

From Use Cases to Tech Visits

A Demonstration of the Development and Deployment of a Multi-Channel Monitoring System for Longitudinal Exposure Surveys

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Challenges to Determining Environmental Exposure: Need for Low-Burden, Integrated Data Collection

Substances

- Gases, particulates
- Pesticide residues
- Product chemicals

Exposure Routes

- Inhalation
- Ingestion
- Dermal contact

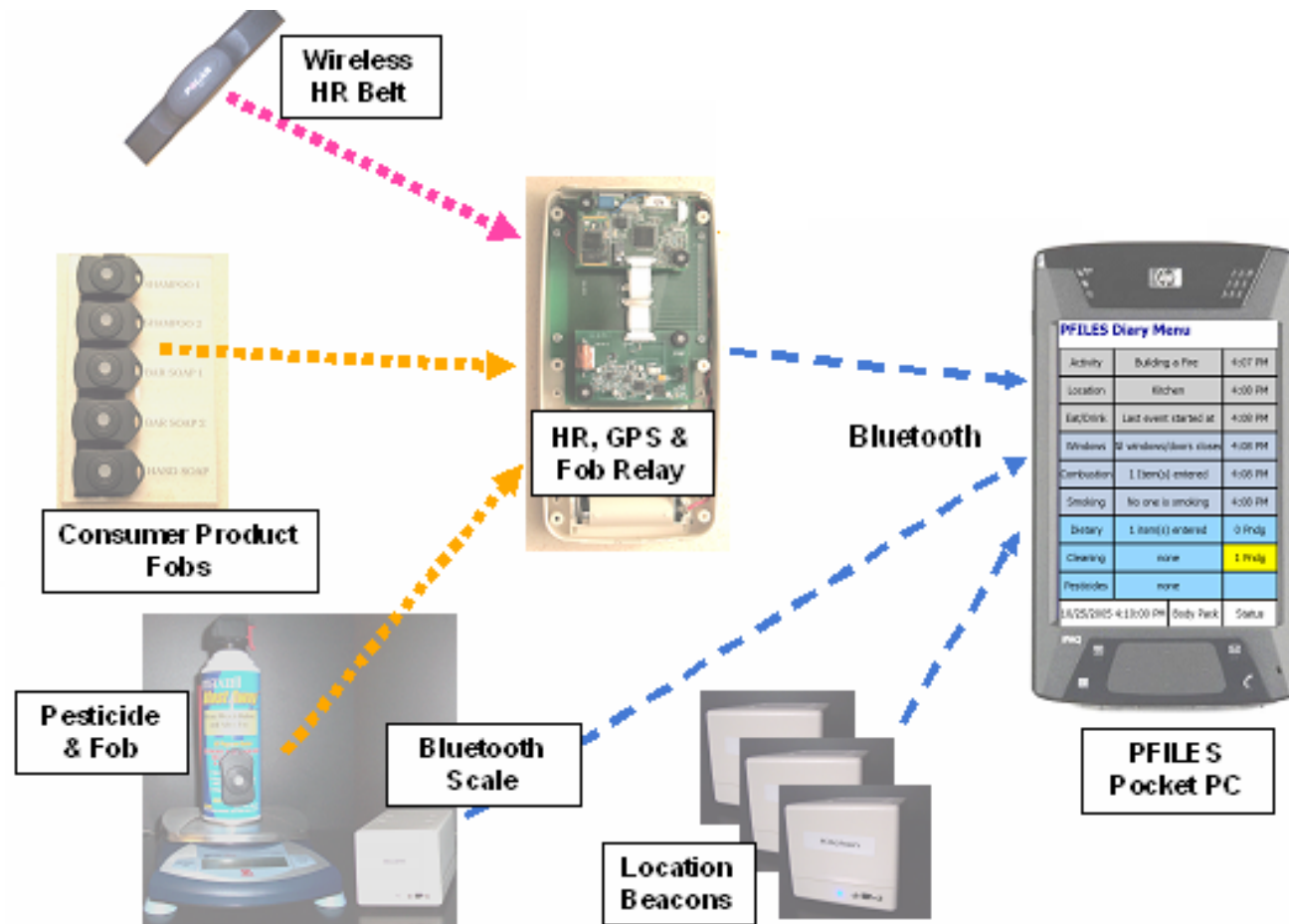
Modifiers of exposure

- Ventilation , breathing rate (exertion)
- Specific activities (painting)
- Geographic location (longitude/latitude)
- Household location (kitchen/garage)
- Food and beverage consumption
- Carpet, gloves, open doors/windows
- Season, temperature, humidity

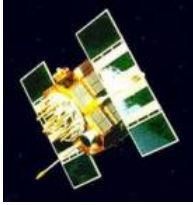



Challenges for Traditional Exposure Monitoring Methods

- Collections based on daily paper-and-pencil diaries, recall interviews, and/or direct observation
- Typically involve collection of information for a very short period of time (<24 hours)
- Self-estimates of exertion level
- No means of measuring compliance
- Increased subject burden, reduced data quality
- Lack of integrated inhalation, ingestion, and dermal exposure data sets have resulted in limited utility

Solution: Integrated Diaries and Passive Monitors



Passive Low-Burden Monitoring

REQUIRMENT	SOLUTION	DEVICE
Macro Location	GPS	
Micro Location	Bluetooth Beacons	
Ventilation (exertion)	Heart Rate Monitor	
Body Movement	Accelerometer	

Deployment

- **Purpose:**
 - Evaluate technical performance of technologies & systems
 - Evaluate participant & analyst burden for various diary modes
- **Pilot test design:**
 - Handheld diaries for activity, diet, product use, and environmental conditions
 - Passive level of exertion monitoring (heart rate/acceleration)
 - Passive location monitoring (residential beacons / GPS)
 - Each participant used the data collection system 7 days

"Active" Monitoring (Self-Report Diaries)

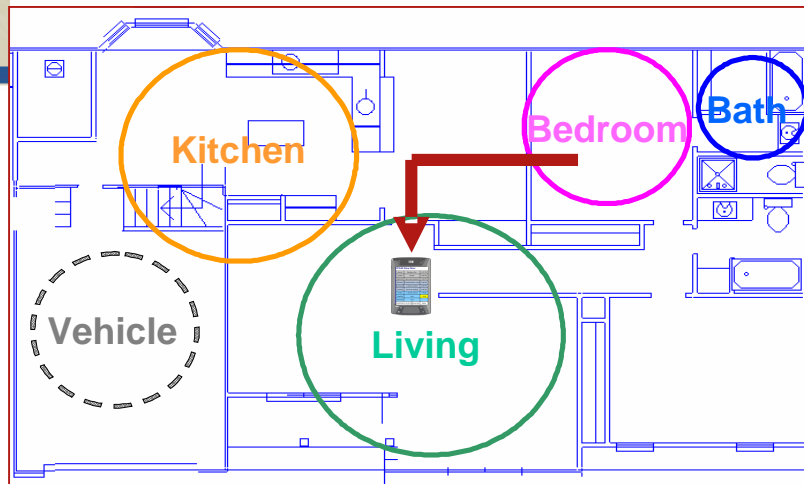
Activity, Location Environmental Diary

Home		
RTI EXIT HELP		
11:28 AM, Wednesday, November 26,		
100%		
Location	Athletic field or play	4:34 PM
Activity	Basketball	4:35 PM
Windows	Outdoors	4:34 PM
Combustion		
Smoking		
Review		
Feedback		
BodyPack Status HR Belt Status		
Version: 2.1.3246.14239		
© 2007-2008 RTI International		

Diet Diary

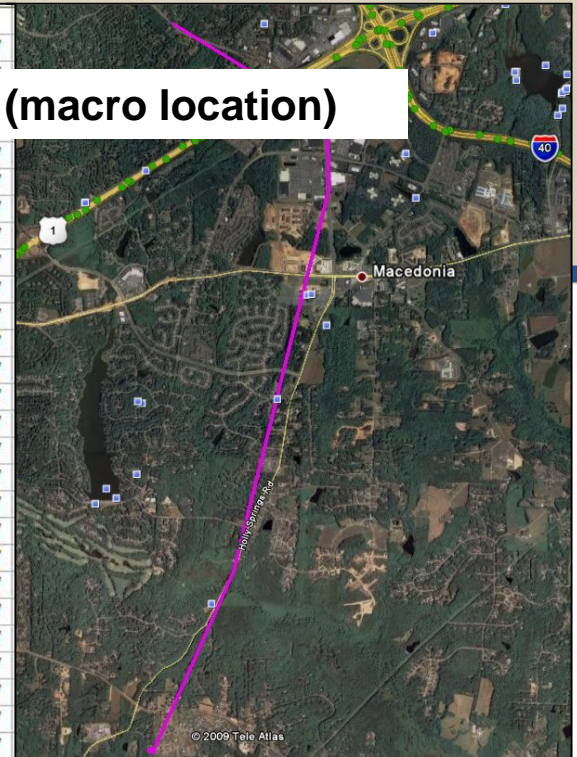
Diary Review	
PgUp PgDn Add Edit Font Zap Done	
Tap a food item to select, then use buttons above. Tap a time to change	
Th 4:00A	
Th 5:00A	
Th 6:00A	
Th 7:00A	
Th 7:50A	Breakfast
Th 7:50A	Eggs, any style (M)
Th 7:50A	Multigrain (M)
Th 7:50A	Butter (S)
Th 7:50A	Coffee (XL)
Th 7:50A	Other Dairy products
Th 7:50A	Sugar, syrup, topping
Th 7:50A	Cranberry juice (L)
Th 8:00A	

Bluetooth Beacons (micro location)

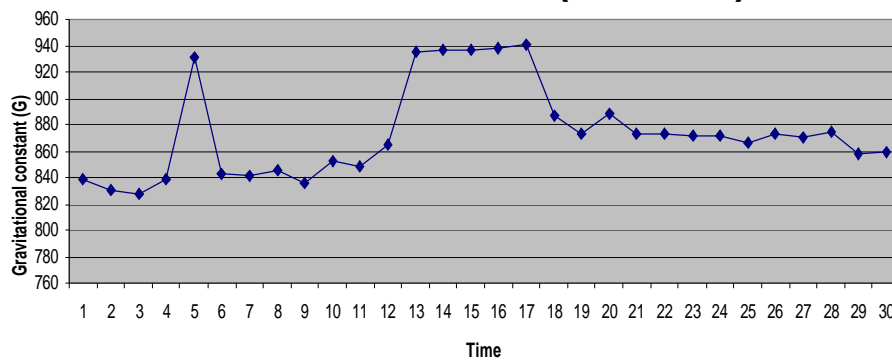


GPS (macro location)

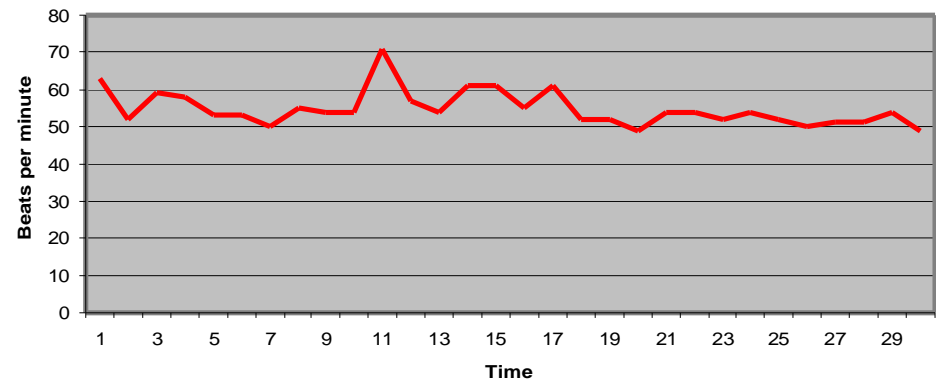
Latitude	Longitude
35 42.3209' N	078 45.5896' W
35 42.3184' N	0
35 42.3259' N	0
35 42.3233' N	0
35 42.3174' N	078 45.5952' W
35 42.3160' N	078 45.5922' W
35 42.3250' N	078 45.5688' W
35 42.3213' N	078 45.5526' W
35 42.3229' N	078 45.5795' W
35 42.3259' N	078 45.5936' W
35 42.3252' N	078 45.5965' W
35 42.3127' N	078 45.5946' W
35 42.3215' N	078 45.5951' W
35 42.3214' N	078 45.5943' W
35 42.3235' N	078 45.5812' W
35 42.3209' N	078 45.5951' W
35 42.3181' N	078 45.5859' W
35 42.3157' N	078 45.5816' W
35 42.3104' N	078 45.5594' W
35 42.3184' N	078 45.5954' W
35 42.3160' N	078 45.5864' W
35 42.3130' N	078 45.5730' W
35 43.2241' N	078 45.0698' W
35 45.1791' N	078 44.4698' W
35 45.5337' N	078 44.4805' W
35 45.5363' N	078 44.4809' W
35 46.0251' N	078 45.4472' W



Accelerometer (exertion)



Heart Rate (exertion)



Contact

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