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ORIGINAL RESEARCH

An Analysis of Hiker Preparedness: A Survey of Hiker Habits in New Hampshire

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Objective.—Describe hiking habits in a heavily used wilderness area to better target injury prevention and reduce search-and-rescue events.

Methods.—A cross-sectional, convenience survey was conducted at 3 trailheads in the White Mountain National Forest of New Hampshire during summer 2011. The study group consisted of hikers who consented to a questionnaire before their trip that assessed demographics, experience, hiking gear, pretrip planning, and communication devices.

Results.—A total of 199 hikers were surveyed. The most common age group was 20 to 29 years at 29.2% (n = 195). The most common hike was less than 12 hours at 78.5% (n = 191). All 10 items deemed essential were carried by 17.8% (n = 197) of hikers. The most common omission reason was "short trip" at 32.2% (n = 162). Defined as greater than 7 items, the 50- to 59-year-old age group was the most prepared at 56.9% (n = 51). Hiker preparedness increased with experience and fitness levels. Hikers planning trips of less than 12 hours were less prepared compared with hikers planning longer trips, at 39.3% (n = 150) and 48.8% (n = 41), respectively. GPS devices were carried by 122 of 193 hikers. Phone GPS users were less prepared than GPS-only device users at 35.8% (34 of 95) and 55.6% (15 of 27), respectively.

Conclusions.—One factor that may help reduce rescues is better-prepared individuals able to avoid emergency medical services activation. Most neglect of preparation results from hikers perceiving short trips as less risky. The groups most often underprepared tend to be younger, less fit, and inexperienced. Therefore, education should target younger groups and stress that all hikes, regardless of duration, carry an inherent risk.

Key words: preparedness, New Hampshire, hiking, wilderness safety

Introduction

Hiking has become a popular form of recreation in the United States. Almost 42% of the roughly 200 million visitors to US National Forests hiked in 2007.[1] The White Mountain National Forest (WMNF) of New Hampshire sees nearly 1.7 million visitors a year, 41.4% of them hiking in 2005.[2] Although many enjoy their hikes without incident, some find themselves unprepared and in need of rescue. In a 2-year period, New Hampshire conducted more than 180 hiking-related search-and-rescue missions.[3]

In addition to hikers, responders place themselves at great risk during a search and can become additional victims. Furthermore, mobilization of teams and helicopters incurs a large burden on local resources. The State of New Hampshire spends more than $260,000 annually on wilderness rescues.[4] Thus, reduction in unnecessary rescue would have benefits to the community as well as to the hiker.

To address these issues, various educational initiatives exist to better prepare hikers for their trip. In New Hampshire, the HikeSafe program was developed by the WMNF, NH Department of Fish and Game (NHFG), and

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Table 1. Demographic characteristics of participants and essential items carried by each group

Characteristic	*Number of hikers (% of total)*	*Prepared hikers (% of subgroup)*[a]	*Average number of items (95% CI)*
Sex (n = 199)			
Female	80 (40.2)	32 (40.0)	6.6 (6.0–7.2)
Male	119 (59.8)	48 (40.3)	6.7 (6.3–7.1)
Age groups (n = 195)			
18–19	4 (2.1)	0 (0)	4.0 (2.4–5.6)
20–29	57 (29.2)	17 (29.8)	6.4 (5.8–7.0)
30–39	43 (22.1)	20 (46.5)	6.6 (5.9–7.3)
40–49	31 (15.9)	15 (48.4)	7.2 (6.2–8.2)
50–59	51 (26.2)	29 (56.9)	6.8 (6.1–7.5)
60–69	8 (4.1)	1 (12.5)	6.0 (4.7–7.3)
70–79	1 (0.5)	1 (100)	9.0 (9.0–9.0)
>80	0 (0)	0 (0)	0.0 (0)
Experience level (n = 199)			
A lot of experience	87 (43.7)	47 (54.0)	7.3 (4.1–10.2)
Some experience	88 (44.2)	29 (33.0)	6.3 (5.2–7.4)
A little experience	21 (10.6)	4 (19.0)	5.3 (4.8–5.8)
No experience	3 (1.5)	0 (0)	4.0 (3.5–4.5)
Fitness level (n = 198)			
Highest	63 (31.8)	30 (47.6)	7.1 (6.5–7.7)
High	64 (32.3)	25 (39.1)	6.6 (6.0–7.2)
Medium	49 (24.7)	19 (38.8)	6.2 (5.5–6.9)
Low	22 (11.1)	6 (27.3)	6.5 (5.5–7.5)
Lowest	0 (0)	0 (0)	0 (0)
Essential items (n = 197)			
<3	14 (7.1)		
3 to 7	103 (52.3)		
>7	80 (40.6)		
All 10 items	35 (17.8)		

CI, confidence interval.

[a] "Prepared" hiker is defined as carrying >7 items. This column's percentage is calculated from the particular group, not the total n.

NH Outdoor Council to " . . . educate hikers on the inherent risks of hiking and how they can become better prepared before beginning any hike."[4] In addition to information about maps, electronic devices, and weather, HikeSafe provides a list of essential items. The 10 essentials are meant to be carried on *every* hike of *any* duration with the goal of reducing the number of searches through self-rescue or surviving for at least 24 hours while waiting for rescue to arrive. The list is as follows:

1. Map
2. Compass
3. Extra clothing
4. Rain gear
5. Fire starter
6. Light
7. Extra food and water
8. Knife
9. First aid kit
10. Whistle

There is no shortage of wilderness gear lists. For example, HikeSafe's list is quite similar to suggestions in the Northwest-based wilderness manual, *Mountaineering: Freedom of the Hills.*[5] As a creation of local officials, the differences in HikeSafe's list better reflect challenges specific to the environment of northern New England. Additionally, the program is heavily promoted to hikers of New Hampshire; all trailheads prominently display the colorful HikeSafe posters, and every visitor's center distributes pamphlets listing the 10 essentials. Thus, New Hampshire's perception of preparedness is defined, at least in part, by HikeSafe.

Proactive initiatives like HikeSafe are built on the assumption of hiker carelessness. This frames the basic research question of our study: are hikers departing unprepared for wilderness travel? If so, in what ways are

Table 2. Characteristics of hikers' preparation and essential items carried by each group

Characteristic	*Number of hikers (% of total)*	*Prepared hikers (% of subgroup)*[a]	*Average number of items (95% CI)*
Hike duration (n = 191)			
<12 hours	150 (78.5)	59 (39.3)	6.5 (5.5–7.5)
12+ hours	41 (21.5)	20 (48.8)	7.6 (5.3–9.9)
Checked weather (n = 197)			
Yes	192 (97.5)	79 (41.1)	6.7 (6.3–7.1)
No	5 (2.5)	1 (20.0)	4.6 (2.4–6.8)
Informed third party of travel plans (n = 196)			
Yes	170 (86.7)	70 (41.2)	7.4 (7.0–7.8)
No	26 (13.3)	10 (38.5)	6.6 (5.5–7.7)
Reasons for not informing others of plans (n = 26)[b]			
Not necessary	7		
Spontaneous decision	7		
Short trip/day hike	5		
In a group	4		
Cell phone	2		
Unsure of destination	2		
No local friends	2		

CI, confidence interval.

[a] "Prepared" hiker is defined as carrying >7 items. This column's percentage is calculated from the particular group, not the total n.

[b] Because of the write-in data format of the qualitative question, multiple responses could be generated from 1 survey.

they unprepared and what are the underlying causes? Using the HikeSafe program as a template, our study constructed a survey evaluating hiker preparedness. Specifically, the survey investigated our initial hypotheses regarding hiker habits: 1) The majority of hikers will *not* be carrying all of the 10 essentials listed in the HikeSafe program. 2) Mobile phones and Global Positioning Systems (GPS) will encourage hikers to choose trails more difficult than they would have otherwise attempted. 3) Most hikers will not inform others of their travel plans.

Methods

This study is a cross-sectional convenience sample of hikers at 3 trailheads throughout the WMNF between June and August 2011. This area's characteristics proved ideal for study: heavily used with more than 700,000 hikers annually,[2] trails of varying difficulty, accessibility by car from surrounding states, and previous epidemiologic characterization.[3]

The survey is modeled after HikeSafe, consisting of 22 questions (see online Appendix). Survey questions were binary or spectrum response. A "communication device" was defined as a cell phone, smart phone, or personal locator beacon. A "GPS device" included smart phones and dedicated GPS devices. HikeSafe guidelines discourage GPS substitution for map and compass because the WMNF is notorious for poor signal reception, particularly with smart phone-based GPS.[4] Thus, carrying a GPS device was not counted as satisfying the "map" or "compass" essentials. Recognizing multiple essentials lists, a relative definition of "prepared" was chosen as carrying more than 7 of the HikeSafe essential items. Finally, a write-in question collected qualitative information about decision making.

Hikers were approached at the trailheads, given an explanation of the study, and asked whether they wished to participate. A waiver for written consent was obtained through the Rhode Island Hospital Institutional Review Board. Surveys were conducted on summer weekend mornings to maximize participation. The exclusion criteria were as follows: 1) not fluent or literate in English; 2) younger than 18 years old; and 3) not *beginning* a hike.

The trailheads selected were Old Bridle Path/Falling Waters (OBP/FW), Appalachia, and Zealand Falls (ZF). The OBP/FW trailhead is the starting point for 2 trails, both of which offer access to the popular Franconia Ridge. Although either route is a steep climb, both are relatively short. Appalachia provides access to the rugged Presidential range and a number of easier hikes. Finally, ZF trailhead offers the choice of the demanding Pemigewasset Wilderness or taking the easier, level path to ZF Hut. These trailheads were chosen to provide a representative sample of hikers through high volume, location, and varied difficulty levels.

Table 3. Characteristics of hikers' communication/GPS devices and essential items carried by each group

Characteristic	*Number of hikers (% of total)*	*Prepared hikers (% of subgroup)*[a]	*Average number of items (95% CI)*
Communications device (n = 196)			
Communications device	177 (90.3)	66 (37.3)	6.6 (6.2–7.0)
No device	19 (9.7)	8 (42.1)	6.8 (5.8–7.8)
Would hike without communications device? (n = 156)			
Unlikely	9 (5.8)	2 (22.2)	5.1 (3.4–6.8)
Somewhat unlikely	5 (3.2)	1 (20.0)	5.2 (2.5–7.9)
Somewhat likely	30 (19.2)	14 (46.7)	7.2 (6.4–8.0)
Likely	112 (71.8)	39 (34.8)	6.5 (6.0–7.0)
GPS capability (n = 193)			
GPS capability	122 (63.2)	49 (40.2)	6.6 (6.1–7.1)
No device	71 (36.8)	24 (33.8)	6.6 (6.1–7.1)
GPS type (n = 122)			
GPS via phone	95 (77.9)	34 (35.8)	6.3 (5.7–6.9)
Dedicated GPS device	27 (22.1)	15 (55.6)	7.7 (6.9–7.5)
Would hike without GPS? (n = 111)			
Unlikely	7 (6.3)	1 (14.3)	4.9 (2.7–7.1)
Somewhat unlikely	2 (1.8)	2 (100.0)	10.0 (10.0–10.0)
Somewhat likely	20 (18.0)	8 (40.0)	6.7 (5.7–7.7)
Likely	82 (73.9)	34 (41.5)	6.8 (6.2–7.4)

CI, confidence interval; GPS, Global Positioning System.
[a] "Prepared" hiker defined as carrying >7 items and this column's percentage is calculated from the particular group, not the total n.

The data were stored and analyzed in Microsoft Excel 2010 (Microsoft Corp, Redmond, WA). Analysis consisted of calculating descriptive statistics including percentages, means, and 95% confidence intervals.

Results

On 8 separate data collection days between June and August 2011, 199 hikers were surveyed. OBP/FW was surveyed 3 times, Appalachia 3 times, and ZF 2 times. Not all surveys were fully completed, thus the denominator of some aggregated results is less than 199.

Table 1 shows demographics and experience. The most common hiker encountered in this study was a 20- to 29-year-old man with a self-described "high" fitness level and "some" wilderness experience. All 10 essentials were carried by 17.8% of hikers, whereas 40.6% carried more than 7. The 50- to 59-year-olds were the most likely to be prepared (>7 items). Numbers of prepared hikers and average number of essential items increased with experience and fitness levels.

Table 2 describes aspects of planning for hiking trips. The majority of hikers planned to be out less than 12 hours, had checked the weather, and informed another of travel plans. Hikers planning trips shorter than 12 hours were less prepared compared with those planning longer trips. If hikers did not inform a third party of travel plans, it was most often because they "didn't think it necessary."

Table 3 describes types of and opinions regarding communications devices carried. The majority of hikers carried communications and GPS devices. However, most hikers had GPS access via smart phone rather than through a dedicated GPS device. Smart phone GPS users were less prepared than dedicated-device GPS users. Most did not feel their willingness to hike changed whether or not they carried a communications or GPS device.

Figure 1 displays the frequency of individual items carried, and Table 4 sums qualitative data about causes of item omission. The most omitted items were whistles and compasses. "Short trip" was the most often cited reason for omission of an essential item.

Discussion

We initially hypothesized that the majority of hikers would *not* carry all 10 of the HikeSafe essentials felt necessary to minimize hiking risk, that mobile technology would encourage hikers to choose more difficult trails, and that most hikers would not inform others of their travel plans.

Roughly 4 of 5 hikers did not carry all 10 HikeSafe essentials, supporting our first hypothesis. One similar

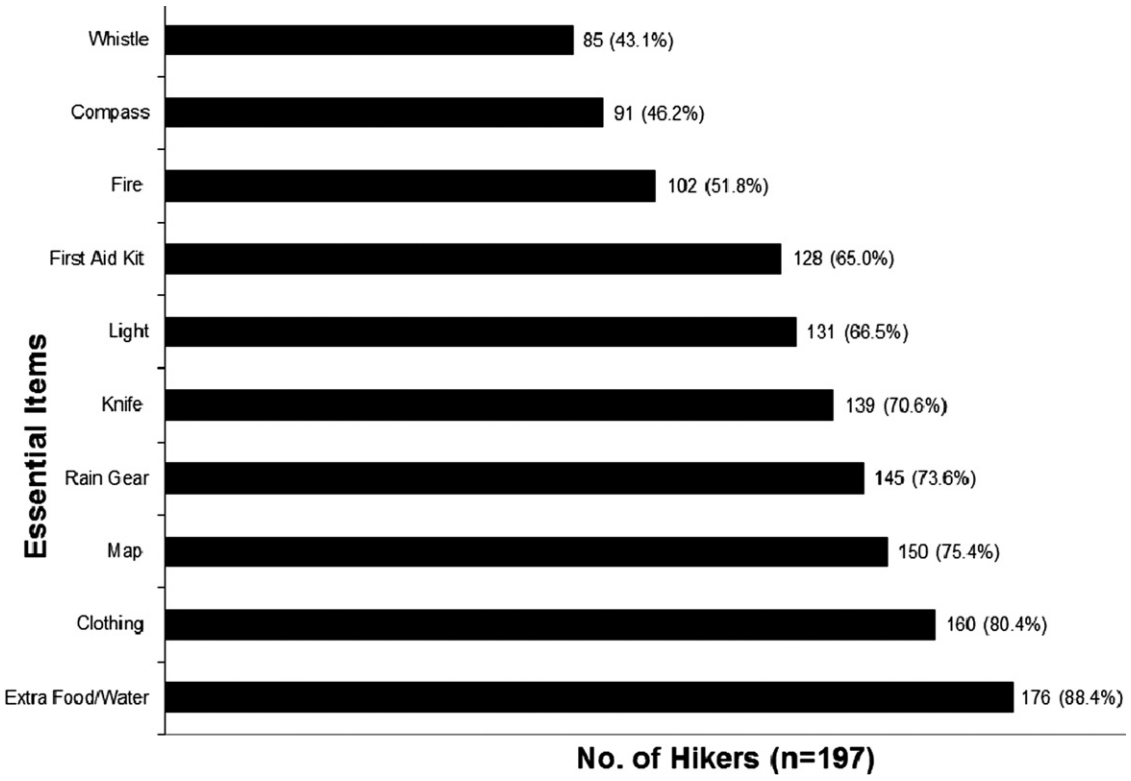

Figure 1. Distribution of essential items carried by type.

study by Kogut et al[6] in 1994 found Yosemite hikers carried 48% of 23 recommended medical supply categories. Although not directly comparable to the essentials list, the Yosemite hikers carried a higher percentage of a larger number of items. This suggests New Hampshire hikers were less prepared, at least by regional comparison.

Regional differences also contribute to the multiplicity of "essentials" lists, further complicating assessment of hiker preparedness. The Northwest-based *Mountaineering: Freedom of the Hills* list excludes whistles and allows GPS as a substitute for map and compass, perhaps reflecting environmental differences.[5] For example, whistles may be valued more in the heavily wooded White Mountains, but may be overlooked in lists for some larger, sparsely forested Western parks. Similarly, WMNF officials' experience with limited GPS availability may have led them to prefer recommendation of a map and compass. We attempted to adjust for this regional list variability with a more relaxed standard of "prepared" as more than 7 items, but still found most hikers less prepared.

The preparedness of individual groups also had interesting implications. According to the 2004 study by Ela, WMNF search and rescues (SARs) most often involved hikers between 20 and 49 years old, compared with 50- to 59-year-olds who were involved in roughly 50% fewer SARs.[3] Interestingly, by some measures 50- to 59-year-olds in our study were some of the best prepared. Perhaps older hikers more realistically appraise their abilities and attempt to compensate with additional equipment. This is further supported by the increased preparedness of those rating themselves highest in wilderness experience.

We hypothesized that the increase in communication and navigational devices may lead hikers to take risks they would have otherwise avoided, but this speculation was not borne out by the data. GPS users predominantly relied on smart phones despite being in an area of noted poor cellular reception. Noting this group's decreased overall preparation, it may be these hikers are less experienced and thus unaware of the signal quality in wilderness regions, and the limitations this could impose. This could serve as a future educational point.

Informing friends and family of wilderness travel plans may be more important than what is carried in a pack. The essential items will help a hiker survive for 24 hours, but leaving notice will ensure that help will be on the way. The data showed that most hikers informed others of travel plans, disproving our third hypothesis.

Hikers perceived risk to be dependent on the amount of time spent on the trail. "Short length/duration" of trip

Table 4. Reasons cited for omitting essential items

Reasons cited (n = 162)[a]	*Number of instances*
Short trip duration/length	49
Forgot	30
"Don't need"	26
Hiking during the daylight	20
Good weather forecast	16
Carried by another party member	15
"I am an experienced hiker"	10
Do not own item	9
Busy/popular trail	8
Known terrain/hiked previously	7
Staffed hut along hike	4
Backpack weight concerns	4
Left in other bag	3
Lost item	2
Spontaneous hike	2
Self-described "laziness"	2
Close to road	2
Fire illegal in NF	1
Just follow the trail	1
Have cell phone	1

NF, National Forest.

[a] Because of the write-in data format of the qualitative question, multiple responses could be generated from 1 survey.

was a commonly cited reason for neglecting tasks of preparation. Additionally, there was a sharp difference in preparation between those planning a day hike (<12 hours) versus a longer one. Thus, our data imply day hikers are more apt to be underprepared because of their perception that shorter hikes are less dangerous.

LIMITATIONS

The major drawbacks in our study stem primarily from its small scale. The data would be more generalizable if the sample size were larger and not restricted to 1 recreational area. Many item averages suffered from overlapping confidence intervals, making conclusions difficult to draw from these data.

In addition to sample size, the sole field researcher limited the survey to convenience methodology. For example, the data were collected in the morning. This may reflect a different group of hikers than those that would be surveyed in the afternoon.

We also believe our communication and navigational inquiry lacked rigor. The survey prompt regarding electronics-influenced behavior was a hypothetical situation: "If you did NOT have this device, how likely is it that you would have chosen a hike of this difficulty?" The survey responses may have reflected an idealized situation or one in which the hiker knows the "right" answer. The wording of the question is regrettable as it leaves much to speculation, leaving these findings inconclusive.

FURTHER STUDY

The information derived from this study raises several questions for further investigation. Our data imply that day hikers are less prepared; the next step would be to determine whether day hikers are disproportionately involved in SAR events.

Using a map (GPS or otherwise) and compass together, or orienteering, is a skill that requires training and practice. A follow-up study could be to assess whether hikers could properly use the navigation items they carried. Otherwise, their requirement as an essential is moot.

As mentioned in the limitations section, we did not feel our survey adequately assessed the impact of communications and navigational devices on hiking behavior. Thus, this topic requires further inquiry.

Finally, we believe quantitative measurements of injuries or rescue events within short distances of the trailhead would give a better picture of the risks of short hikes. These data could subsequently be incorporated into hiker education materials as a more persuasive argument for being prepared despite "only going for a day hike."

Conclusions

One factor that may help reduce SAR missions is better-educated and better-prepared individuals who are able to avoid activating the emergency medical services system. Should an accident occur, a major factor influencing a successful rescue is a hiker's preparation with survival, navigational, and signaling equipment. Educational efforts must be guided by accurate assessments of current hiking behavior.

Despite our limitations, the data from this survey provide insight into WMNF hiker habits, which can be used to improve hiker education and safety. First, the idea of "short" hikes being lower risk is a misperception that contributes to insufficient preparation. Second, the groups most often underprepared tend to be younger, less fit, and inexperienced hikers. Finally, although many essentials are agreed on, it is important to carry the proper gear for the local area. Therefore, hiker education efforts should target younger groups stressing that all hikes, regardless of duration, carry an inherent risk and warrant preparation by regional standards.

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Supplementary data

Supplementary Appendix associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.wem.2013.02.002.

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