Streaming data from a smartphone application: a new approach using mHealth and data-driven analysis to map health during travel

Andrea Farnham
(Swiss Tropical and Public Health Institute, Basel)

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Institut für Statistik, Ludwigstr. 33, Seminarraum

Introduction: Travel medicine research has remained relatively unchanged in the face of rapid expansion of international travel and corresponding health challenges, despite known research shortcomings in non-infectious disease research and the wide availability of new Mobile Health (mHealth) and statistical methodologies.

Aim: To identify the range of health outcomes during travel using real-time monitoring and daily reporting of health behaviors and outcomes via smartphone application and identify traveler subgroups who may benefit from more targeted advice before and during travel.

Methods: We recruited a prospective cohort of travelers $\geq$ 18 years planning travel to Thailand for $<$ 5 weeks from the travel clinics in Zurich and Basel (Switzerland). Participants answered demographic, clinical, and risk behavior questionnaires pre-travel, and a daily health questionnaire each day during travel using a smartphone application. Environmental, social media, and location data were collected passively by GPS. Classification trees were used to identify predictors of health behavior and outcomes during travel.

Results: Non-infectious disease events were common, with 22.7% (17 out of 75 travelers) experiencing an accident, 40.0% (n=30) a wound or cut, and 14.7% (n=11) a bite or lick from an animal. Mental health events were widely reported, with 80.0% (n=60) reporting lethargy, 34.7% (n=26) anxiety, and 34.7% (n=26) feeling tense or irritable. Classification trees identified several robust patterns in traveler behavior, with age, trip length, previous travel experience, and having experienced a sports injury in the past year as the most important discriminatory variables for health threats.

Conclusion: Travel medicine research utilizing mHealth technology has the potential to revolutionize our understanding of health during travel by creating an almost real-time timeline of health events and behaviors during travel. Our study suggests that travelers commonly deal with a wide range of health events during travel and certain traveler subgroups may be at higher risk for different health risks. In particular, non-infectious disease related health issues were more common than expected. These health issues are rarely addressed in traditional travel medicine research, and suggest a substantial potential for improving evidence-based travel medicine advice.