Participation and Selection Bias in the SHARE Accelerometer Study (SAS)

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MASS Workshop
Manchester, 22-23 June, 2023

Background

- Surveys are increasingly including a variety of enhancements as discussed at MASS
- These enhancements create the risk of additional sample loss and selection bias
- Adding enhancements to probability-based surveys gives us the opportunity to explore and remediate these potential errors
- We explore one example: the SHARE accelerometer study (SAS)

Accelerometry Literature

- A number of studies have explored the use of accelerometers (activity trackers) in large-scale population-based studies
  - Relatively few papers on methodology
- Outcomes are defined differently across studies, and often incompletely
  - Some focus on consent; others focus on “sufficient data” given use of the device; others focus on item- or epoch-level missingness
  - Few (if any) focus on *all* stages of the process
  - Few focus on the *consequences* of cumulative sample loss, i.e., selection or participation errors

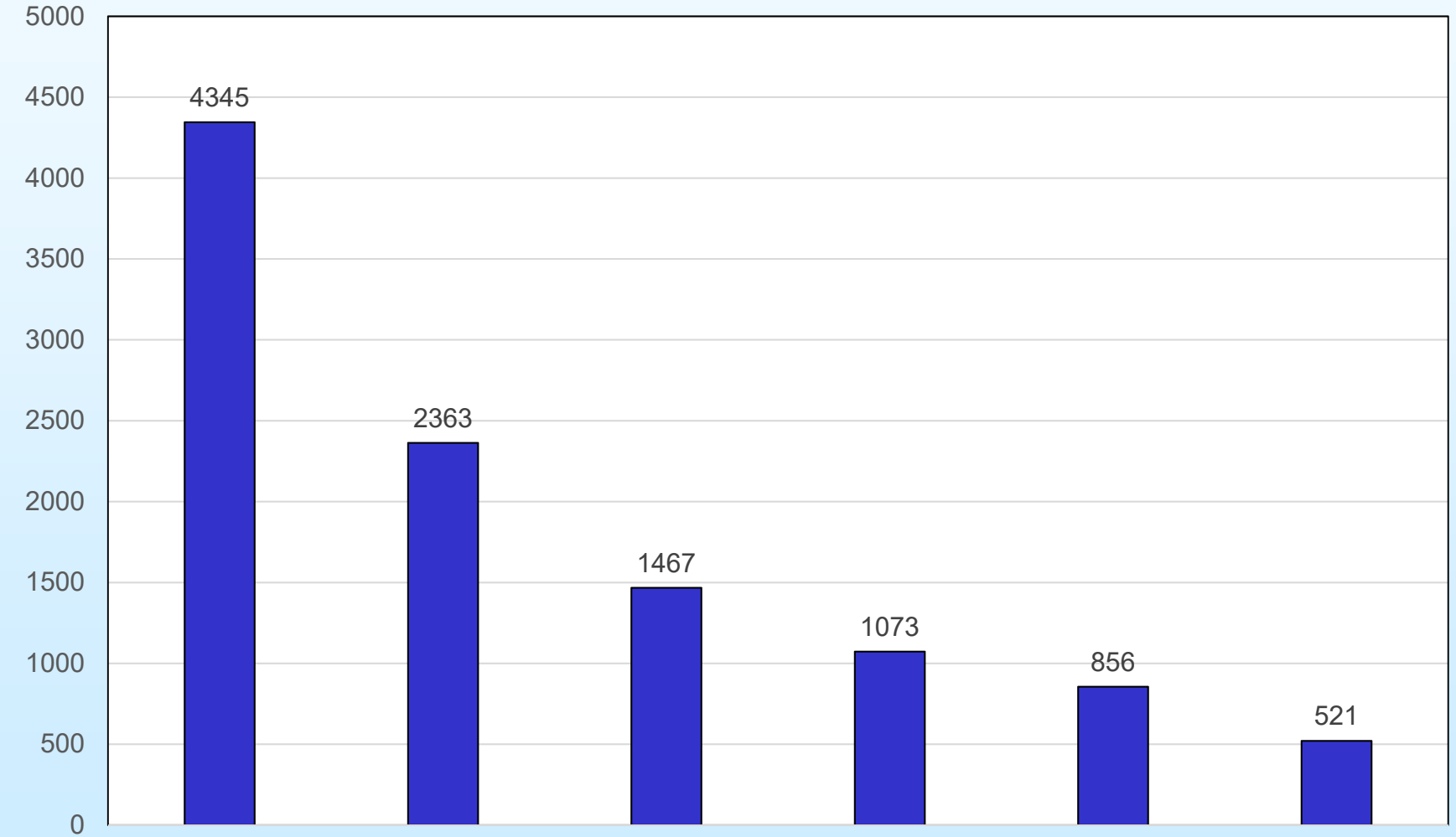
The SHARE accelerometer study

- In W8 (2019-2020) of the Survey of Health, Ageing and Retirement in Europe (SHARE) a sub-sample of respondents in 10 countries were invited to wear an Axivity AX3 accelerometer on their upper thigh for 8 days
- Several stages of selection:
  - Consent obtained in FTF interviews
  - A subsample was mailed devices on a flow basis
  - Participants started to use the device
  - Participants used the device for 8 days (fully adherent) before returning it for re-use

Research Questions

- RQ1: What are the sample losses at each stage of the process?
- RQ2: What are the predictors of participation or loss at each stage?
  - Causes and correlates of sample loss
  - Are these the same or different across the stages?
- RQ3: What are the selection biases at each stage?
  - Consequences of cumulative sample loss
  - Are the effects compounding or offsetting across stages?
- “Healthy volunteer bias” hypothesis: those who volunteer for health-related studies are generally more healthy and active

RQ1: Participation Counts and Rates



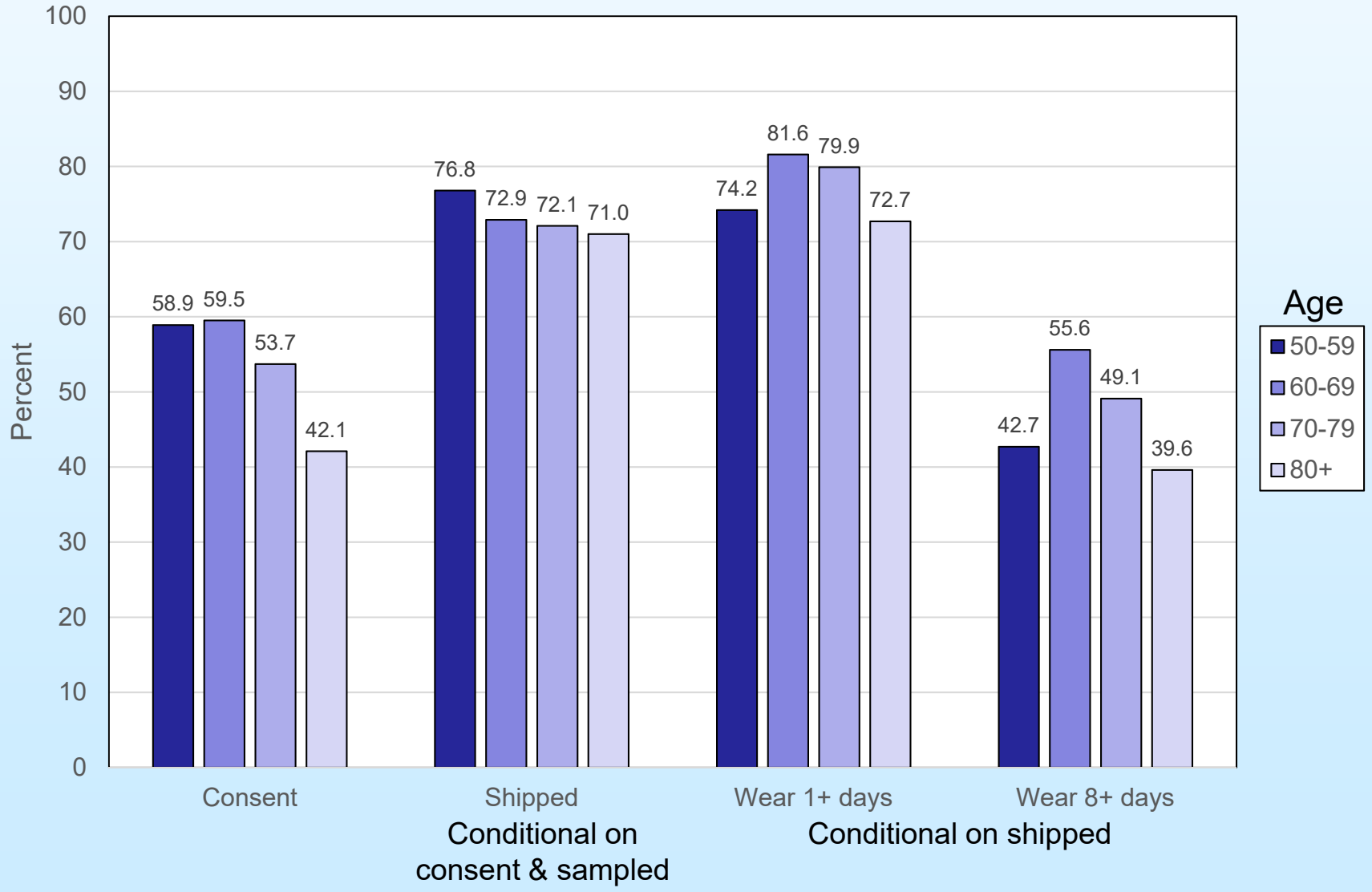
Conditional losses	45.6%	→	37.9%	→	26.9%	→	20.2%	→	39.1%
Cumulative losses	45.6%	→	66.3%	→	75.3%	→	80.3%	→	88.0%

RQ1: Description of Sample Loss

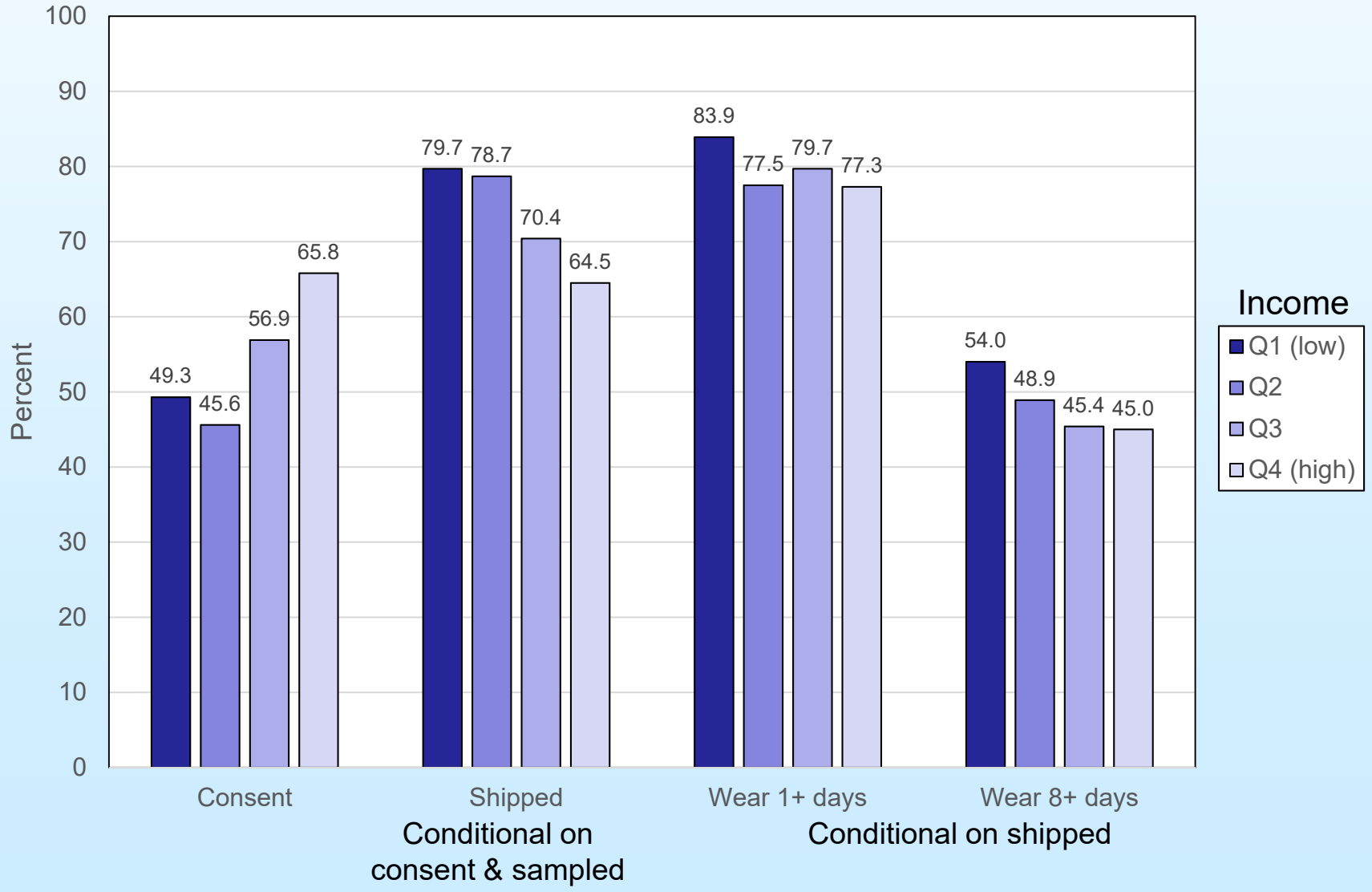
- Biggest loss at consent: 54.4% consent rate
- Among those sampled for SAS, 73.1% shipped a device
- Among those shipped a device:
  - 79.8% minimally adherent (1+ wear days)
  - 48.6% fully adherent (8+ wear days)*
- Cumulative sample loss was 88%
  - Only 12% of eligible sample was fully adherent

*The SHARE working paper defines fully adherent as 7+ days

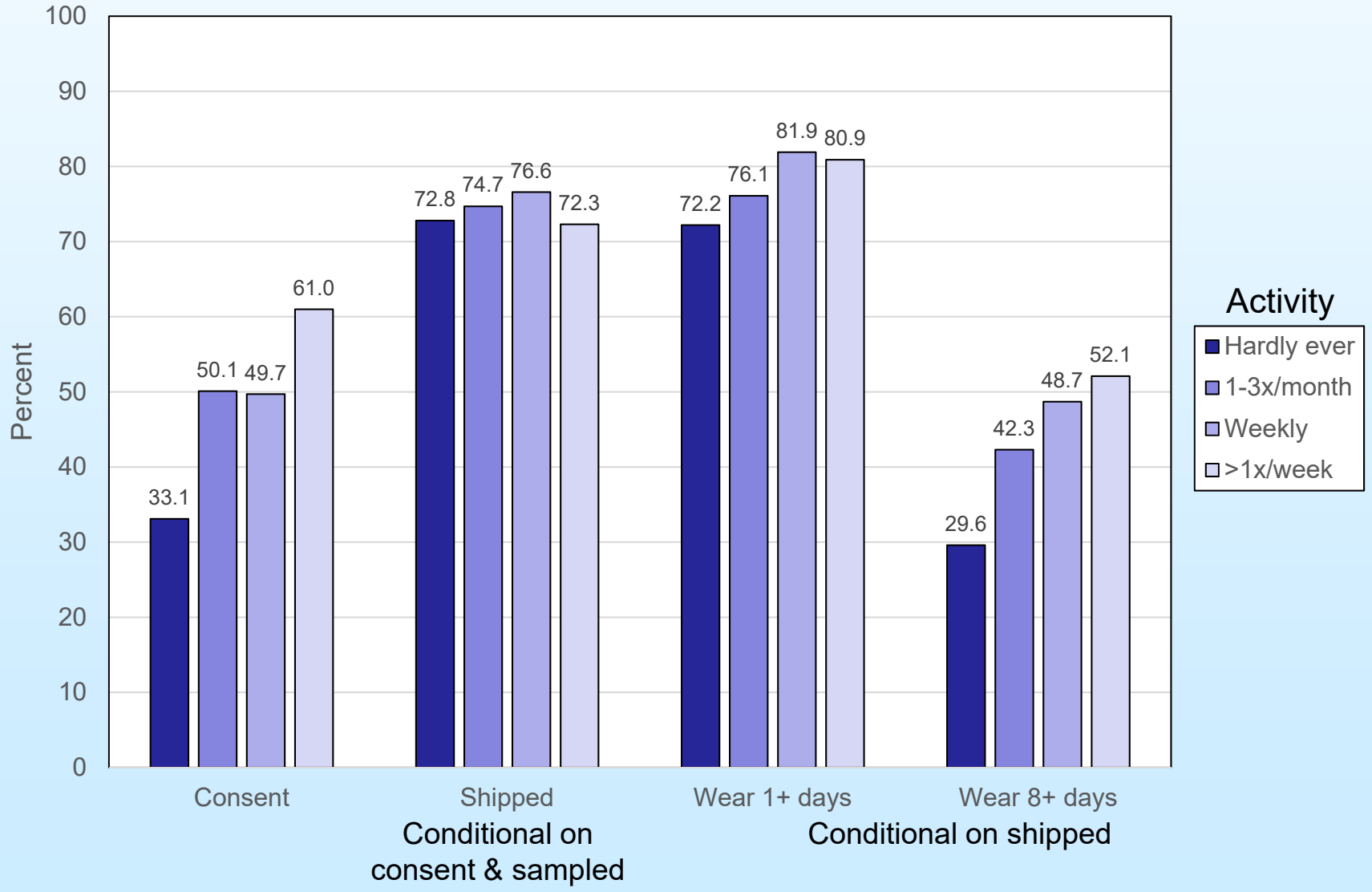
Conditional Participation Rates by Age



Conditional Participation Rates by Income



Conditional Participation Rates by Moderate Physical Activity



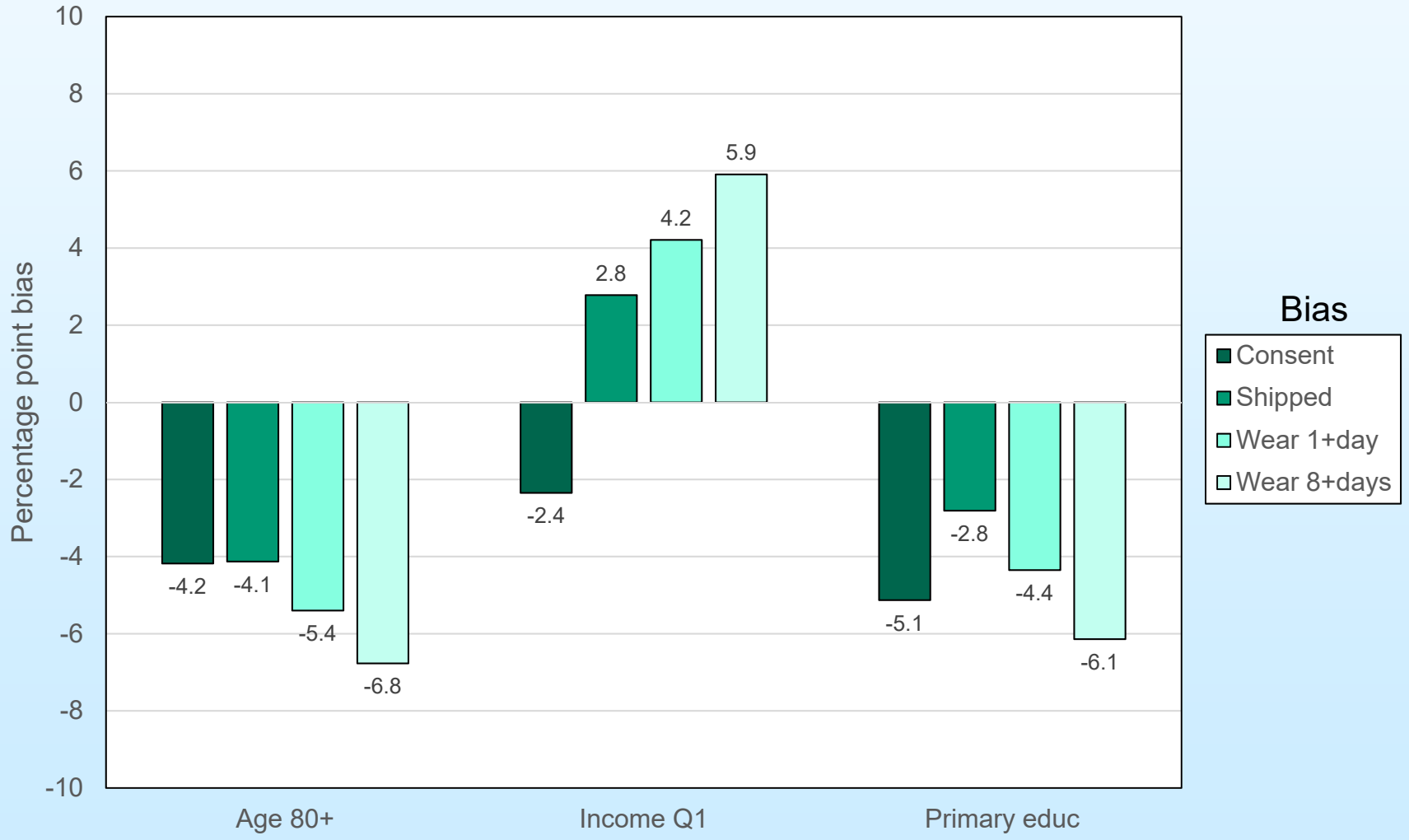
RQ2: Predictors of Participation

- Several demographic, survey experience, and health and well-being variables associated with consent
- Fewer variables associated with being shipped a device, conditional on being sampled for the SAS
- Several variables are still significantly associated with partial and full adherence, despite increased variances from cumulative sample loss
- Some effects are consistent across all stages, but others are not

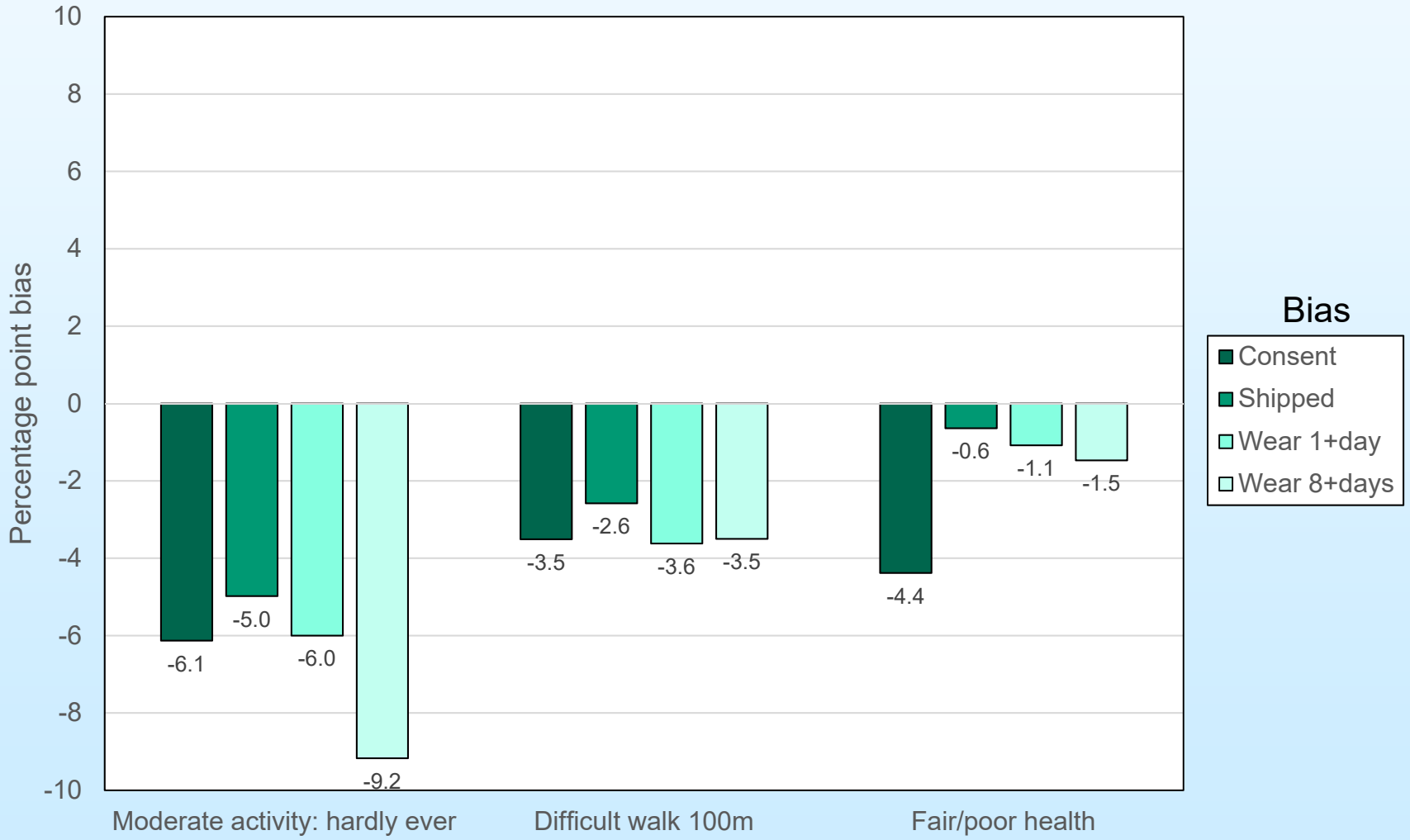
RQ3

- We look at cumulative bias across selected stages
- Do biases get progressively worse (compounding) with loss at each stage, or are biases offsetting?
- Look at biases relative to eligible sample distribution
- Selected examples follow

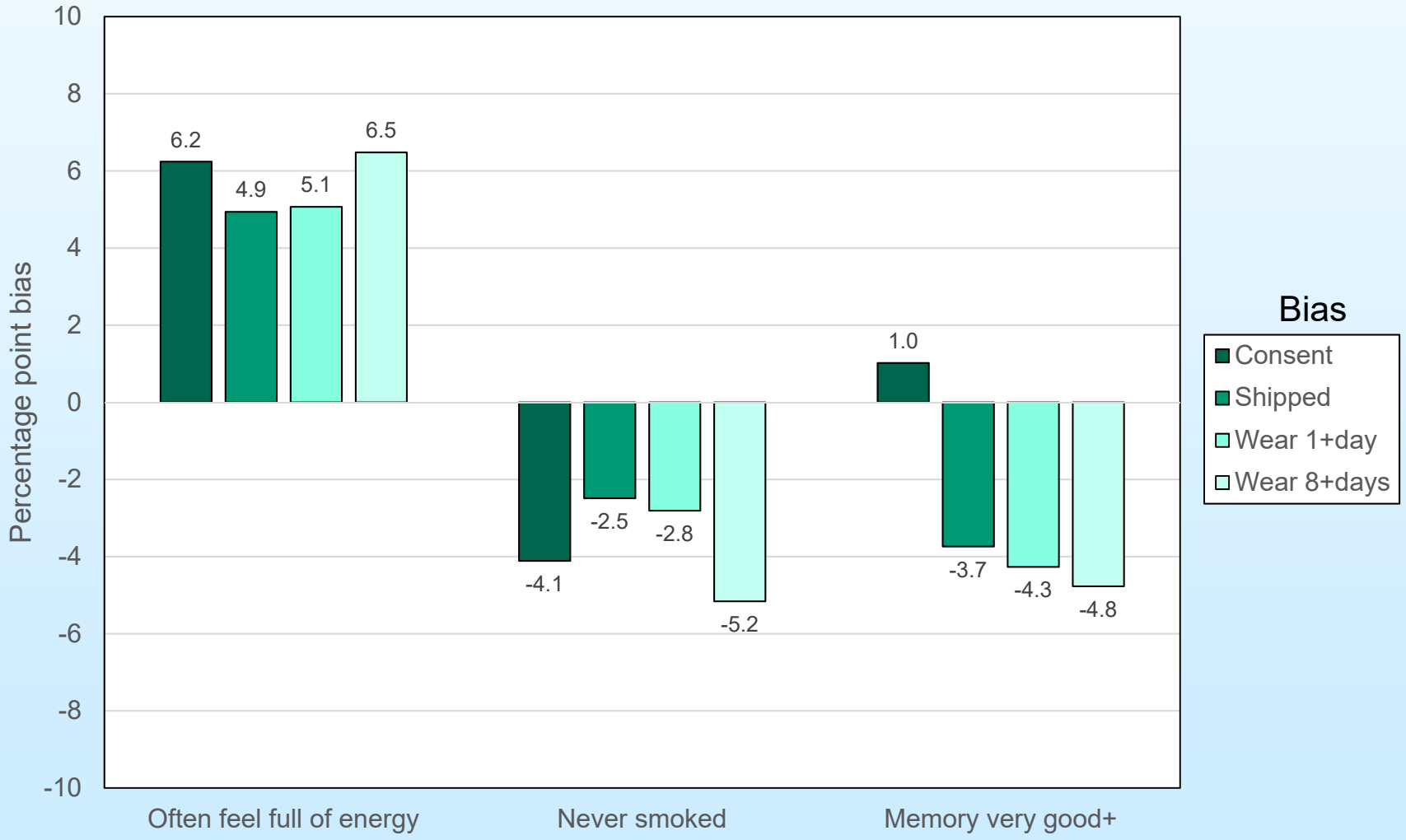
Cumulative Biases: Demographic Variables



Cumulative Biases: Health Variables 1



Cumulative Biases: Health Variables 2



RQ3: Bias

- Some evidence supporting the “healthy volunteer” hypothesis
  - General tendency for more healthy people to be over-represented in the fully-adherent group
  - But this is by no means consistent or particularly strong
- Little evidence of bias accumulating over the stages of participation
  - Pattern not consistent across variables
  - Biases observed at the consent stage largely persist throughout the process

Summary

- Need for detailed descriptions of all stages of the participation process
  - Kudos to SHARE for doing so
- Need to focus not only on sample loss but on potential biases
- Some evidence on healthy volunteer bias
  - Pattern is not always clear and consistent
  - Biases are not very large and do not appear to compound across the stages
  - Maybe volunteers are different from those explicitly invited to participate

Implications for Practice

- Addressing the consent challenge is the biggest low-hanging fruit
  - Even with interviewers administering in-person consent, high rate of non-consent
- Minimizing delays between consent and task onset likely to be effective
- Identifying correlates of participation at each stage can guide fieldwork strategies to minimize differential loss
  - E.g., responsive/adaptive designs

Thank You!

Selected References

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