



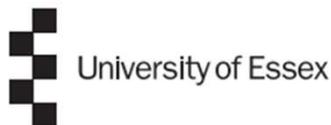
Understanding Society

THE UK HOUSEHOLD LONGITUDINAL STUDY

# Using mobile apps for data collection: 10 things we've learnt from experimental testing on the *Understanding Society* Innovation Panel

Annette Jäckle (University of Essex)  
[aejack@essex.ac.uk](mailto:aejack@essex.ac.uk)

Survey Methodology Seminar  
City University, London (28 Nov 2019)

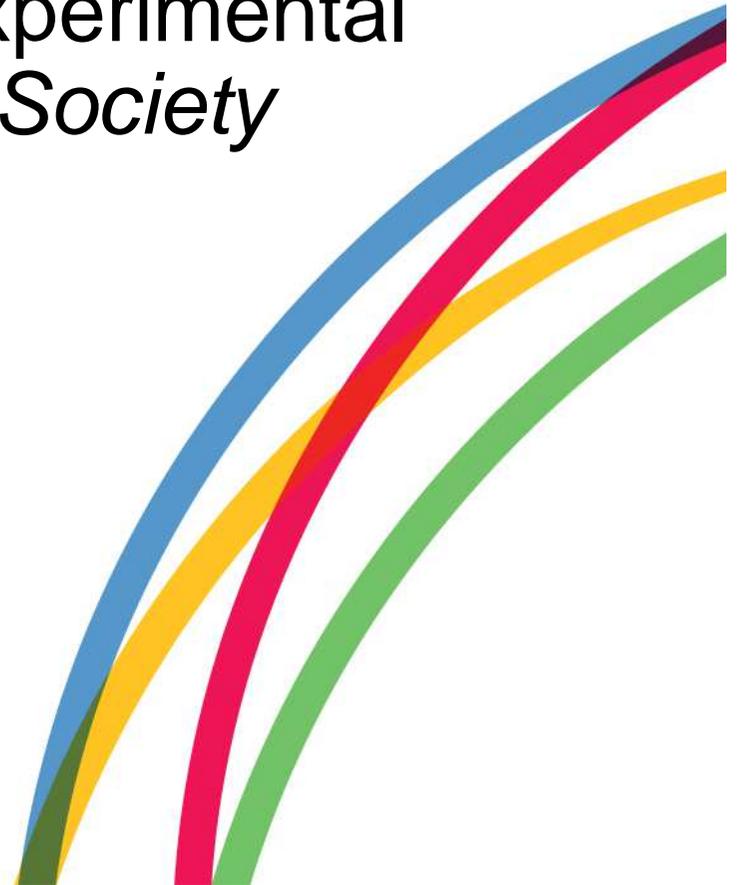


University of Essex

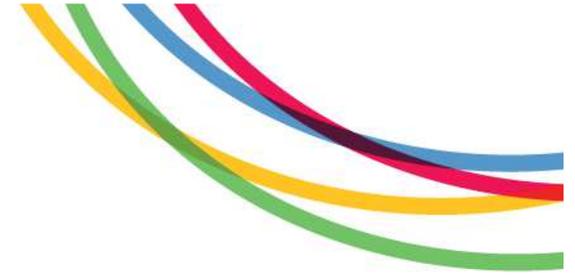


Economic  
and Social  
Research Council

An initiative by the Economic and Social Research Council, with scientific leadership by the Institute for Social and Economic Research, University of Essex, and survey delivery by NatCen Social Research and Kantar

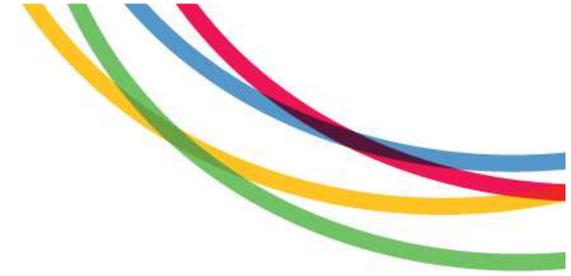


# 10 things we've learnt....



- Stock-taking at end of first studies using mobile apps for data collection
    - What have we learnt?
    - What are the next big questions?
  - High-level findings from our studies
    - Need replication
    - For details, see papers
  - Methods
    - Experimental testing
    - Quasi-experimental
    - Observational
-

# Acknowledgements



- Project: Understanding household finance through better measurement

- Funders: KANTAR WLDRLDPANEL



- Team members:

Annette Jäckle (PI, Essex)

Mike Brewer (Essex)

Jonathan Burton (Essex)

Mick Couper (Michigan)

Thomas Crossley (EUI)

Paul Fisher (Essex)

Alexandra Gaia (Bicocca-Milan)

Carli Lessof (Southampton)

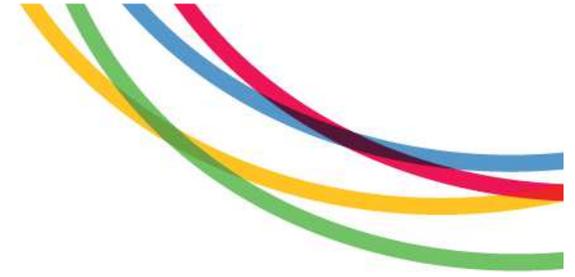
Cormac O’Dea (Yale)

Brendan Read (Essex)

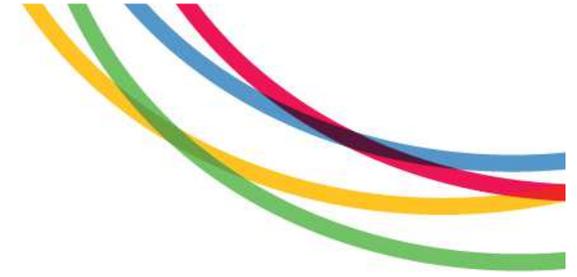
Alexander Wenz (Mannheim)

Joachim Winter (Munich)

# Background



- **UK Household Longitudinal Study: *Understanding Society***
    - Probability sample of households in UK
    - Annual interviews: all household members aged 16+
    - Socio-economic situation, health, family, education, work, ...
    - Funded by ESRC
    - Implemented by Kantar and NatCen Social Research
  - **Household finances – limited questionnaire space:**
    - Income: measured in detail
    - Spending: only some categories
    - Wealth and assets: infrequently
  - **Collect good data about monthly spending using an app?**
-



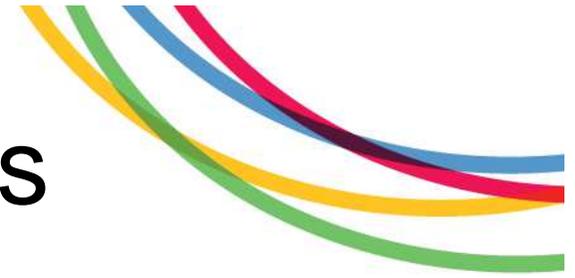
# Methods literature

## Data collection using mobile apps

- Best practice for design and implementation of app-based data collection?
  - Who participates, how they use the app (e.g. Yan et al 2017)
  - Respondent incentives (e.g. Haas et al 2018)
  - Data collected passively
    - Consent for passive data collection (e.g. Kreuter et al 2019)
    - How useful are these data – deriving indicators (e.g. Smeets et al 2019)
    - Data quality and missingness (e.g. McCool et al 2019)
  - Use of apps for health interventions and measurement (e.g. Yardley et al 2015)
-

# General aims of our studies

## Total Survey Error assessment



### **Measurement:**

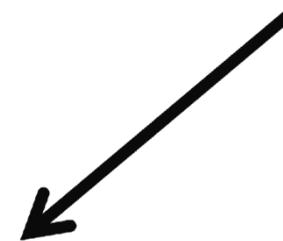
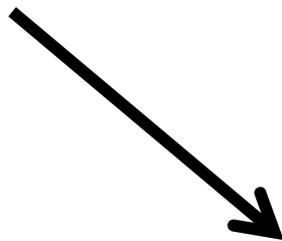
Does it matter that respondents use many different mobile devices?

### **Representation:**

What are the barriers to participation?  
How can we increase participation, reduce bias?

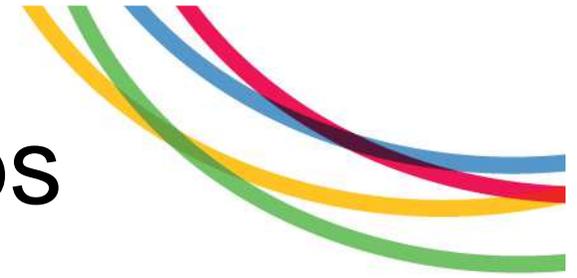
### **Estimates:**

How do they compare to benchmark data?



# 2 studies using mobile apps

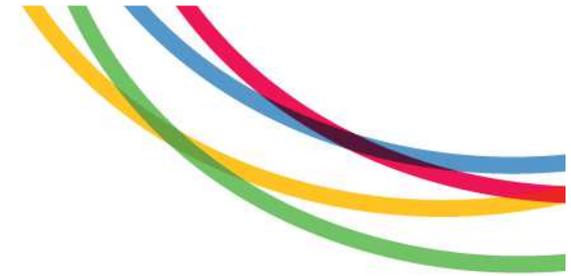
## Shared features



- **Spending diaries**
  - Purchase events, not items
  - 1 month
- **2 different mobile apps**
  - Respondent's own mobile devices
  - iOS, Android
- **Debrief questionnaires**

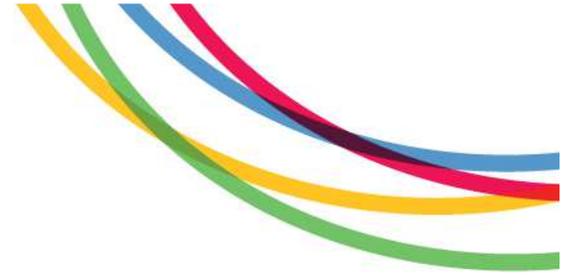
<ul style="list-style-type: none"><li>• <b>Incentives: Innovation Panel</b></li></ul>	<ul style="list-style-type: none"><li>• <b>Access panel</b></li></ul>
<ul style="list-style-type: none"><li>£0.50 per day app used</li><li>£10 bonus if all days</li><li>£3 for debrief questionnaire</li></ul>	<ul style="list-style-type: none"><li>Similar scheme</li><li>In line with usual incentives</li></ul>

# Study designs

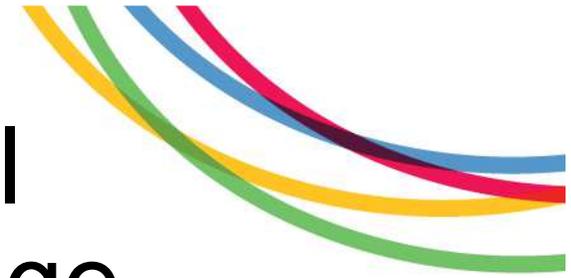


	Study 1	Study 2
	2016	2018
	Kantar Worldpanel	Kantar
Samples	Innovation Panel	Innovation Panel Online access panel (Lightspeed)
Concepts	Purchases of goods & services (receipts)	All spending, incl. housing costs
Tasks	Photos of shopping receipts Amounts & categories	Amounts & categories Direct debits / standing orders
	--	Browser based (= app)
Experiments	-- (letter)	Invitation (in interview vs. letter)
	Bonus for app download (£6 vs. £2)	Feedback on spending (yes vs. no)

# 10 things we've learnt



# (1) Getting people to install apps is the biggest challenge



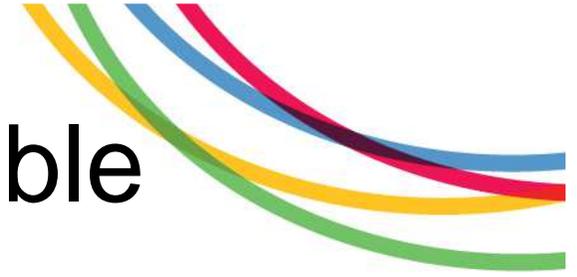
	Study 1	Study 2	
	Innovation Panel	Innovation Panel	Access Panel
Completed baseline survey	2,112	2,898	2,867
Used app at least once	270	437	404
Participation rate	13%	15%	14%

- Similar rates in other app studies (e.g. Kreuter et al 2019)
- Study 1 debrief of non-participants
  - 54%: technical problems, e.g.:
    - No compatible device
    - Insufficient storage space
  - 42%: not confident installing or using apps

---

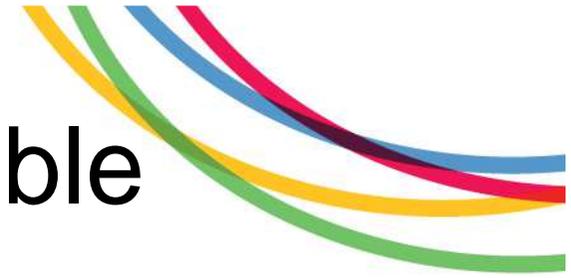
Source: Study 1. Jäckle, Burton, Couper and Lessof (2019); Study 2. Jäckle, Wenz, Burton and Couper (2019)

## (2) Estimates are comparable to benchmark data

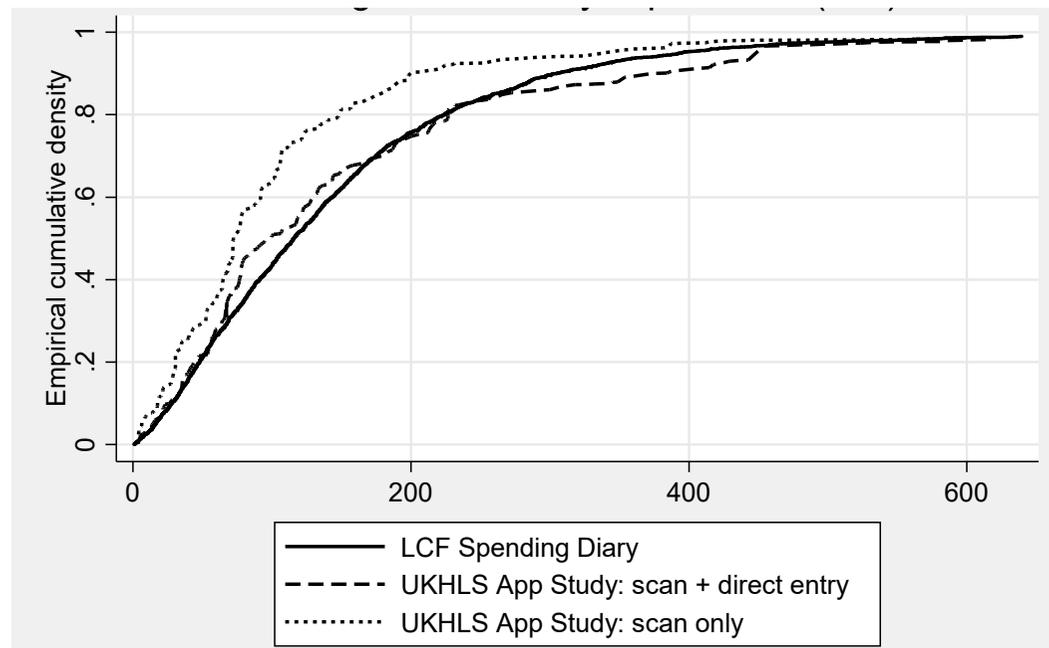


- Study 1 – spending data from
  - Photos of receipts
  - Direct entry of spending
- Compared to Living Cost and Food Survey (LCF)
  - 2 week paper spending diary
  - Main survey on household expenditure in the UK
- For comparability – data restricted to
  - Great Britain
  - First 2 weeks of data
  - No imputed data
  - Study 1 respondents weighted to LCF

## (2) Estimates are comparable to benchmark data



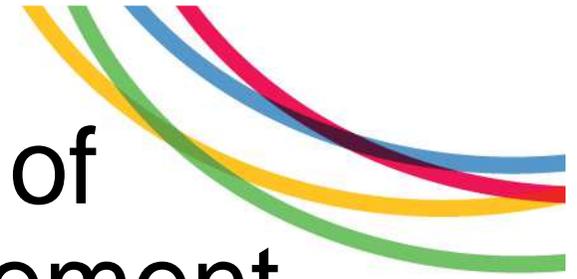
Average total weekly expenditure (£):



Spending by category:

Some very similar, but some differences

# (3) Technical specification of devices can affect measurement



- Study 1

270 participants used 90 different devices

Coded technical specification of devices	Indicators of data quality examined
Operating system: Apple, Android Device type: smartphone, tablet RAM Camera quality: megapixels Processor performance score	Time taken to complete app task Whether receipt photographed or direct entry of spending Whether image of receipt fully readable Number of items on receipt

Source: Study 1. Read (2019b)

# (3) Technical specification of devices can affect measurement



Some evidence of device effects

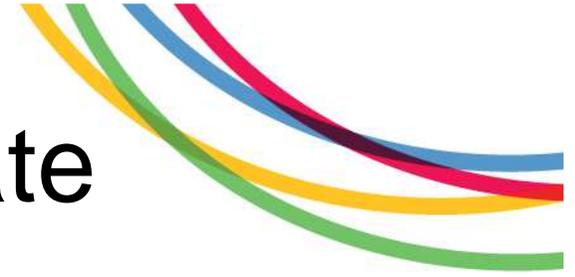
Example: image quality

iOS 	better than	ANDROID 
SMARTPHONE 	better than	TABLET 
RAM 	better than	

- Remain after controlling for respondent characteristics

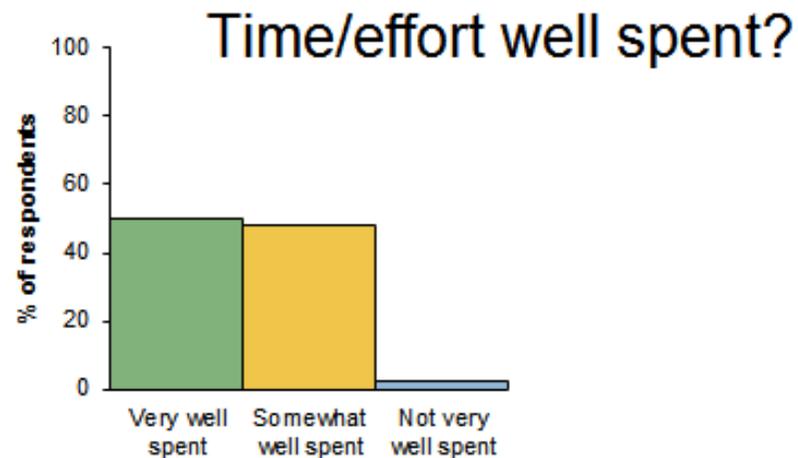
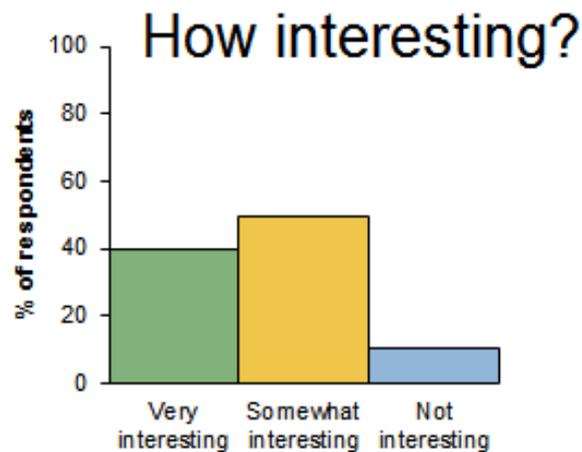
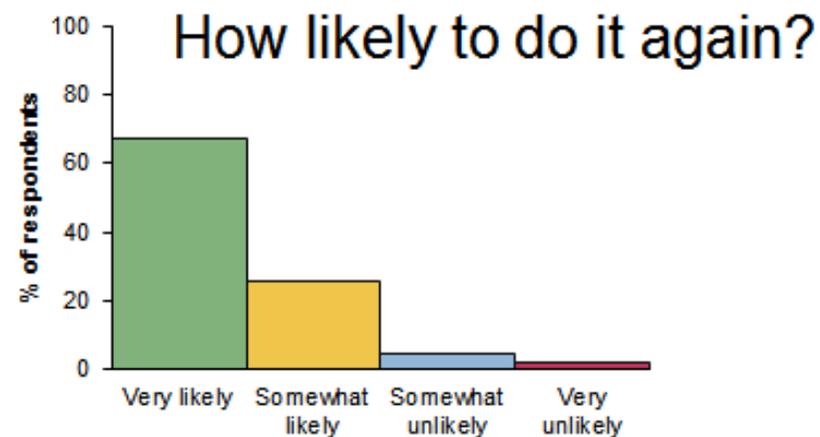
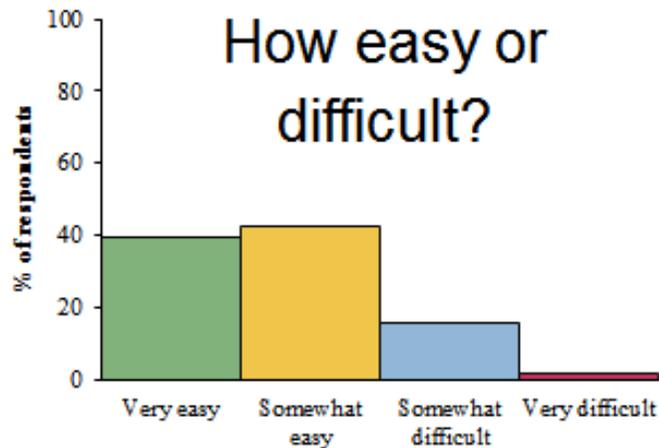
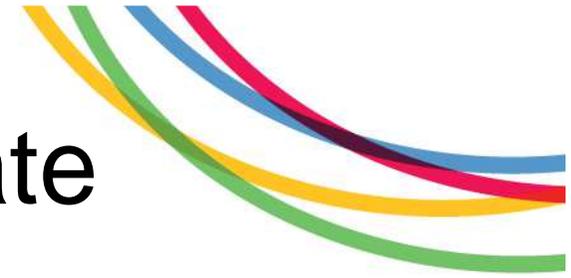
Source: Study 1. Read (2019b)

## (4) Those who do participate experience low burden



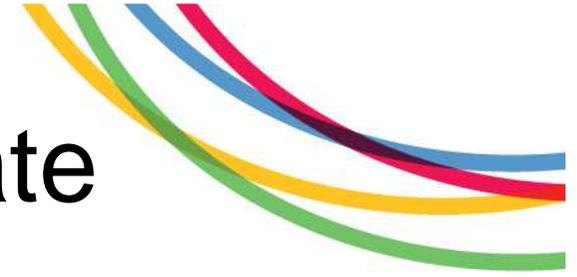
- Study 1
- Objective burden
  - App paradata: time taken to report spending
  - Only 45s per day on average
  - Variations in objective burden did not predict dropout
- Subjective burden:
  - Debrief survey

# (4) Those who do participate experience low burden



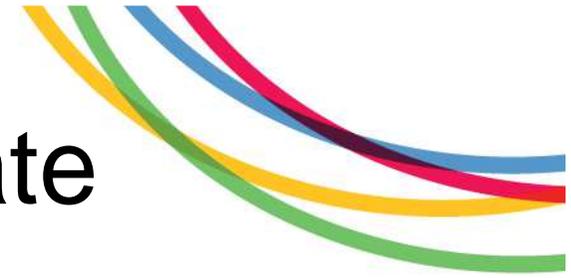
Source: Study 1. Read (2019a)

# (5) Those who do participate show little sign of fatigue

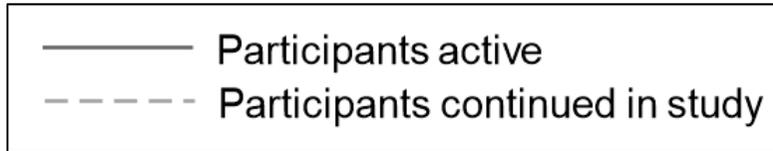
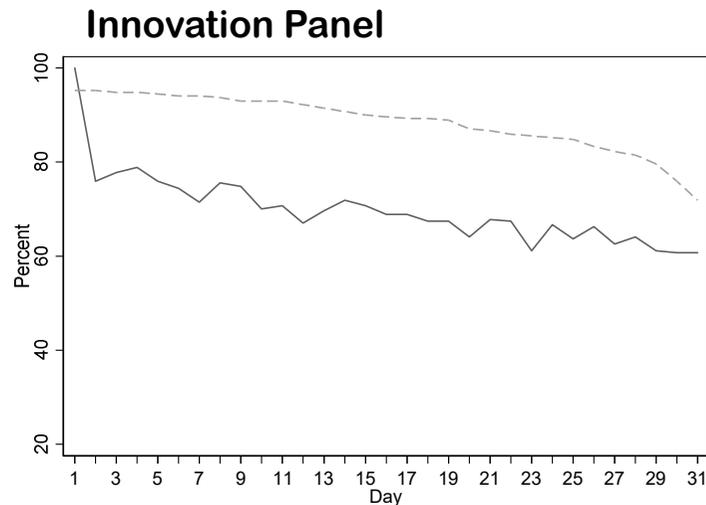


- Study 1 & 2
- Dropout over the month

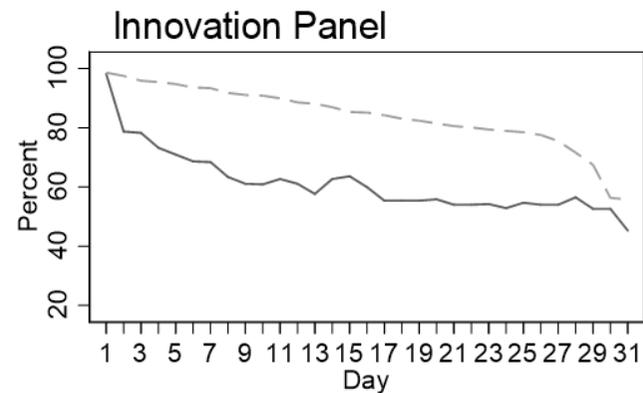
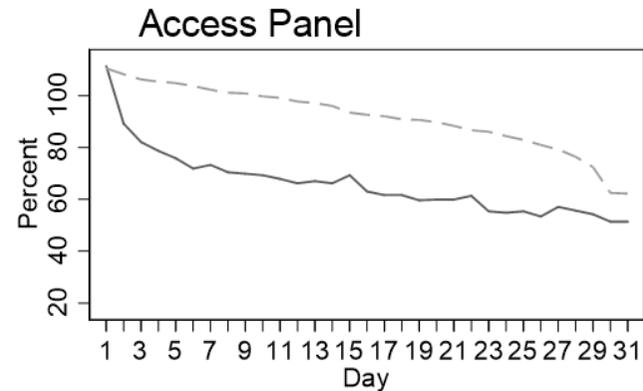
# (5) Those who do participate show little sign of fatigue



## Study 1

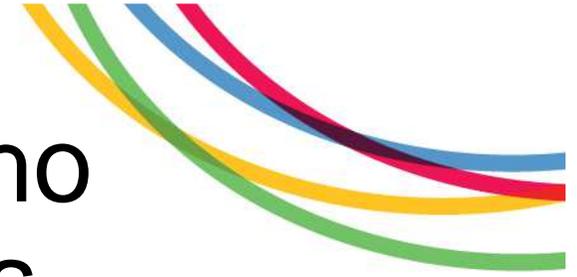


## Study 2



Source: Study 1. Jäckle, Burton, Couper and Lessof (2019); Study 2. Jäckle, Wenz, Burton and Couper (2019)

# (6) Cannot ignore those who do not have mobile devices



- Study 1
- In UK: mobile device ownership is not universal
- Background characteristics from annual interview

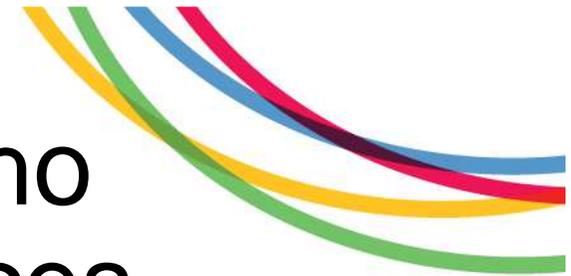
Participants and non-participants

Socio-demographic characteristics

Financial behaviours

Mobile device ownership and usage

# (6) Cannot ignore those who do not have mobile devices

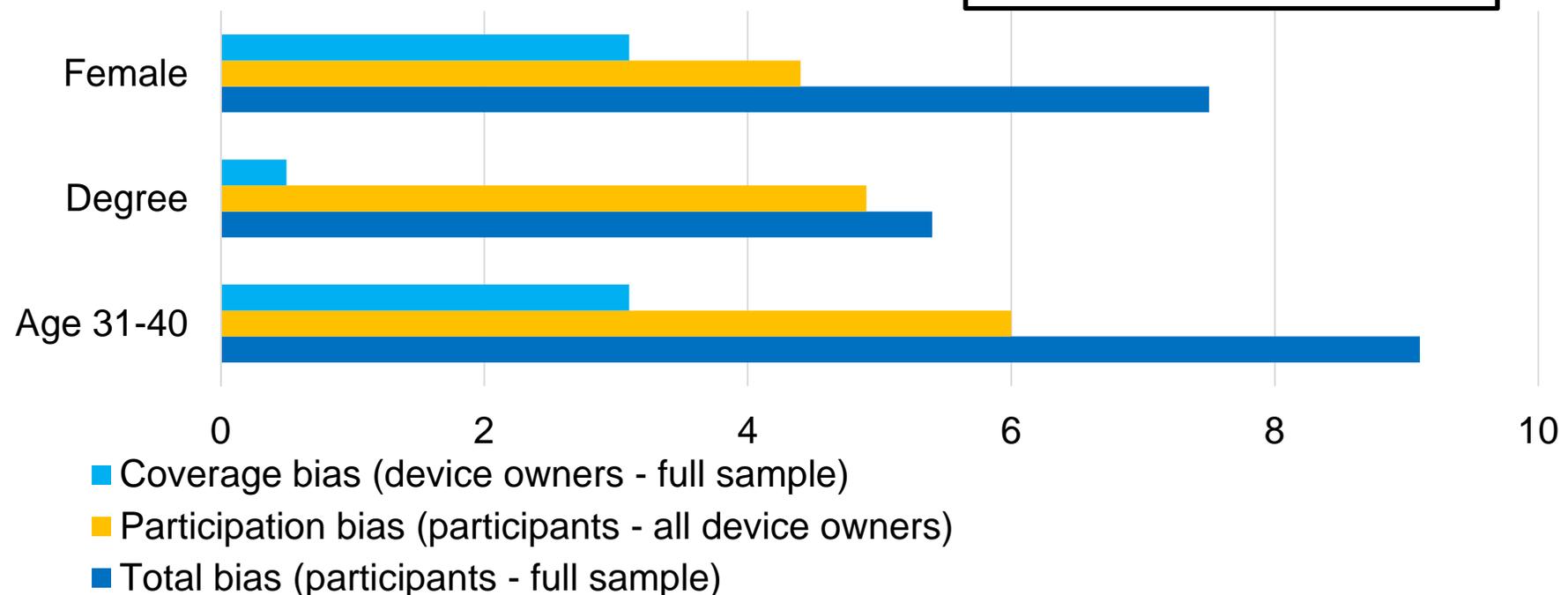


Study 1

Percentage point differences

Examples of general pattern

Coverage and participation bias compounded



Source: Study 1. Jäckle, Burton, Couper and Lessof (2019)



# Aside: We have to test our assumptions about what Rs prefer

- Study 1
- Assumed that taking photos of receipts would be easier than entering information directly in the app – but:
  - Over the month, participants shifted from photos to direct entry [1]
  - Direct entry was quicker than taking and uploading photo of receipt [2] (on average 31 vs 45 seconds)
- We did not anticipate this – so did not ask about respondent preferences in the debrief survey
- In future:
  - ➔ Be explicit about assumptions we are making
  - ➔ Plan to collect necessary data to test these assumptions

# (7) Incentives have little effect on participation



- Study 1
- Experiment: bonus incentive for downloading app  
£2 vs £6
- No effects at any stage  
% completed registration survey / used app / used app for 4 weeks
- Also no effects: IAB-SMART study (Haas et al 2018)  
Experiments with incentives for passive data collection
- Anecdotally – need to test  
Those willing to participate expect a reward  
But incentive not enough to motivate those not willing  
£10 bonus for completing every day motivated respondents to continue

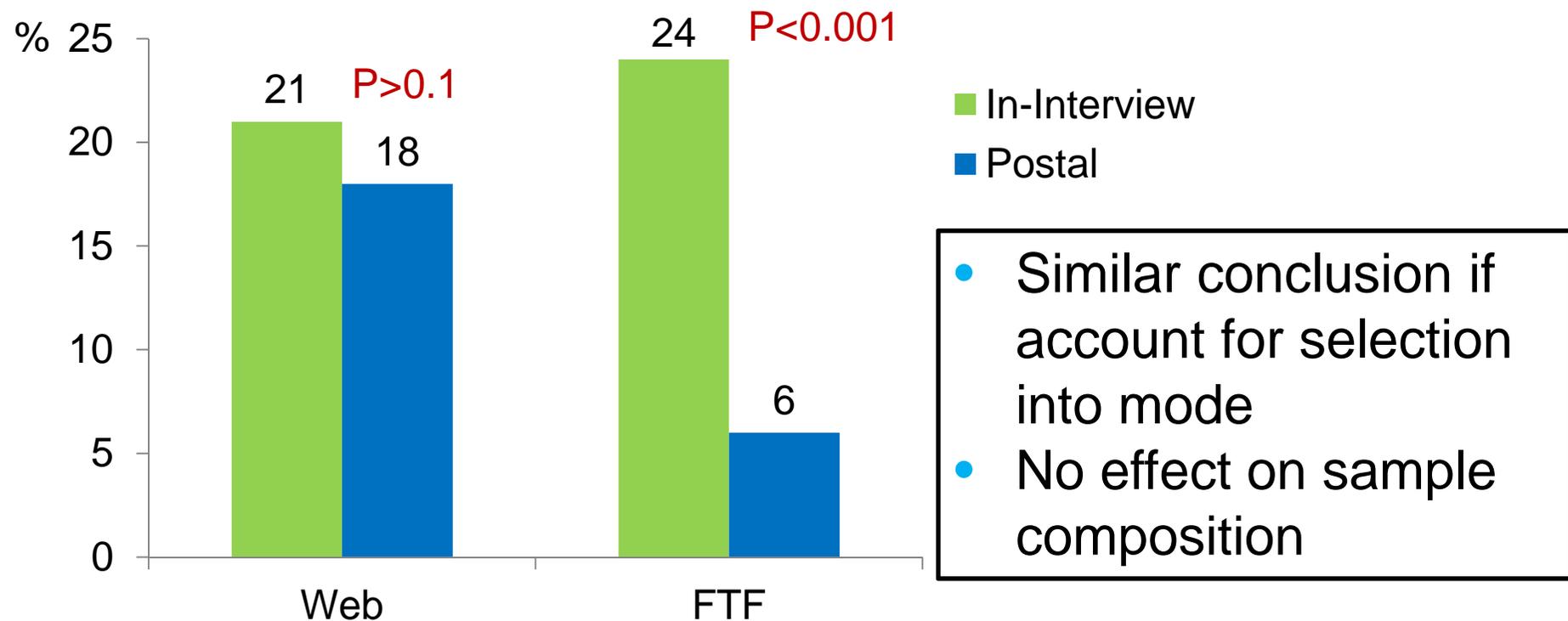


## (8) Inviting Rs to app during an interview increases participation

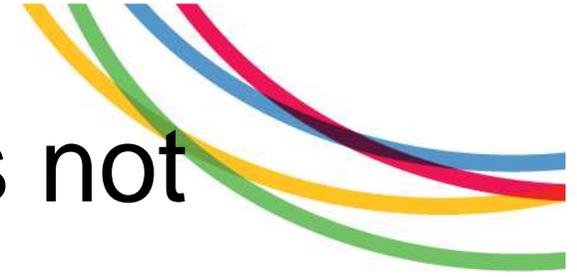
- Study 2 – Innovation Panel
- Experiments:
  - Invitation to app: within IP interview vs letter
  - Mode of annual IP interview: (FTF → web) vs (web → FTF)

# (8) Inviting Rs to app during an interview increases participation

% used app to enter at least 1 purchase, by interview mode



# (9) Offering feedback does not increase participation



- Study 2 – Access Panel
- Experiment
  - Feedback promised in invitation
  - Feedback not mentioned but given
  - No feedback
- No effect on
  - Participation 😞
  - Reported spending 😊
- But: large effect of feedback in other settings (e.g. blood)
- More evidence needed
  - Implementing feedback within app constrains data collection options

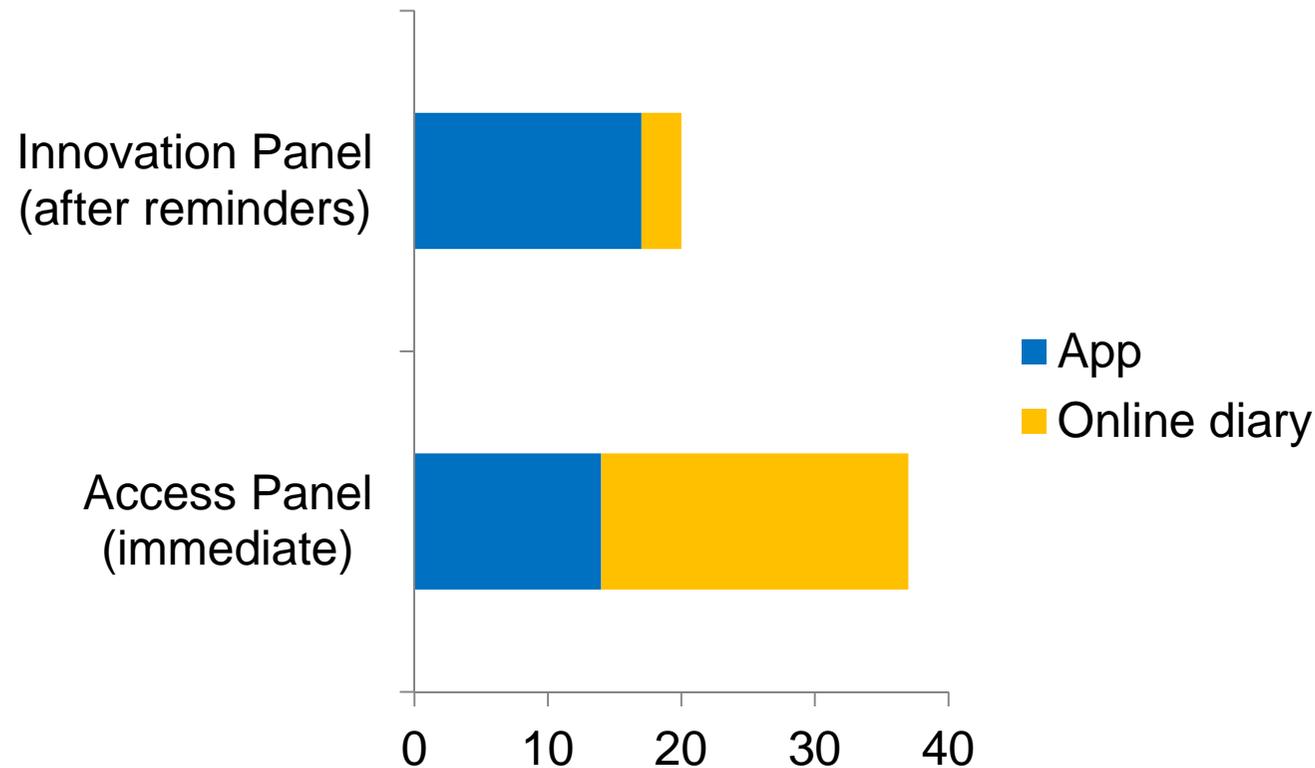


# (10) Browser-based alternative can increase participation & reduce bias

- Study 2 – Innovation Panel and Access Panel
- Browser-based alternative to app offered
  - After several reminders to use the app (in IP)
  - Immediately once app declined (in AP)

# (10) Browser-based alternative can increase participation & reduce bias

% entered at least 1 purchase



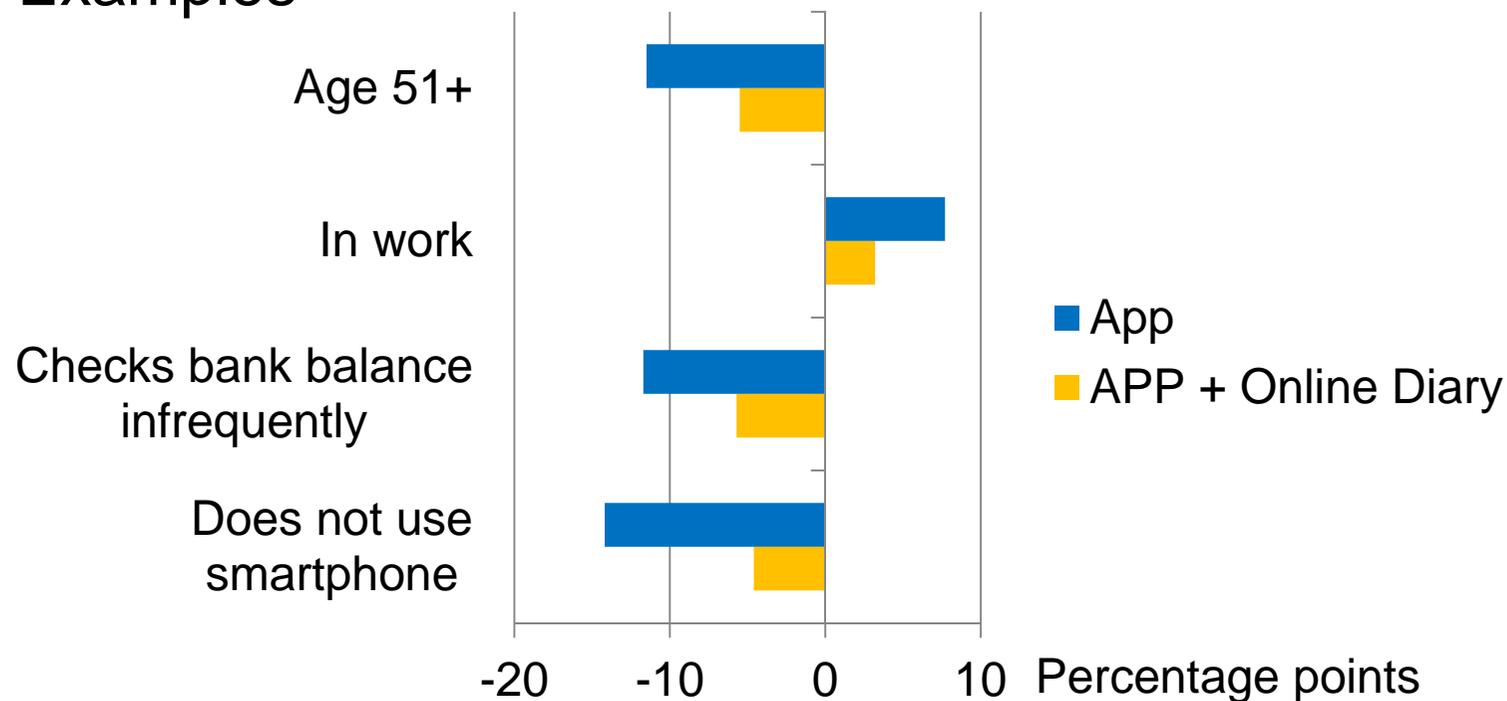
Source: Study 2. Jäckle, Wenz, Burton and Couper (2019)

# (10) Browser-based alternative can increase participation & reduce bias

Study 2 – Access Panel

Percentage point differences: full sample vs. participants

Examples



Source: Study 2. Jäckle, Wenz, Burton and Couper (2019)



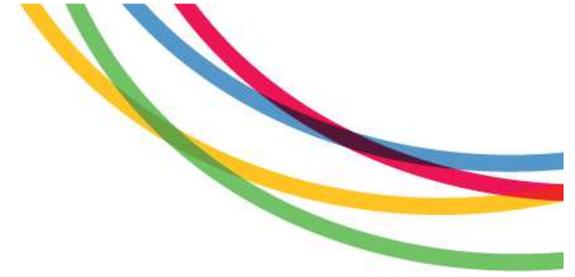
# (10) Browser-based alternative can increase participation & reduce bias

- But high dropout in browser-based version
- How to implement daily reminders?

In app: daily push notification

# 10 things we've learnt

## From studies so far



1. Getting people to install apps is the biggest challenge
  2. Estimates are comparable to benchmark data
  3. Technical specification of devices can affect measurement
  4. Those who do participate experience low burden
  5. Those who do participate show little sign of fatigue
  6. Cannot ignore those who do not have mobile devices
  7. Incentives have little effect on participation
  8. Inviting respondents during an interview increases participation
  9. Offering feedback does not increase participation
  10. Browser-based alternative can increase participation & reduce bias
-

# Ongoing research

## Testing protocols to increase participation



- **Wellbeing app study** (funder: ESRC)

**Topic:** relationships, stressors, mood

**Task:** daily questions for 14 days

**Sample:** Innovation Panel 2020 (w13) respondents

**Experiments:** name of app, bonus incentive, length of daily questionnaire, feedback

- **ESSnet smart surveys** (funder: EUROSTAT)

**Led by:** Barry Schouten (Stats NL)

**Background:** “@HBS” project – app development and testing

**Surveys:** Household Budget Surveys, Time Use Survey

**Experiments:** interviewer assistance, feedback

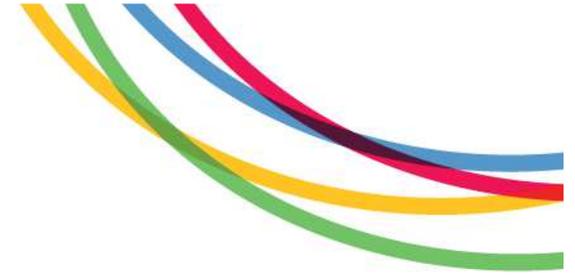
---

# More details here



- Jäckle, Burton, Couper, and Lessof (2019) Participation in a mobile app survey to collect expenditure data as part of a large-scale probability household panel: coverage and participation rates and biases. *Survey Research Methods*, 13(1):23-44.
  - Jäckle, Wenz, Burton and Couper (2019) Increasing participation in a mobile app study: the effects of a sequential mixed-mode design and in-interview invitation. *Understanding Society Working Paper 2019-04*.
  - Lessof, Jäckle, Couper, and Crossley (2019) Adherence to protocol in a mobile app study collecting photographs of shopping receipts. Unpublished manuscript.
  - Read (2019a) Respondent burden in a mobile app: evidence from a shopping receipt scanning study. *Survey Research Methods*, 13(1):45-71.
  - Read (2019b) The influence of device characteristics on data collection using a mobile app. *Understanding Society Working Paper 2019-01*.
  - Wenz, Jäckle, Burton and Couper (2019) The effects of personalized feedback on participation and reporting in mobile app data collection. *Under review*.
  - Wenz, Burton, Couper and Jäckle (2019) Quality of expenditure data collected with a receipt scanning app in a probability household panel. Unpublished manuscript.
-

# Project page



## Links to

- Papers
- Presentations
- Data documentation

[https://www.iser.essex.ac.uk/research/projects/  
understanding-household-finance-through-better-measurement](https://www.iser.essex.ac.uk/research/projects/understanding-household-finance-through-better-measurement)

---

# References

- Haas, Kreuter, Keusch, Trappmann, and Bähr (2018) What do researchers have to invest to collect smartphone data? Presented at BigSurv18, Barcelona, Spain.
  - Kreuter, Haas, Keusch, Bähr, and Trappmann (2019) Collecting Survey and Smartphone Sensor Data With an App: Opportunities and Challenges Around Privacy and Informed Consent, Social Science Computer Review, <https://doi.org/10.1177/0894439318816389>.
  - McCool, Lugtig, and Schouten (2019) Assessing Missingness Mechanisms in Always-On Location Data, presented at ESRA, Zagreb, Croatia.
  - Smeets, Lugtig, Schouten, and McCool (2019) Automatic Trip and Transportation Mode Detection Using a Smartphone App and Machine-Learning. A Validation Study, presented at ESRA, Zagreb, Croatia.
  - Yan, Machado, Heller, Maitland, Kirlin, and Bonilla (2017) The Feasibility of Using Smartphones to Record Food Purchase and Acquisition, Presented at AAPOR, New Orleans, USA.
  - Yardley, Morrison, Bradbury, and Muller (2015) The Person-Based Approach to Intervention Development: Application to Digital Health-Related Behavior Change Interventions, Journal of Medical Internet Research, 17(1).
-