

turning knowledge into practice

Mode Effects in “Data Collection Platforms for Integrated Longitudinal Exposure Surveys”: Impact on Data Quality and Burden

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Introduction

- **Project background**
- **Data collection modes**
- **Data quality and burden analysis**
- **Participant feedback**
- **Conclusions and lessons learned**

Project Summary

- **General:**

- “Data Collection Platforms for Integrated Longitudinal Exposure Surveys” Pilot
- Funded by EPA STAR grant

- **Purpose:**

- Evaluate performance of technologies & systems in the collection of time, activity, location, and energy expenditure data (TALE data)
- Evaluate participant & analyst burden for various diary modes

Project Summary

- **Participant Demographics (n=40)**
 - Gender: Female (n=27); Male (n=13)
 - Age: 18-34 (n=11); 35-64 (n=22); 65+ (n=7)
 - Ed: HS/GED (n=10); some college (n=13); college grad. (n=17)
- **Field study design**
 - Convenience (volunteer) sample in Raleigh/Durham/Chapel Hill area
 - Data collection period: April-July, 2007
 - Four data collection modes: Paper, Pocket PC (PPC) menu, PPC voice, PPC photo
 - Each participant used the data collection system 3-7 days

Example activity data

time	activity
12:04:56	Picking up/Putting Away Items
12:16:31	Napping
13:42:59	Picking up/Putting Away Items
14:04:15	Mowing Lawn- Push Mower
14:36:42	Raking Leaves/Clippings
14:55:34	Operating leaf Blower
15:07:15	Picking up/Putting Away Items
15:25:17	Walking
15:45:52	Grooming/Dressing
15:58:15	Riding in Motor Vehicle
16:06:57	Moderately Strenuous Work
18:45:55	Riding in Motor Vehicle
18:55:19	Riding in Motor Vehicle
19:15:21	Building Supplies
19:55:35	Riding in Motor Vehicle
21:36:39	Sleeping

Data Collection Modes

- **Paper diary (groups 1 & 2)** – traditional forms and booklets
- **PPC menu diary (groups 3 & 4)** – menus and forms on PPC
- **Voice diary (groups 5 & 6)** – questions/answers recorded on PPC
- **Photo diary (groups 7 & 8)** – periodic photos captured on PPC

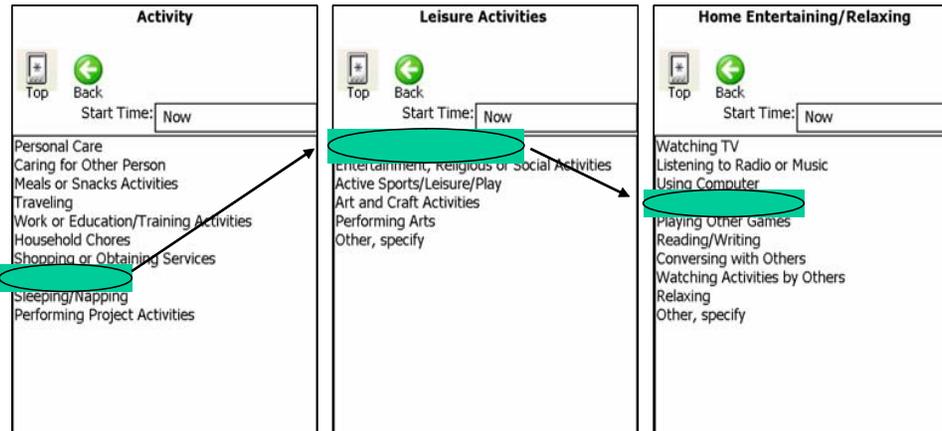
N=40 Groups	<i>Sex</i>		<i>Age</i>			<i>Education Level</i>		
	Female	Male	18-34	35-65	65+	HS/GED	Some College/Associates	College Grad
1 and 2	6	4	3	5	2	2	3	5
3 and 4	7	3	2	6	2	2	4	4
5 and 6	7	3	3	5	2	3	4	3
7 and 8	7	3	3	6	1	3	2	5
<i>Totals</i>	27	13	11	22	7	10	13	17

Mode 1: Paper

- Groups 1 and 2
- 7 daily paper diaries
- 24 hour monitoring day
- Activity self-coded
- Captured start and end time for each location and activity change
- 2 minute exclusion rule
- Analyst re-coded to align with CHAD (EPA's Consolidated Human Activity Database)

START TIME*	STOP TIME*
1 1 2 3 AM <input type="checkbox"/> PM <input checked="" type="checkbox"/>	0 6 4 6 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>
A. YOUR CURRENT LOCATION (circle only one) <u>IN VEHICLE</u> - Car, van, or SUV 01 - Pickup or other truck 02 - Bus 03 - Train, trolley, or subway 04 - Other vehicle 05 Specify _____ <u>INDOOR LOCATION</u> - Your residence c kitchen 06 c garage 07 c other room 08 - Other residence c kitchen 09 c garage 10 c other room 11 - Non-medical office building 12 - Manufacturing facility 13 - Restaurant 14 - Store 15 Specify type _____ - School 16 - Spa or exercise facility 17 - Service station or vehicle repair facility 18 - Other indoor location 19 Specify _____ <u>OUTDOOR LOCATION</u> - Your residence c lawn, garden, or natural area 20 c pavement, deck, or porch 21 - Other residence c lawn, garden, or natural area 22 c pavement, deck, or porch 23 - Outdoor restaurant or eating area 24 - School grounds or athletic field 25 - Service station or other vehicle refueling 26 - Parking lot 27 - Parking garage 28 - Other outdoor location 29 Specify _____	B. YOUR ACTIVITY (please be specific) Sleeping C. YOUR BREATHING RATE (circle only one) - Sleeping or napping 01 - Slow (e.g., sitting, standing, slow walk) 02 - Medium (e.g., brisk walk) 03 - Fast (e.g., running) 04 D. OUTDOORS OR IN VEHICLE WITHIN 30 FEET OF ROADWAY? - Yes 01 - No 02 E. SMOKING (circle all that apply) - You are smoking 01 - Others are smoking (within 30 feet) 02 - No one is smoking 03 F. OTHER OPERATING COMBUSTION SOURCES WITHIN 30 FEET OF YOUR LOCATION (circle all that apply) - Gas stove 01 - Fireplace 02 - Wood stove 03 - Kerosene heater 04 - Other indoor combustion source 05 Specify _____ - Charcoal grill 06 - Gasoline-powered mower 07 - Gasoline-powered tool 08 - Other outdoor combustion source 09 Specify _____ G. WINDOWS AND DOORS TO OUTDOORS (ONLY IF INDOORS OR IN VEHICLE) (circle all that apply) - One or more windows are open 01 - One or more doors are open 02 - All windows and doors are closed 03 Note: You do not need to report locations or activities that last less than 2 minutes.

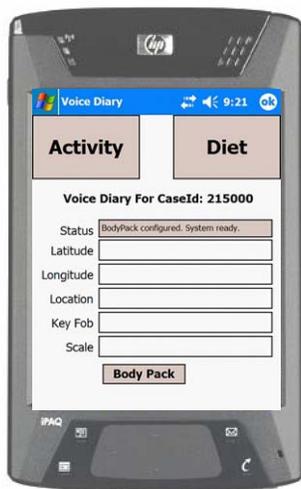
Mode 2: PPC



Multilevel menus are used to capture activity and location data.

- Groups 3 and 4
- ~12 hour monitoring day
- Drill down menus correspond with CHAD activities; no analyst re-coding required
- Only captured start time for each location and activity change; compliance assumed
- 2 minute exclusion rule

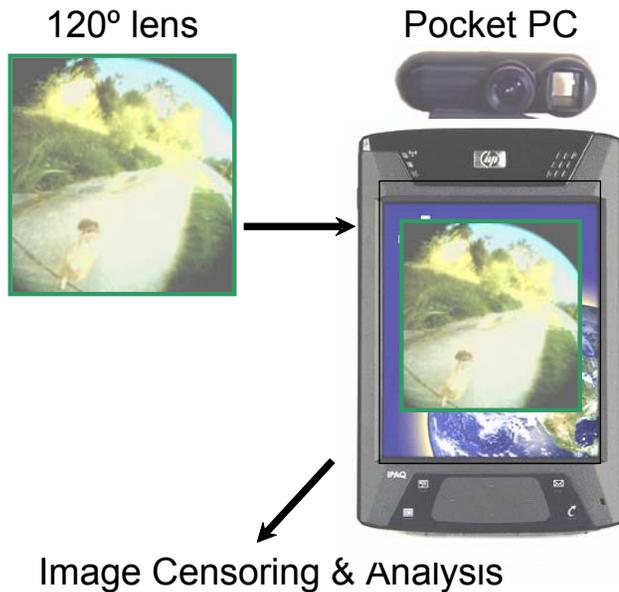
Mode 3: Voice



- Groups 5 and 6
- ~12 hour monitoring day
- Activity and location self-coded
- Brief voice-interactive questionnaire
- Only captured start time for each location and activity change; compliance assumed
- 2 minute exclusion rule
- Analyst re-coded to align with CHAD



Mode 4: Photo



- Groups 7 and 8
- Automated camera lens took photo every 90 seconds
- ~12 hour monitoring day
- 2 minute exclusion rule not followed due to timing of the automated photos
- Participant responsible for downloading and reviewing photos; opportunity granted for self-censoring
- Analyst re-coded to align with CHAD



Quantity and Quality: Photo Mode

	# of photos	% of photos
Photos with good data (activity)	7654	46.11
Photos with bad data (activity)	8820	53.13

	# of photos	% of photos
Photos with good data (location)	9582	57.99
Photos with bad data (location)	6814	41.24

Participant reporting compliance

	Diary Mode	Activities per hour	Locations per hour
	Paper	1.42	0.95
	PPC	1.12	0.75
	Voice	1.29	1.34
	Photo	2.69	2.59

Perceived Data Entry Burden

	Photo	PPC	Paper	Voice
Complete data entry (change location or activity) <i>Median in seconds</i>	0	45	60	60
Get equipment ready first day <i>Median in minutes</i>	10	2.5	5	5
Get equipment ready other days <i>Median in minutes</i>	5	1.5	4.5	2
Shut down equipment first day <i>Median in minutes</i>	10	3	4.5	3
Shut down equipment other days <i>Median in minutes</i>	5	3	3	2.5

Participant Burden for each entry of an activity/location

Data Coding/Analyst Burden

	Analyst hours	Study hours	Analyst hours per 24-hr day
PPC¹	00.0	630.1	0.00
Photo²	58.5	282.4	4.97
Voice²	87.4	427.0	4.91
Paper³	69.7	979.7	1.71

1. Pocket PC menu diary is self-coded by the participant
2. Time for coding by a single analyst.
3. Included time for 100% re-key verification.

Participant Feedback

Paper Mode

“Activity journal worked well but was time consuming. It was hard to drop everything to record all of my actions. People will get lazy and leave stuff out.”

“Paper diary need tremendous improvement because it is really hard to keep up with all the activities and location(s)...Because I was writing so much, I sometimes skipped some activities.”

Pocket PC Mode

“It was kind of easy to track info on PPC. Loved not having to write everything down. Was not complicated at all.”

“What I thought worked really well was the PPC - once you got the hang , the process was very smooth.”

Participant Feedback

Voice Mode

"I felt ridiculous talking to the PPC while I was at work, and I thought people were looking at me when I wore everything out in public. It felt really weird talking to this thing in front of other people. I just knew my boss would not tolerate it, so I didn't use it while I was at work."

"[I suggest you] give people a recorder they can just talk into without the prompts. The prompts didn't allow for any explanations, so couldn't provide any detail. Make the diary more free-form."

Photo Mode

"I thought people thought I was spying on them...In public I put my shirt over the lens or put the camera in the hip pack so that I didn't take photographs of other people."

"...[the] camera did all the work so that was fine. It was very easy."

Lessons Learned – Data Quality

- Some participants reported avoiding activities to reduce entries for paper, voice, and PPC diaries.
- Technical issues affected recording quality and compliance in voice mode.
- Self-censoring of photo mode did not result in a large loss of data; rather the ability to accurately analyze the photos posed a greater problem.
- Photo mode resulted in greatest number of activities and locations; may be result of analyst coding vs. self-coding.

Lessons Learned - Burden

- The burden for PPC activity and location data entry is low; however several expressed difficulty with the menus.
- Some participants expressed privacy issues when using the photo and voice modes.
- Photo and voice modes had greatest analyst burden; PPC mode requires no analyst re-coding.
- Photo mode had no data collection burden, but uploading and reviewing photos added time at end of day that some found burdensome.

Recommendations

- Further improvement in PPC menu structures, prompting, and automation may help to improve compliance and avoid behavior modifications.
- Photo mode not recommended due to poor cost-to-benefit ratio; analyst review may lead to over-coding of activity and location changes.
- Future use of voice and photo modes should include efforts to make equipment and data collection activities as discreet as possible.

Questions?

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