Travel Health Risk Perceptions and Prevention Behaviors of US Study Abroad Students

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Background. The number of American study abroad students increased more than 150% in the past decade, along with growth in destinations with increased health risks. This study investigated travel health risk perceptions and prevention behaviors to guide interventions that address the emerging health needs of US study abroad students.

Method. A cross-sectional design was used to collect data from 318 American study abroad students using a Web-based survey. The primary source of travel health information was youth-oriented travel guidebooks (85%). The grand mean risk perception score for 18 travel health threats was 1.7 on a 1 to 4 scale, with top-rated threats being contaminated food/water, psychological distress, personal assault, and excessive sun exposure. Predeparture advice was received from primary care providers (52%) and travel health specialists (18%). Additional prevention measures were vaccines (42%) and medication (24%). Of 114 students listing their travel vaccinations, 11% described receiving a malaria vaccine and 4% a hepatitis C vaccine, although no such vaccines exist. Most respondents were confident/very confident in their ability to engage in prevention behaviors (94%). Health problems were primarily infectious disease (70%), psychological distress (10%), and injuries (8%). When asked if prior travel destinations involved areas where malaria transmission occurs, 20% responded, “Don’t know.”

Conclusions. Identified gaps in travel health knowledge and prevention behaviors may produce hazardous consequences when combined with low-perceived risk, reliance on travel guidebooks for health information, and high ratings for prevention self-efficacy. Future research is needed to test the effectiveness of educational interventions designed for student travelers who would benefit from guided practice with destination-specific risk appraisal and prevention planning. Web-based educational resources are a good fit for this population because they are easily updated, available in all phases of travel, and can accommodate interactive multimedia designs that actively engage and motivate students to adopt prevention behaviors.

As colleges and universities increasingly emphasize international education as part of their core mission, more students are encouraged and enabled to travel for course credit and as service volunteers. The Institute of International Education (IIE) has documented an increase of more than 150% in US students studying abroad over the past decade, with nearly a quarter of a million additional students now receiving academic credits from IIE-affiliated programs annually.¹ Growth in student travel to nontraditional study sites is reflected in the following IIE increases from 2006 to 2007: Asia (20%), Africa (19%), Middle East (7%), and Latin America (7%). Additional students travel independently, including “gap year” activities between high school and college in which youths provide service in developing countries while exploring personal interests and career options.² Furthermore, the Paul Simon Study Abroad Student Foundation Act aims to fund 1 million American study abroad students annually while targeting nontraditional study sites in developing regions of the world.³

Although research on study abroad students is limited, evidence suggests that travel-related health concerns and health problems are common in this population. Cooke and colleagues⁴ reported data from 49 UK undergraduate students who volunteered for 1 year in a developing country. Survey data obtained predeparture and at 6 and 12 months into their overseas experience found that at predeparture students perceived the top three risks to be gastroenteritis, malaria/prophylaxis, and psychological issues. Once abroad, students perceived an increased risk for accidents, sexually transmitted infections, and psychological issues. This demonstrates how experience alters risk perceptions and...
where additional attention could be focused during preparation and overseas support.

A study that documented the frequency of illness and injury among 644 UK youths participating in summer expeditions to developing countries found that the most common complaints for the 75% seeking medical advice were gastrointestinal symptoms (53%), headache (18%), and respiratory symptoms (14%). A subsequent study done on 2,402 UK youths traveling to a developing country showed that the five most prevalent problems among the 64% seeking advice were gastrointestinal (42%), cold or sore throat (11%), headache (11%), and trauma (10%). There were six confirmed cases of malaria in students who traveled to Africa.

There is evidence that a substantial proportion of student travelers do not engage in travel health prevention behaviors. In a study of 1,197 Chinese study abroad students, 75% sought no pretravel health advice and 48% used no travel health precautions. Of those who received advice, 41% received it from nonexpert sources. In 2002, 25 university staff and students responded to a survey within 6 months of their return from a US exchange program with Ghana. Most participants (80%) reported an illness during the 1-month stay, 35% did not seek medical attention for symptoms consistent with malaria, 44% did not adhere to the malaria chemoprophylaxis recommendations, and 92% failed to use a bed net. In 2005, a cluster of six student travelers, aged 19 to 22, became symptomatic in a UK airport with high fevers, rigors, and confusion on their way home to the United States from East Africa. These six individuals, and a peer who later became symptomatic, completed a survey revealing that only one person had initiated malaria chemoprophylaxis (later discontinued prematurely) and group members had slept under unimpregnated bed nets.

These data identify the growing need to inform students who study and travel abroad about travel-related health risks specific to their circumstances, but little is known about travel health risk appraisal and prevention behaviors from the US student perspective. Limited information makes it difficult to tailor prevention education to the unique needs of this at-risk population. This study investigated perception of risk, travel-related health problems and prevention behaviors, preferred sources of information, and confidence in personal risk-reduction skills for American study abroad students. Additional objectives of this study were to explore the likelihood of reaching students in the three phases of travel (ie, planning, abroad, returned) using a Web-based survey and to examine the association of phase of travel and prior travel to a malaria-risk region with the descriptive variables targeted by this survey.

Subjects and Methods

A cross-sectional Web-based survey was conducted after approval by the campus Health Sciences Institutional Review Board. A convenience sample of 1,000 University of Wisconsin–Madison study abroad students was invited to participate through an e-mail letter of invitation, using campus study abroad listserv groups accessed in collaboration with the Division of International Studies. Eligible students who agreed to participate were linked to a Web-based survey from the letter of invitation. There were 491 hits (49% of sample) to the survey link, with 318 surveys completed, yielding a participation rate of 32% without incentive. The survey was open to respondents for 8 weeks from June to August 2007; one e-mail reminder was sent at 4 weeks. Eligibility criteria required that participants be at least 18 years of age and a current member of a campus study abroad listserv for outgoing American students. There were no exclusions by gender, ethnicity, academic major, or year in school.

Measures

Survey development was guided conceptually by the self-regulation model (SRM). The SRM describes the dynamic and iterative process that individuals use to translate health information into representations (mental models), to develop an action plan from these representations, and to appraise the success of the action plan. Representations shape health behaviors. Information is acquired through experiential learning (concrete) and/or print and other media or word of mouth (abstract). Representations constructed through experiential learning have a particularly robust influence on behavior. Representations are constructed in both cognitive and affective domains that interact during the course of personalizing this information. In this study, “likelihood” was used to measure cognitive risk perception representations (probability estimates) and “worry” was used to measure affective risk perception representations. One item on prevention self-efficacy, or the degree of confidence in one’s ability to perform an action, was included in the survey instrument because perceived self-efficacy is a significant predictor for engagement in prevention behaviors.

Validity testing was conducted using an expert panel comprising five travel health specialists who rated items for content validity using a 4-point scale (1 = not at all relevant to 4 = very relevant). A content validity index (CVI) was calculated from these ratings, representing the proportion of items that achieve a rating of 3 or 4. The CVI was 0.96, exceeding the reference criterion of 0.8. Additionally, five study abroad students rated items for clarity (1 = not at all clear to 4 = very clear), and revisions were made to improve comprehension. The final version of the survey took less than 10 minutes to complete in 15 volunteers who tested the online format. It consisted of items on student demographics (n = 10), risk perceptions for 18 travel health threats (n = 36), travel-related health problems (n = 1), past (n = 4) and future (n = 25) prevention behaviors, pretravel information sources (n = 7), confidence in personal risk-reduction skills (n = 1), and advice for future study abroad students (n = 1). Respondents
were asked to rate the likelihood (1 = not at all to 4 = very) for using common pretravel information sources and for engaging in future prevention behavior. Past prevention behavior items (n = 4) were coded as Yes or No. Prior exposure to malaria-risk regions was coded as Yes, No, or Don’t know. Students used text boxes to further describe travel destinations, travel-related health problems, past prevention behavior, information sources not included in the survey, and advice for future study abroad students. Students were directed to respond based on any past international travel with the exception of questions about study abroad travel status (planning, abroad, and returned) and study abroad destinations.

Statistical Analysis

The de-identified data were exported from Zoomerang survey software (MarketTools Inc., San Francisco, CA, USA) to SPSS 15.0 (SPSS Inc., Chicago, IL, USA) for analysis. Data were first analyzed using descriptive statistics. The associations of phase of travel (planning, abroad, and returned) and prior travel to a malaria-risk region to study variables were examined using analysis of variance, t-tests, and the chi-square test. Risk perception scores were derived by averaging the ratings for “likelihood” and “worry” for each travel health threat using a rating scale of 1 = not at all to 4 = very for “How likely” and “How worried.” Uniform codes were used for missing data, and no data were imputed for missing responses. Survey items on future prevention behaviors were not included in this analysis.

Results

Demographic characteristics of the 318 respondents are summarized in Table 1. Respondents represented all phases of study abroad travel at the time of the survey, with 43% in the planning phase, 13% abroad, and 44% having returned from at least one study abroad experience. Study abroad destinations were Europe (52%), Latin America (21%), Asia (11%), Africa (9%), Oceania (4%), and the Middle East (3%). Prior travel outside the United States, unaffiliated with a study abroad experience, was reported by 76% of the participants. For prior travel to a malaria-risk region, 56% reported none, 24% reported prior travel, and 20% reported that they did not know.

The most likely information source for pretravel information was a youth-oriented travel guidebook, such as Let’s Go, Rough Guide, or Lonely Planet (85%), followed by consultation with a primary care provider (60%) and the US State Department Web site (57%). One third or less reported that they were likely or very likely to use the Web sites for the CIA World Factbook (33%), Centers for Disease Control and Prevention (24%), and World Health Organization (21%) or to consult with a travel health specialist (24%). An open-ended question about other preferred information sources elicited 84 responses: friends and family (75%), commercial Internet sites (12%), campus study abroad program materials (9%), and travel agents/US Embassy/credit card travel services (4%).

The mean scores for “likelihood” and “worry” across 18 travel health threats are presented in Table 2. Cronbach’s alpha for internal consistency was .85 for likelihood, .87 for worry, and .90 for the combined dimensions. The top five risk perception scores were contaminated food/water (M = 2.38), psychological distress (M = 2.32), physical/sexual assault (M = 2.23), excessive sun exposure (M = 2.19), and motor vehicle accident (M = 1.97). The grand mean risk perception score was 1.7, indicating an overall low level of perceived risk. As a measure of prevention self-efficacy, 94% of respondents rated themselves as confident (45%) or very confident (49%) about their ability to engage in personal risk-reduction skills in all phases of travel (M = 3.43).

Students’ prevention behaviors are shown in Figure 1. Of the 114 students who specifically named their travel vaccinations using an open-ended text box, 11% (n = 12) reported a malaria vaccine and 4% (n = 4) reported a hepatitis C vaccine, even though no such vaccines are available. The most frequently reported vaccine categories were hepatitis (n = 80 for A, B, or unspecified), typhoid (n = 51), yellow fever (n = 42), tetanus (n = 16), and rabies (n = 14). Meningitis, influenza, Japanese encephalitis, MMR, and polio each had eight or fewer mentions. Seventy-three students (24%) obtained prescriptions for travel-related medications, with 49% for malaria chemoprophylaxis, 37% for traveler’s diarrhea, and the remainder for motion and altitude sickness, acne, allergies, and yeast vaginitis. Nineteen (25%) of the students reporting prior travel to a malaria-risk region reported no use of travel-related medication.

Travel-related health problems were reported by 25% of respondents: 70% were infectious in origin, primarily gastrointestinal, respiratory, skin, and vector-borne diseases such as dengue and malaria; 10% were psychological distress, primarily loneliness, depression, or anxiety; 8% were injuries; and 7% were asthma/allergy symptoms. The remaining 5% included altitude...
sickness, chronic pain conditions, constipation, and motion sickness.

Ratings for information sources/risk perceptions/prevention self-efficacy and responses for experience with travel-related health problems and prevention behaviors did not differ by respondents’ phase of travel. Although risk perception scores were low across all health threats, they varied significantly according to whether the student reported travel to a malaria-risk region (Table 3). Students who reported Yes for prior travel to a malaria-risk region were also significantly more likely to use travel information sources beyond a guidebook (all \( F > 4.7 \) and all \( p < .01 \)) and to report the highest proportion of prevention behaviors and travel-related health problems compared with those who had not been exposed to a malaria-risk region or who did not know whether they had been exposed. Eighty percent responding Yes had consulted a general practitioner (\( \chi^2 = 30.117, df = 2, p < .001 \)), 49% had consulted a travel health specialist (\( \chi^2 = 68.618, df = 2, p < .001 \)), 88% obtained travel vaccinations (\( \chi^2 = 88.955, df = 2, p < .001 \)), 72% obtained travel medication (\( \chi^2 = 133.944, df = 2, p < .001 \)), and 37% reported a travel-related health problem (\( \chi^2 = 9.932, df = 2, p < .01 \)). Gender and race/ethnicity were not used as factors during data analysis due to the disproportionate numbers of female and White respondents that reflect the US study abroad population.

The survey concluded with an open-ended item soliciting advice for future study abroad students based on the respondents’ own experiences. Of the 84 respondents, 93% included comments about being aware of destination-specific risks and to plan ahead based on these risks, while 6% advised others only to “have fun.” Other advice included getting travel vaccinations (13%), packing medications from home for common illnesses (8%), understanding health insurance coverage/keeping an insurance card easily accessible (7%), getting safety advice from locals (6%), and using a buddy system when going out (4%).

Data from this study showed that students did not find any travel health threats to be highly likely or worrisome. Some deficits in prevention knowledge and behaviors were identified, such as 1 in 5 students responding “Don’t know” to a question about prior travel to a malaria-risk region, 1 in 7 reporting that they received a travel vaccine that does not currently exist, and 1 in 4 failing to seek malaria chemoprophylaxis despite awareness of malaria transmission at their destination. Reported experience in a malaria-risk region was associated with an increased perception of risk across most travel health threats and a greater use of prtravel consultation and travel-related vaccines and medication.

| Table 2 | Mean ratings for 18 travel health threats using a scale of 1 = *not at all* to 4 = *very* |
|---|---|---|
| (N = 318)* | Likelihood | Worry |
| Contaminated food and water | 2.61 | 2.13 |
| Psychological distress (homesickness, loneliness, depression, anxiety) | 2.59 | 2.13 |
| Excessive sun exposure | 2.47 | 1.91 |
| Physical or sexual assault | 2.22 | 2.24 |
| Motor vehicle accident (pedestrian, bike, or in vehicle) | 2.14 | 1.80 |
| Infection transmitted through the bite of an insect (mosquito, fly, tick) | 2.08 | 1.67 |
| Infection spread by coughing and sneezing (such as influenza and TB) | 2.02 | 1.59 |
| Problem related to alcohol or drugs | 1.78 | 1.55 |
| Armed conflict or a terrorist attack | 1.66 | 1.71 |
| Mass transit accident involving plane, train, or subway | 1.65 | 1.65 |
| Malaria | 1.59 | 1.45 |
| Natural disaster (hurricane flood, tsunami, earthquake, tornado) | 1.57 | 1.41 |
| Sexually transmitted infection | 1.53 | 1.40 |
| Infection with other diseases spread by animals (bird flu, plague, Ebola) | 1.36 | 1.28 |
| Fall from a hazard or height | 1.36 | 1.24 |
| Fire | 1.34 | 1.20 |
| Drowning or near drowning | 1.26 | 1.19 |
| Rabies | 1.26 | 1.18 |

*The n for each item may vary due to missing cases.*

Figure 1 Past travel health prevention behaviors (N = 318). The n for each item may vary due to missing cases.
Grand mean risk perception score 1.6 1.7 1.8 F(2, 305) alone. Subsequent behavior will be consistent with health representations and not study abroad experiences. Travel experiences influence cognitive and emotional abilities. According to the self-regulation model, all past (planning, abroad, and returned) to examine study variables, and at a time of their choosing. Study demographic data reflected state and national data, and a response rate of 32% with no incentive supports the feasibility of accessing this population in all three phases of travel (planning, abroad, and returned) through a Web-based survey.

The finding that 76% of respondents had traveled abroad prior to electing to study abroad may explain the lack of significant differences when using phase of travel (planning, abroad, and returned) to examine study variables. According to the self-regulation model, all past travel experiences influence cognitive and emotional health representations and not study abroad experiences alone. Subsequent behavior will be consistent with these representations about risk and prevention. Students are less likely to use malaria chemoprophylaxis or mosquito avoidance strategies if they mistakenly believe that they are protected through a pretravel vaccination or if they lack accurate knowledge about where and how malaria is transmitted, the consequences of malaria infection, and the most effective risk-reduction measures.

Travelers consult a variety of sources for health information about specific destinations. Airlines and travel agents generally neither provide sufficiently detailed or personalized travel health information to optimize traveler safety nor routinely recommend that travelers going to destinations with greater health risks consult a travel health specialist prior to departure. The need for this pretravel consultation has been established by a series of studies conducted in international airports that found that travelers underestimate the risk associated with travel to developing countries and/or fail to follow prevention recommendations while traveling. In this study, youth-oriented travel guidebooks were the primary information source for students. This finding is consistent with a survey of Australian hostellers who identified travel guidebooks and the Internet as major sources of travel health advice.

The findings that students perceived no travel health threats to be highly likely or worrisome and that ratings for prevention self-efficacy were remarkably high are congruent with the developmental stage of the respondents who had a mean age of 20 years in this sample. The top two risk perception rankings for encountering food/water contamination and psychological distress tracked well with the health problems most commonly reported in this study and in prior research. However, students may be underestimating the likelihood of two major causes of preventable deaths when abroad: motor vehicle injuries and drowning, which appear to be statistically more likely when traveling than when living at home. Students also did not consider the threat of sexually transmitted infections to be likely or worrisome, despite data from prior studies showing that 30% to 76% of travelers who reported sex with new partners while abroad did not use condoms consistently. The threat with the lowest risk perception score was rabies, despite the increase in travel to regions of the world where the risk of rabies exposure is significant and access to rabies postexposure treatment may be limited or unavailable.

Finally, risk perception scores among students who reported past travel to a malaria-risk region compared with those with no travel to a risk region were significantly higher. These data are in agreement with Cooke and colleagues, who reported a marked difference between perceived health risks before departure and after time abroad in developing countries.

### Table 3  Risk perception by travel to a malaria-endemic region (1 = not at all to 4 = very)

<table>
<thead>
<tr>
<th></th>
<th>No (n = 173)</th>
<th>Don’t know (n = 61)</th>
<th>Yes (n = 75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand mean risk perception score</td>
<td>1.6</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>F(2, 305) = 19.824; t = .303 for Yes/No, p &lt; .001; t = .172 for Yes/Don’t know, p &lt; .05</td>
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### Discussion

Study findings must be interpreted within the limitations imposed by a cross-sectional design. The convenience sample of students who responded to the e-mail letter of invitation may have been atypical, introducing sampling bias, while the use of self-report for prevention behaviors and health problems introduces limitations related to memory and social desirability bias. Although students were not prohibited from submitting a survey more than once to ensure anonymity, the time and effort required for completion and lack of an incentive reduces the probability that this occurred.

Strengths of this study included broad access to study abroad students due to the nearly universal use of digital communication by college students. A Web-based survey is more inclusive of students who connect to campus primarily through online communications and also allows students to respond from anywhere in the world and at a time of their choosing. Study demographic data reflected state and national data, and a response rate of 32% with no incentive supports the feasibility of accessing this population in all three phases of travel (planning, abroad, and returned) through a Web-based survey.

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The findings that students perceived no travel health threats to be highly likely or worrisome and that ratings for prevention self-efficacy were remarkably high are congruent with the developmental stage of the respondents who had a mean age of 20 years in this sample. The top two risk perception rankings for encountering food/water contamination and psychological distress tracked well with the health problems most commonly reported in this study and in prior research. However, students may be underestimating the likelihood of two major causes of preventable deaths when abroad: motor vehicle injuries and drowning, which appear to be statistically more likely when traveling than when living at home. Students also did not consider the threat of sexually transmitted infections to be likely or worrisome, despite data from prior studies showing that 30% to 76% of travelers who reported sex with new partners while abroad did not use condoms consistently. The threat with the lowest risk perception score was rabies, despite the increase in travel to regions of the world where the risk of rabies exposure is significant and access to rabies postexposure treatment may be limited or unavailable.

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### Conclusions

This study provides useful information for clinicians who provide travel health information to students, for study abroad program administrators wishing to maximize student safety, and for researchers designing innovative educational tools for travelers. The low-perceived risk, high-prevention self-efficacy, and reliance on youth-oriented travel guidebooks for travel health information revealed by these data create a potentially dangerous situation when combined with the gaps noted in travel health knowledge and prevention behaviors. This presents a challenge in travel health education. The technical savvy of these students supports approaches more responsive to changing risk circumstances. Additionally, Web-based resources (ie, games and simulations) that provide experience by proxy are a good fit for this student population. They
present opportunities to boost student learning and to engage the student in prevention behaviors with simulated consequences when mistakes are made. Correcting misperceptions and focusing attention on destination-specific risk appraisal and personal protective measures will improve the odds for students’ safe return from global travels.

Declaration of Interests

The authors state that they have no conflicts of interest.

References