Hiking/walking, short fall	189	195	384 (22.5)	29.7	19.8	(2–84)	37.2	22.5	(1–83)
Hiking/walking, illness*	68	47	116 (6.8)	37.9	18.4	(2–73)	39.0	17.5	(10–69)
Ski/snowboard	50	38	88 (5.1)	22.7	14.2	(6–70)	25.0	12.6	(9–47)
Horseback riding	16	48	64 (3.8)	38.5	18.6	(9–67)	37.0	18.3	(8–67)
Camping	25	37	62 (3.6)	32.9	26.1	(2–87)	29.0	23.8	(2–82)
MVA*	33	19	57 (3.3)	33.9	18.8	(15–68)	29.0	23.8	(2–82)
Snowplay/sledding*	33	22	56 (3.3)	20.6	14.5	(4–48)	23.9	15.6	(8–44)
Bicycling	27	20	47 (2.8)	23.6	13.8	(5–50)	27.3	20.2	(5–55)
Sharp object use	29	4	33 (1.9)	24.5	14.5	(1–49)	22.0	19.5	(9–51)
Swimming	21	11	32 (1.9)	23.4	11.2	(6–50)	31.4	18.0	(10–68)
Hiking/walking, long fall*	19	7	27 (1.6)	27.8	12.4	(11–46)	34.6	24.6	(11–73)
Boating	7	10	17 (1.0)	46.2	27.4	(17–74)	31.9	23.1	(7–81)
Eating	6	10	16 (<1)	38.6	19.2	(23–67)	36.1	15.6	(13–65)
Assault/fight	7	8	15 (<1)	20.0	10.4	(2–34)	29.0	17.0	(15–69)
Substance abuse	10	5	15 (<1)	29.0	10.1	(16–43)	23.0	5.3	(18–32)
Driving	3	10	13 (<1)	19	—	—	39.5	21.4	(6–80)
Run/jog	5	5	10 (<1)	32.5	32.8	(2–79)	11.4	5.1	(3–17)
Rock climb	9	—	9 (<1)	24.2	2.7	(21–29)	—	—	—
Scuba	9	—	9 (<1)	32.2	6.4	(22–39)	—	—	—
Fishing	4	2	6 (<1)	22.2	9.2	(12–34)	7	—	—
Wild animal encounter	2	2	4 (<1)	5	—	—	12.4	6.0	(8–22)
Water innertubing	1	2	3 (<1)	14	—	—	28.5	—	(16–41)
Water skiing	1	1	2 (<1)	18	—	—	—	—	—
Surfing	1	—	1 (<1)	25	—	—	—	—	—
Miscellaneous*	60	53	114 (6.7)	27.6	22.6	(1–84)	28.3	19.6	(1–78)
Unknown*	252	252	508 (29.7)						
Total*	887	808 (47.3)	1,708 [§] (100.0)						

§Refers to number of people injured. *No gender specified. avg = average. SD = standard deviation. MVA = motor vehicle accident. Driving = illness occurred without MVA. Example: "car-sickness," headache, rough roads, exhaust inhalation. Hiking/walking = illness occurred without a fall. Example: fatigue, shortness of breath, painful lower joints, blisters. Hiking/walking short = victim was hiking/walking, then fell, with fall ranging from a ground slip to a less than 10-foot fall or slide. Hiking/walking long = victim was hiking/walking, then fell, with a fall or slide greater than 10 feet. Wild animal encounter = examples include feeding squirrels, bears entering lodge.

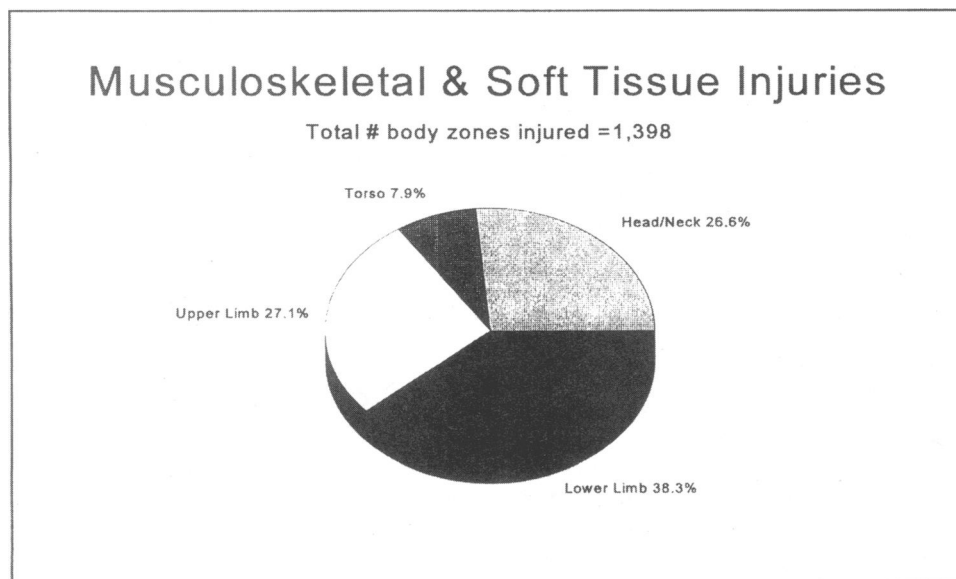


Figure 2.—This figure shows the most common site of musculoskeletal and soft tissue injuries.

TABLE 4.—Mortality by Cause and Gender

Cause	Male	Female	Total (%)
Cardiac§	11	2	13 (16.7)
Drown	11	1	12 (15.4)
Fall ¥	8	4	12 (15.4)
MVA	5	3	8 (10.3)
Plane crash	4	1	5 (6.4)
Natural causes	3	1	4 (5.1)
Gunshot	2	—	2 (2.6)
Asthma	—	1	1 (1.3)
Avalanche	1	—	1 (1.3)
Drug overdose	1	—	1 (1.3)
Hypothermia	1	—	1 (1.3)
Shark attack	1	—	1 (1.3)
Volcanic fumes†	1	—	1 (1.3)
Trauma NOS	1	—	1 (1.3)
Unknown	6	1	10 (12.8)*
Total	.61 (78.2)	14 (17.9)	78 (100)

§Includes myocardial infarction, acute congestive heart failure, and arrhythmias.

¥ Range in length between 50 and 800 feet

† Inhalation injury.

NOS = not otherwise specified, MVA = motor vehicle accident

*No gender specified for 3 people.

TABLE 5.—Mortalities According to Activity at Time of Death and Gender

Cause	Male	Female	Total (%)
Drive (car)	6	3	9 (11.5)
Swim	7	2	9 (11.5)
Hike	5	2	7 (9.0)
Suicide	5	—	5 (6.4)
Fly (plane)	4	1	5 (6.4)
Rock climb	5	—	5 (6.4)
Scuba	3	—	3 (3.9)
Ski/sled	1	1	2 (2.6)
Base jump	—	1	1 (1.3)
Bike	1	—	1 (1.3)
Boat	—	1	1 (1.3)
Motorcycle	1	—	1 (1.3)
Miscellaneous	3	—	3 (3.8)
Unknown§	20	3	26 (33.3)*
Total	.61 (78.2)	14 (17.9)	78 (100)

*No gender specified for 3 people

§2 people swam over a waterfall with unclear etiology of their deaths (whether due to the fall versus drowning). They have thus been categorized as unknown.

Media-grabbing situations that occur by the forces of nature (such as wild animal attacks or lightning) are quite rare. The fact that this study found two lightning-related injuries is somewhat surprising given that documented lightning injuries are infrequent.¹

Unlike the mix of diagnoses and symptoms seen in injury reports, the NPS reports closely examine fatalities. Coroners' reports and follow-ups with hospital personnel are used routinely. A true medical diagnosis is often available in NPS reports and allows for more valid statements to be made about mortalities in the eight parks within this study. Of importance is the very low death rate of 0.26 per 100,000 visits. This indicates, at least in California, that wilderness environments and activities pose minimal fatal hazards. Most of the deaths, 78%, were men.

As is true nationally, the number one cause of death in this study was heart disease. The three purely environment-related activity fatalities (avalanche, shark attack, and volcanic fume inhalation) accounted for less than 4% of all mortalities. This fact serves to reemphasize that the lands within the boundaries of this study pose little direct threat. Surprisingly, suicide ranked fourth in a field of 12 known activities leading to mortalities. It does not appear that the wilderness environment itself is inherently more dangerous for those contemplating suicide; rather, it serves as a magnet that draws people to its serene atmosphere.

The time that it took to extract the raw data from NPS records proved to be one of the main difficulties encountered in this study. The NPS records are not computerized, nor are they kept in national or even regional databases. While the need for budgetary restrictions is appreciated,

computerizing NPS records would facilitate future statistical and wilderness resource management.

Limitations

The missing 1993 data from Channel Island and Santa Monica Mountains parks appear to have little impact on the overall study—the contributed data from those two parks are very small. The missing injury data from Yosemite, however, substantially restricts us from generalizing the study results due to the large volume of visitors and visitor injuries encountered annually at the park.

Data on the number of injuries per activity (Table 3) only examine the type of activity in which the person was involved when the injury occurred. It does not address the inherent risk or safety of a particular activity, because data on the number of people participating in each activity are not available.

Though obvious, it is important to note that not every injury occurring within the seven parks was documented. As several of the rangers at the various parks pointed out, it is probable that the more minor the injury, the less likely it is to be formally reported.

It is also important to note that the injuries, illnesses, and mortalities in the NPS files are not official diagnoses. The EMS reports reflect the opinion of paramedics, and SARs and CIRs are filled out by park rangers.

Conclusions

It is rare that morbidity and mortality in California National Parks are officially reported. Of those that are reported, the most common morbidities are musculoskeletal, and the most common cause of mortality is

heart disease. With the computer technology available today, data regarding morbidity and mortality should be routinely reported, maintained, and collated. Such information is important for people and wilderness groups and for education and health care planning.

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