UNIVERSITY OF MANNHEIM
School of Social Sciences

Measurement of Physical Activity through Data Donation in a Web Survey of Older Adults

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Measuring Physical Activity in Older Adults

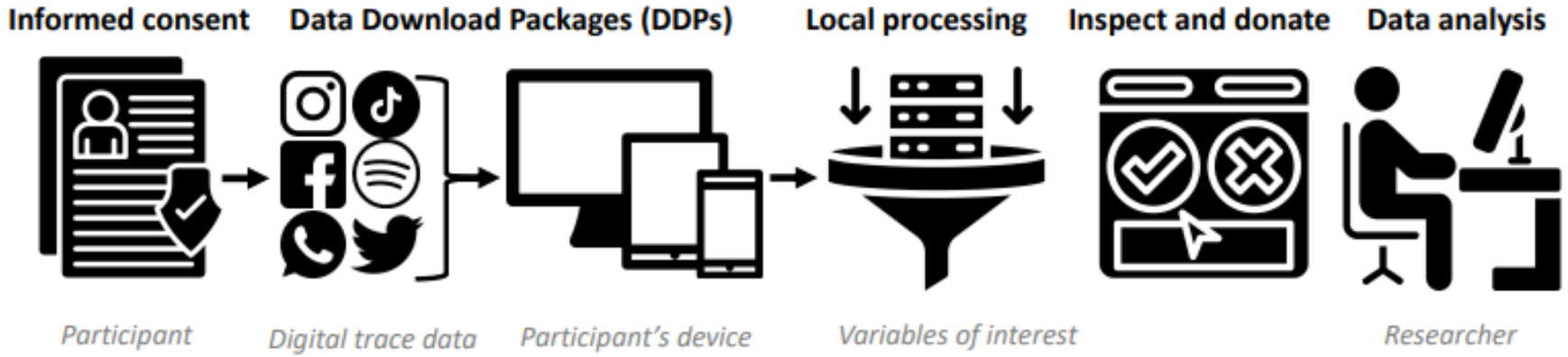
- Physical activity (PA) foundation of healthy lifestyle, elevated immune and psychological function, and decreased mortality (Pate et al. 1995; Warburton et al. 2006), especially for aging populations (DiPietro 2001)

- Accurate measurement of PA key to identifying determinants of health and developing appropriate interventions
  - Self-reports often limited to global measures and misclassification (Bauman et al. 2009; Farrell et al. 2014)
  - More fine-grained day-reconstruction methods burdensome, prone to recall error, and restricted to short reference periods (Kahnemann et al. 2004)
  - Providing participants with wearables to track PA reduces reactivity and measurement error but non-compliance and high device costs (Montoye et al. 2016; Schneller et al. 2017)

Potential Alternative: Data Donation

- Takes advantage of GDPR Articles 15 (*Right of access by the data subject*) and 20 (*Right to data portability*)
  - Receive personal data in structured, commonly used, and machine-readable format ("Data Download Package"; DDP)
  - Transmit data to another data controller

- Privacy-preserving data donation platforms



Boeschoten et al. (2023)

Data Donation

Advantages

+ Allows access to data that cannot be collected otherwise
  - e.g., individual-level social media data
+ Works for range of platforms
  - WhatsApp, Facebook, Instagram, Google, YouTube, Netflix, Apple Health, Fitbit,…
+ User retains full control over what data are donated
+ Cost-efficient because participants use own devices

Challenges

- Limited to users of certain platforms or devices
- Data donation process rather cumbersome for users (willingness/participation)
- Some technical know-how needed

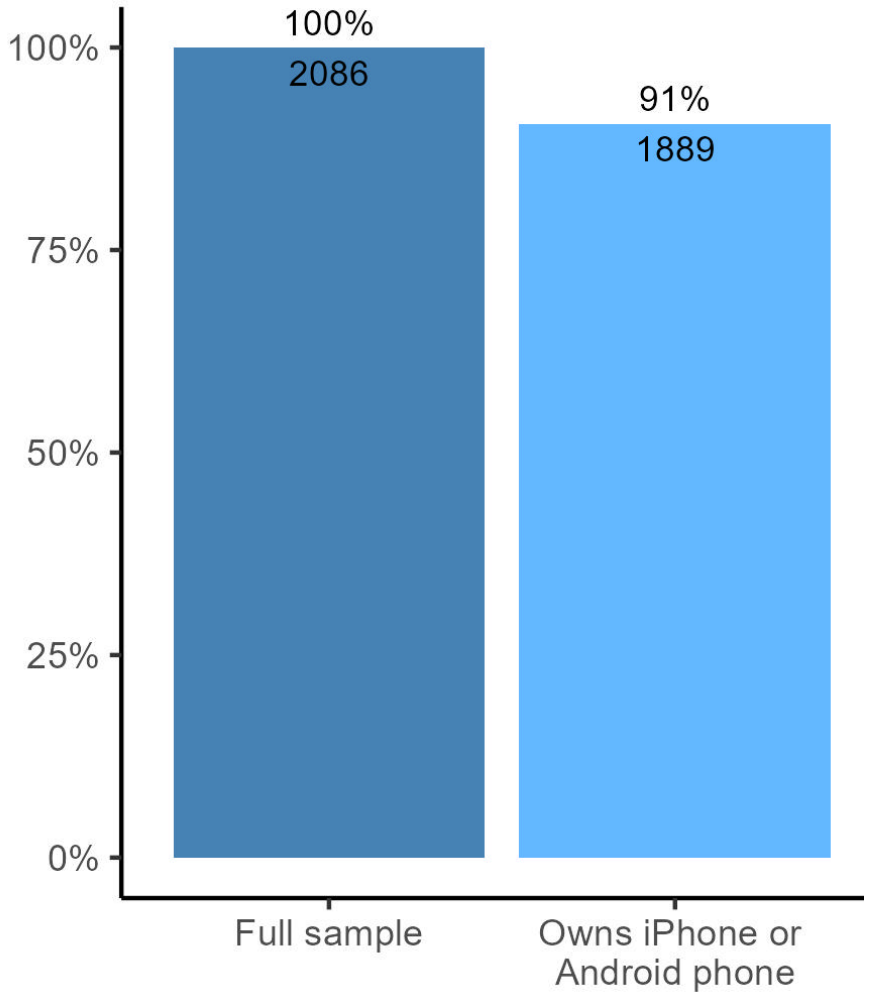
Research Questions

- How **willing** are older adults to donate their PA data from different smartphone apps?
- What **drives** donation of PA data at the different stages of participation?
- What **bias** does arise from selective data donation?

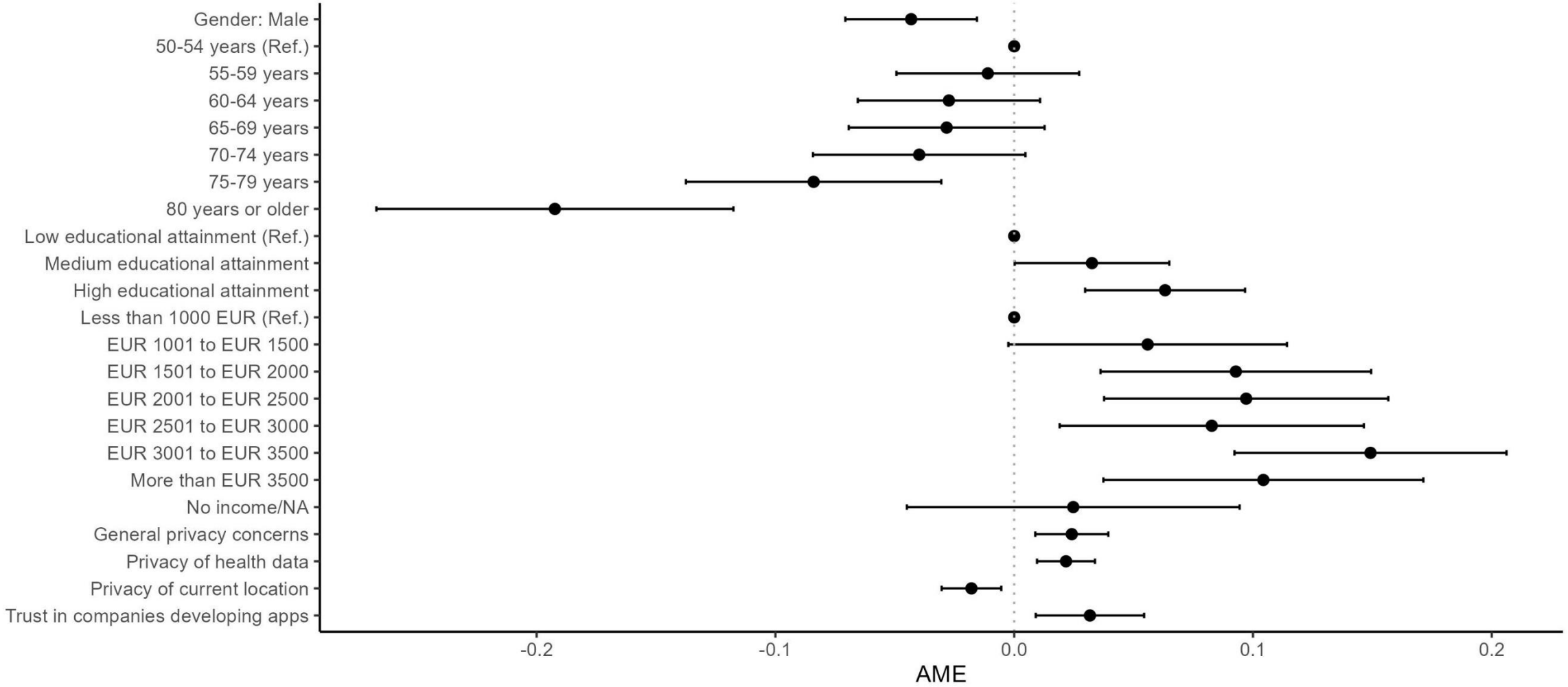
Data

- Web survey with 2,086 adults aged 50+ in LISS panel Jan & Mar 2024
  - Probability-based online panel of Dutch general population
  - Questionnaire
    - Sociodemographics
    - Self-rated health, chronic illness, health-related difficulties and limitations
    - Physical activity past 7 days
    - Smartphone ownership and activities
    - General privacy concerns, privacy of different types of data, trust in various institutions
- iPhone and Android smartphone owners asked to download passively collected PA data from 2017-2023 from their devices (Apple Health, Google Location History, or Samsung Health) and donate them via PORT

Participation

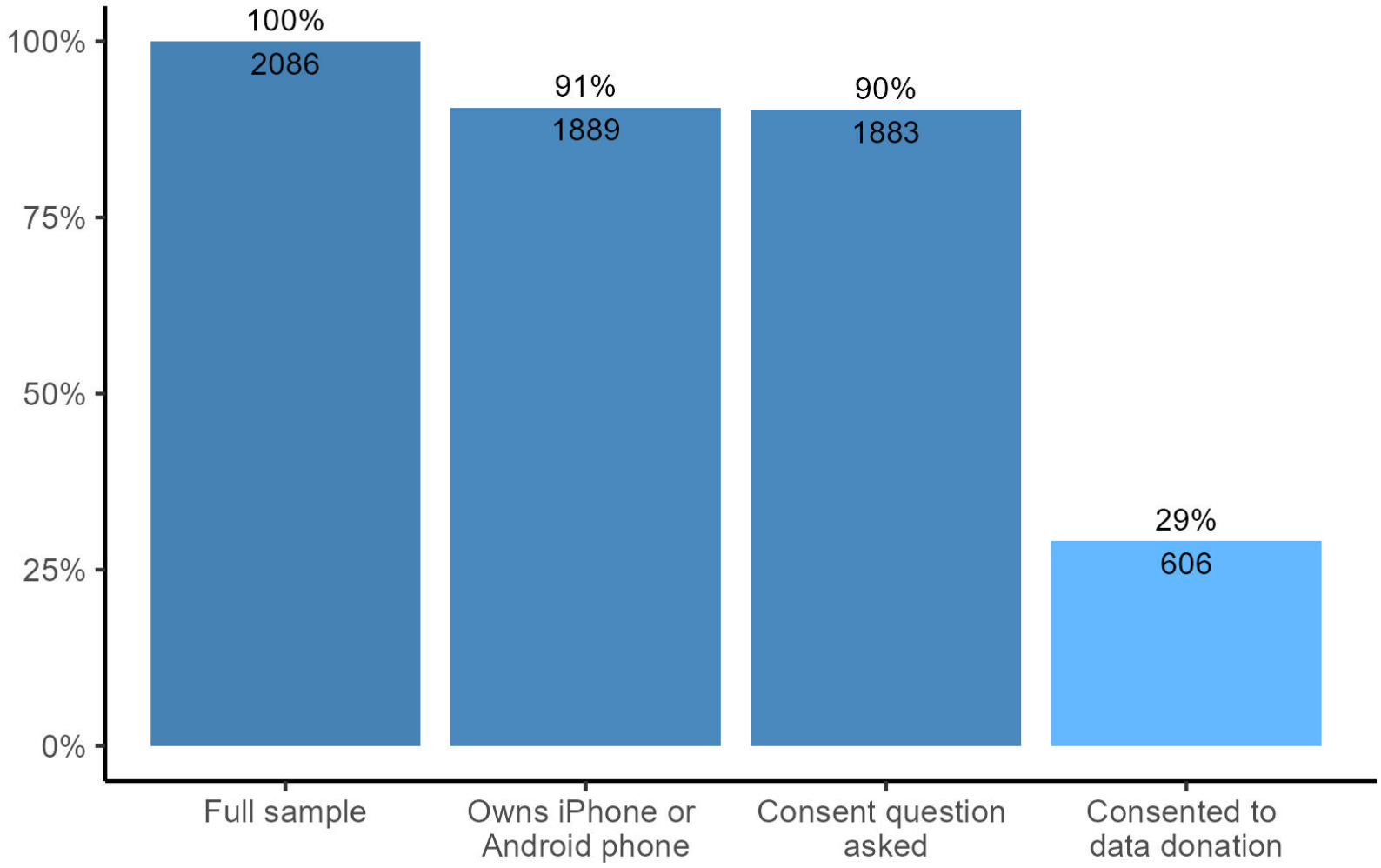


Owns iPhone or Android Phone

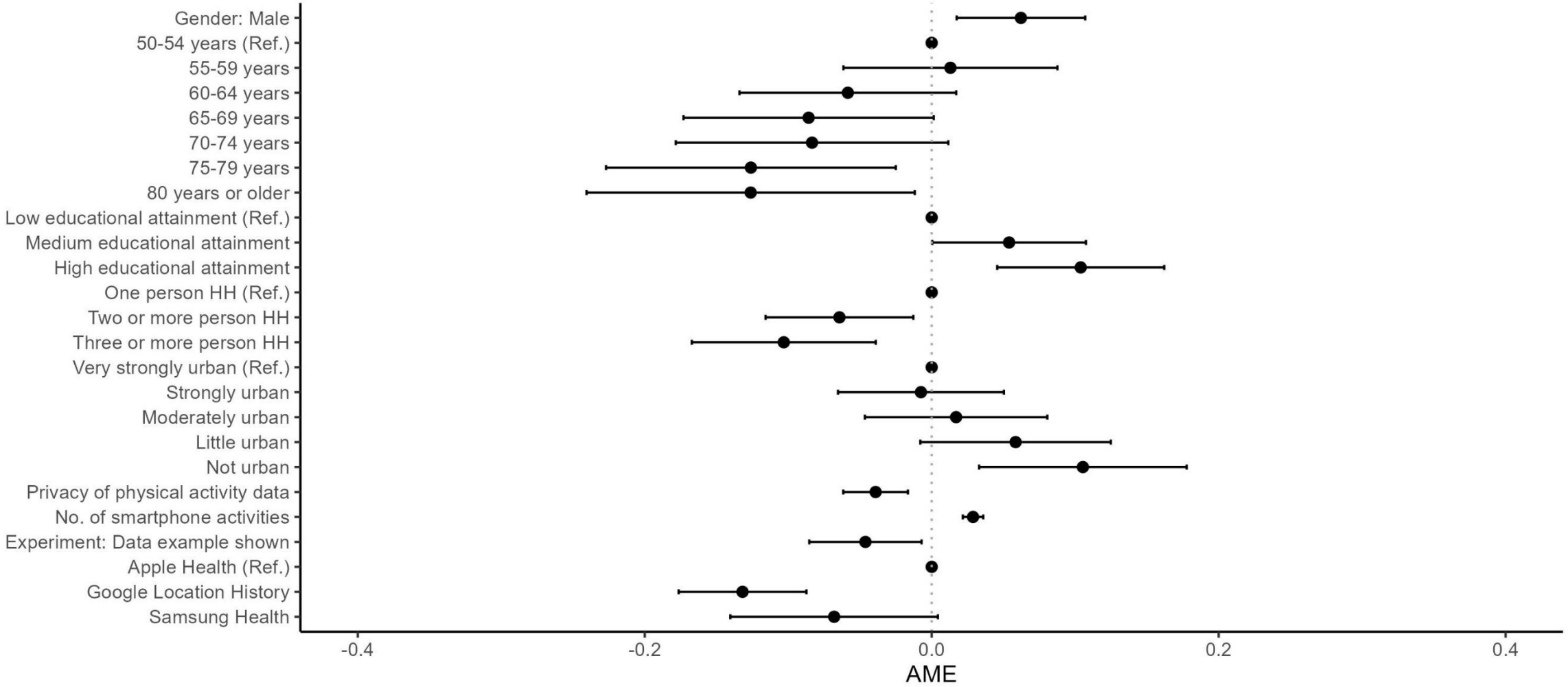


Sign. (p<.05) average marginal effects (AME; points) and 95% confidence intervals (lines) from logistic regression model predicting owning iPhone or Android phone; Control variables: gender, age, educational attainment, employment status, monthly personal net income, HH size, urbanicity, general privacy concerns, privacy of information, trust in various organizations; n = 2,019.

Participation



Consented to Data Donation

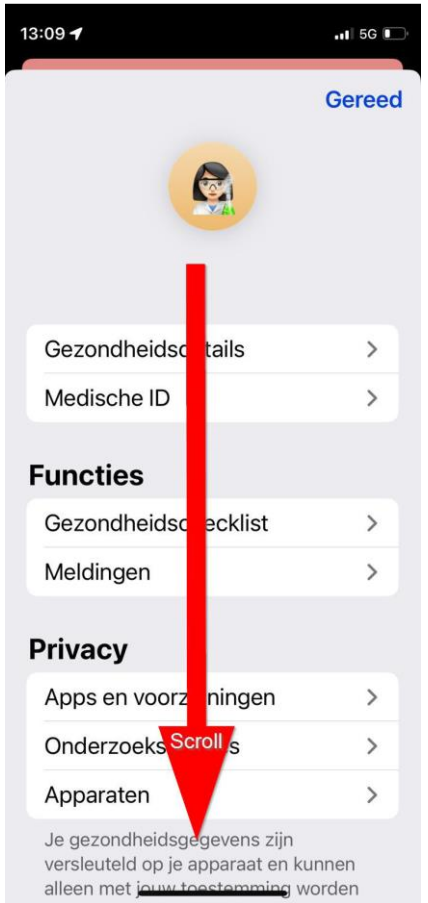


Sign. (p<.05) average marginal effects (AME; points) and 95% confidence intervals (lines) from logistic regression model predicting consent to data donation (conditional on being asked for consent); Control variables: gender, age, educational attainment, employment status, monthly personal net income, HH size, urbanicity, general privacy concerns, privacy of information, trust in various organizations, no. of smartphone activities, experiment (not) showing example data, type of data requested; n = 1,829.

Data Donation Process (Apple Health)

Go to
Apple Health

Go to
Your Profile



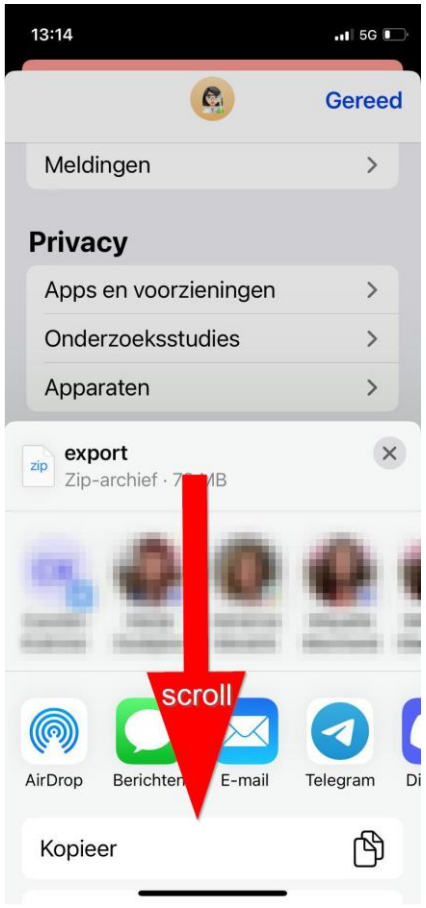
Scroll down

Click Export
Health Data

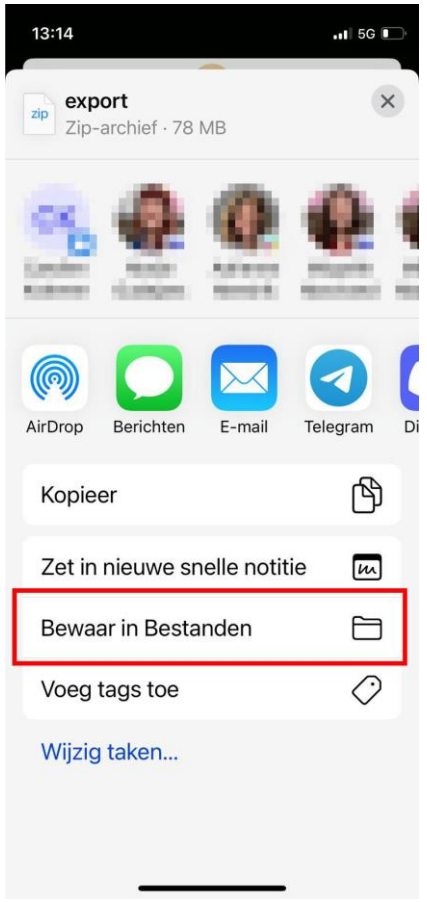
Data Donation Process (Apple Health)

Export

Be patient

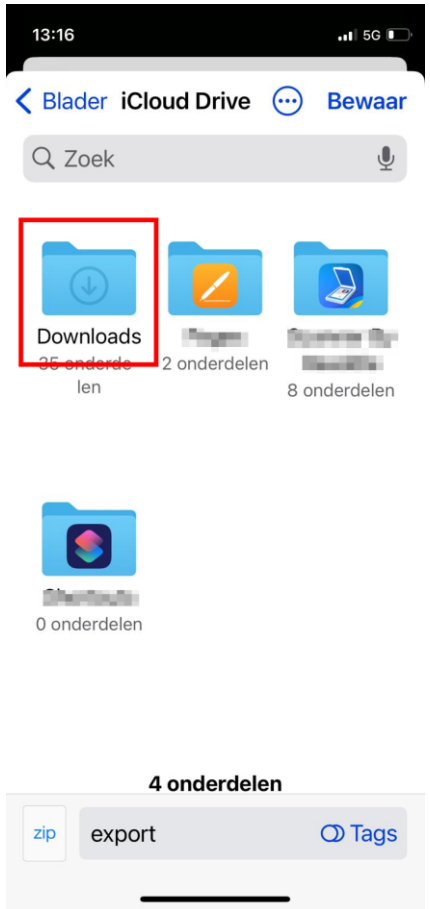


Scroll down

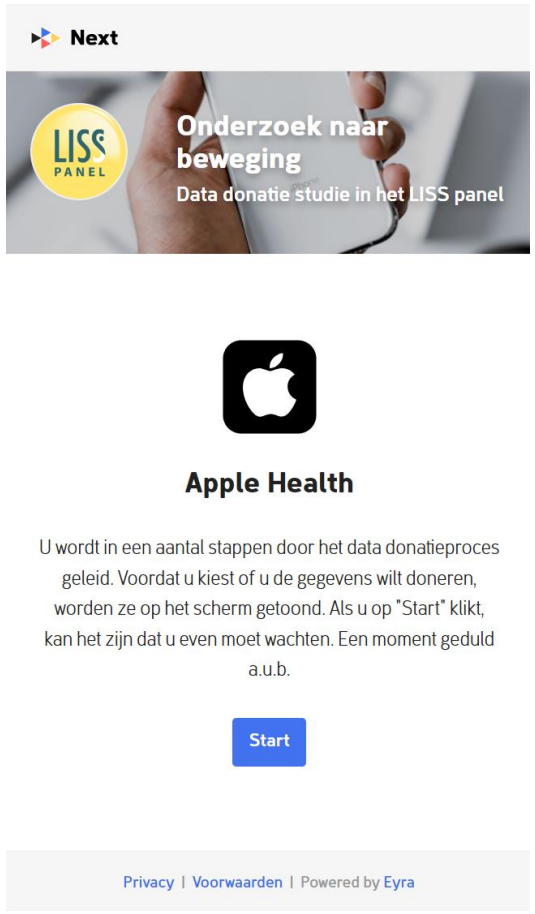


Save data

Data Donation Process (Apple Health)

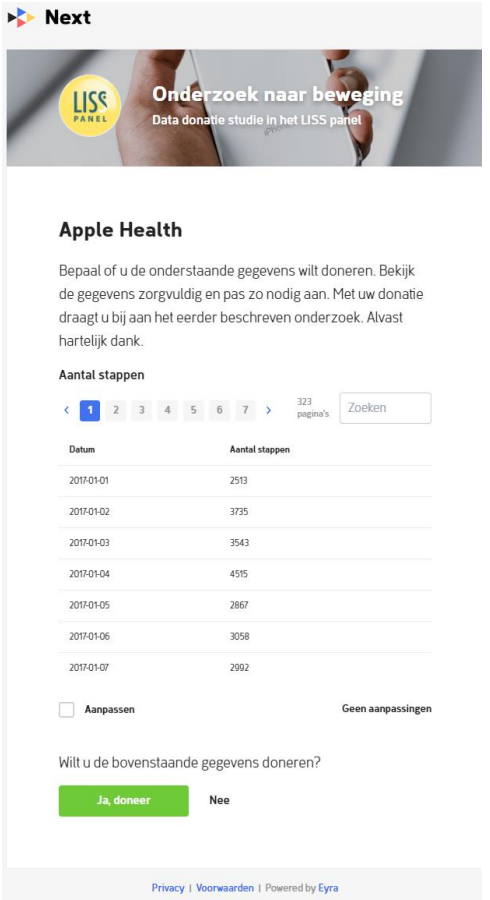


Go to Downloads



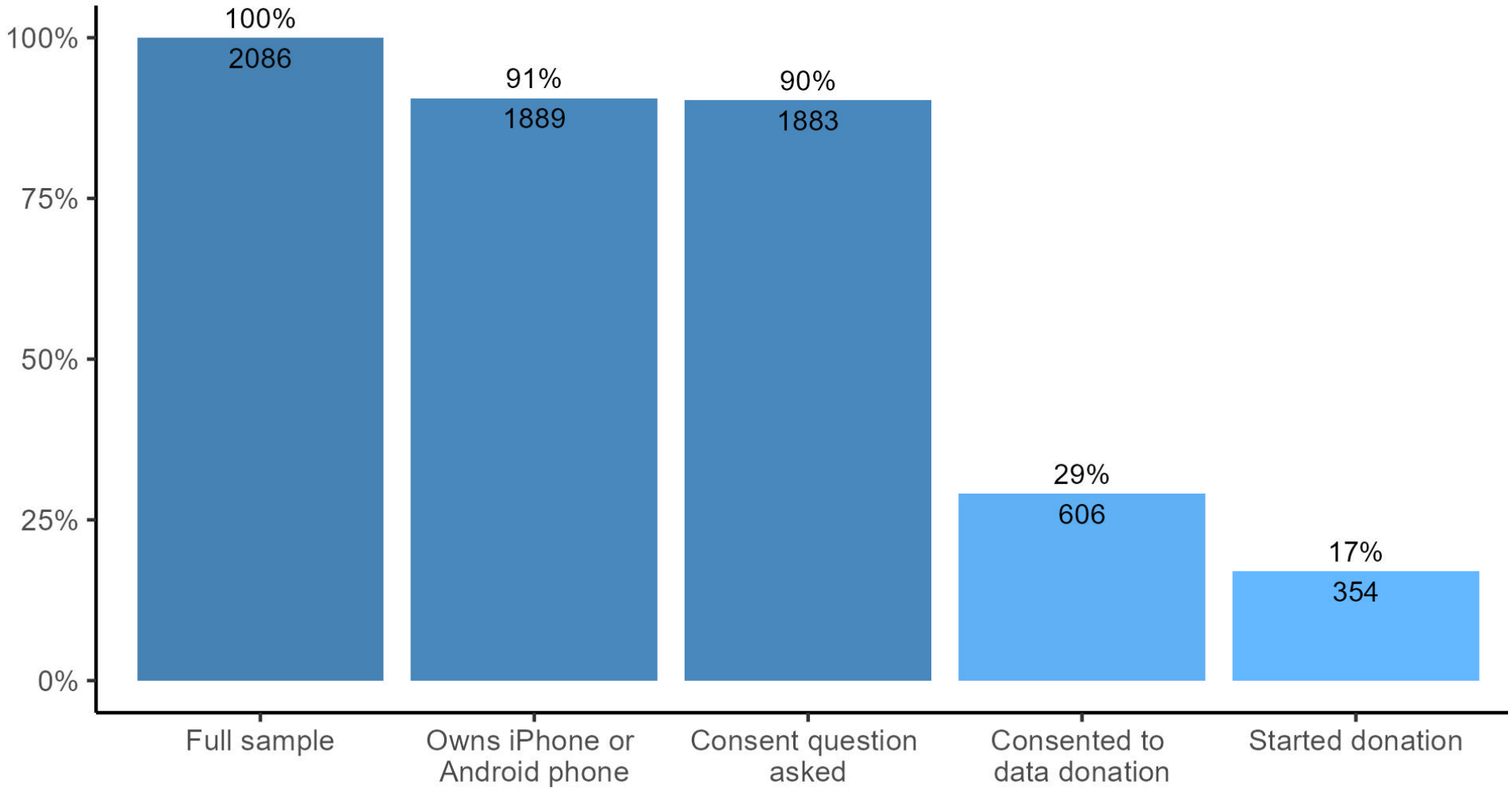
Go to Port

Upload DDP

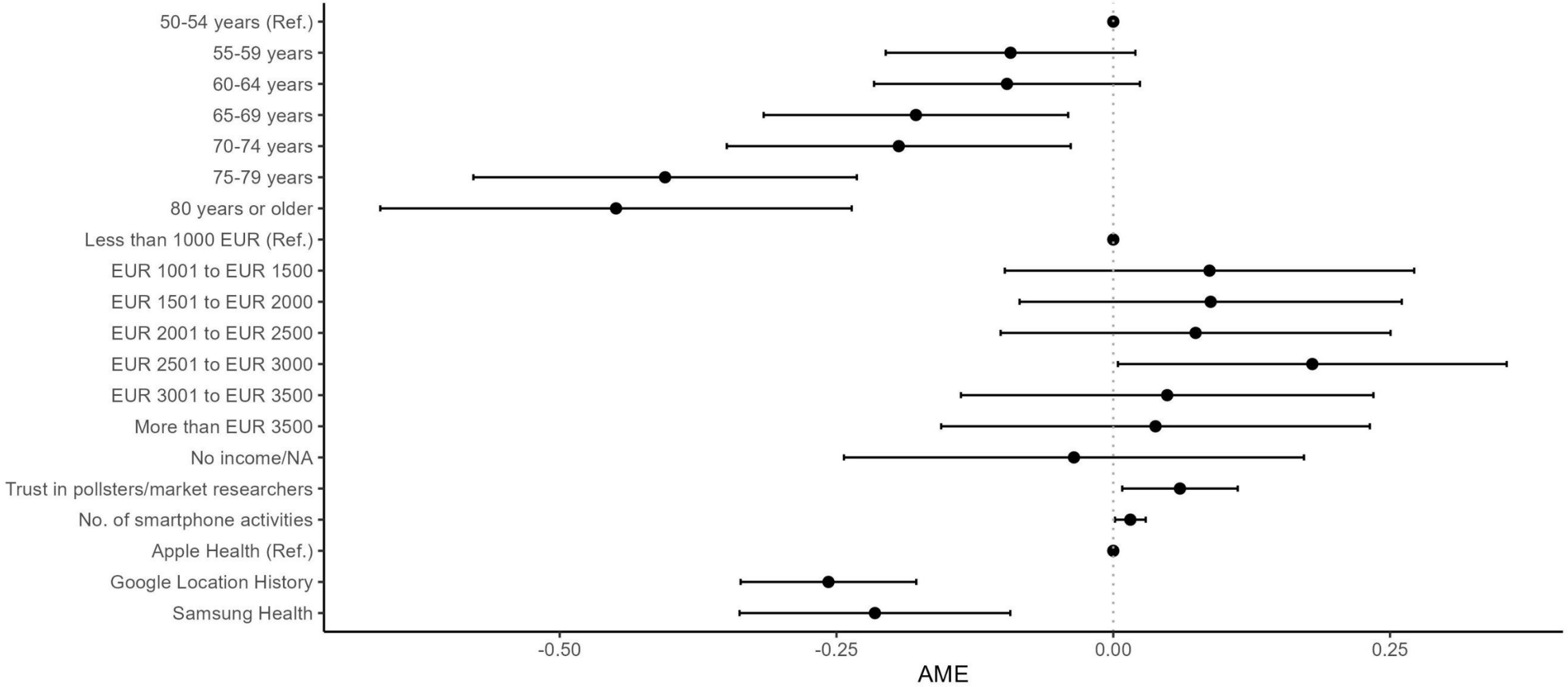


Review data & donate

Participation

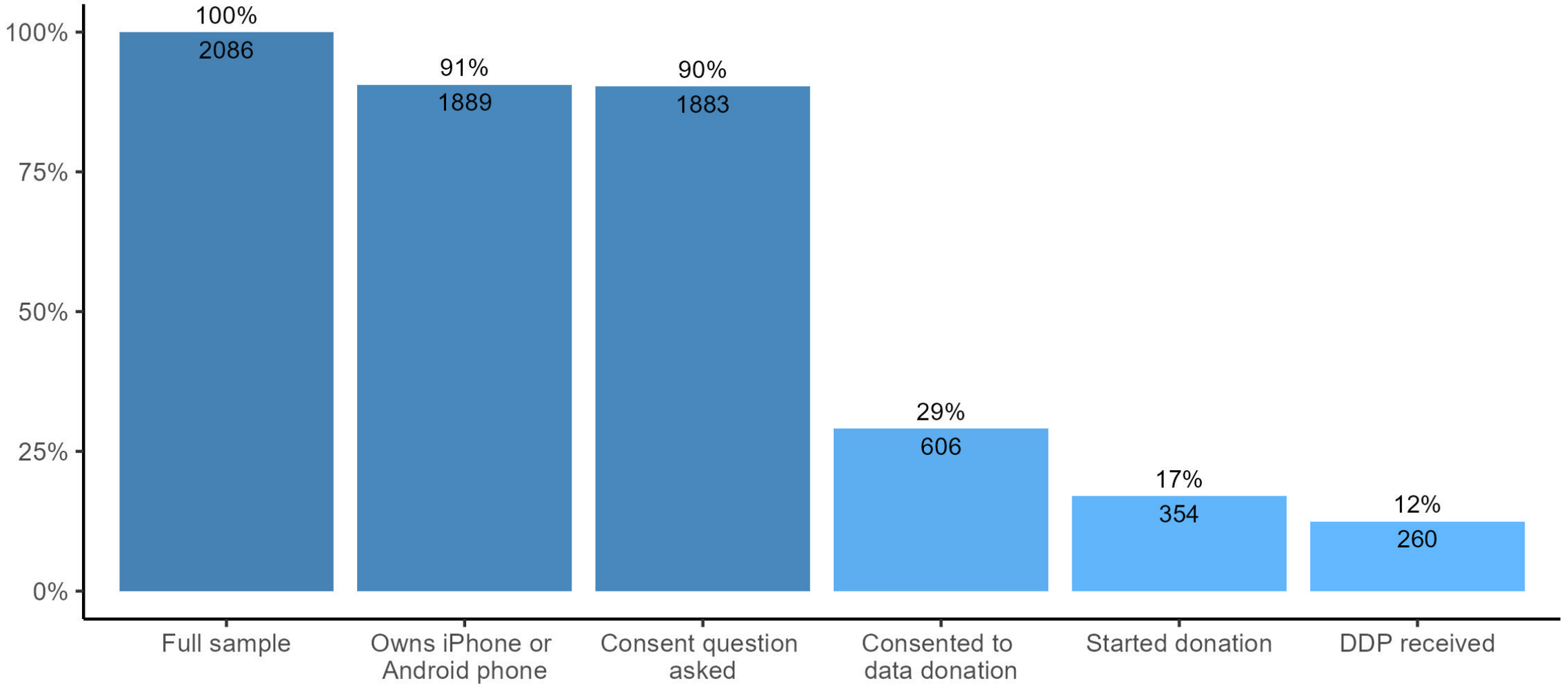


Started Data Donation

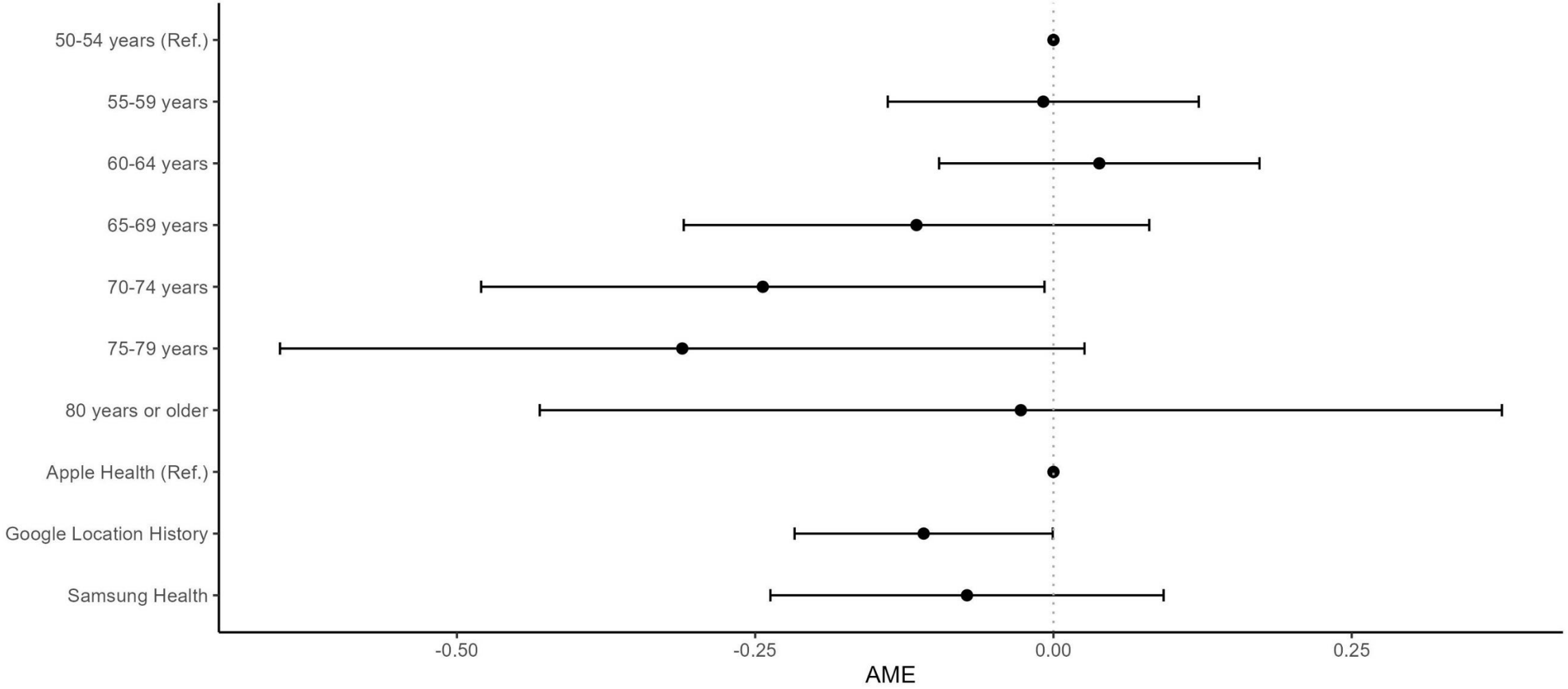


Sign. (p<.05) average marginal effects (AME; points) and 95% confidence intervals (lines) from logistic regression model predicting starting data donation (conditional on consent); Control variables: gender, age, educational attainment, employment status, monthly personal net income, HH size, urbanicity, general privacy concerns, privacy of information, trust in various organizations, no. of smartphone activities, experiment (not) showing example data, type of data requested; n = 596.

Participation

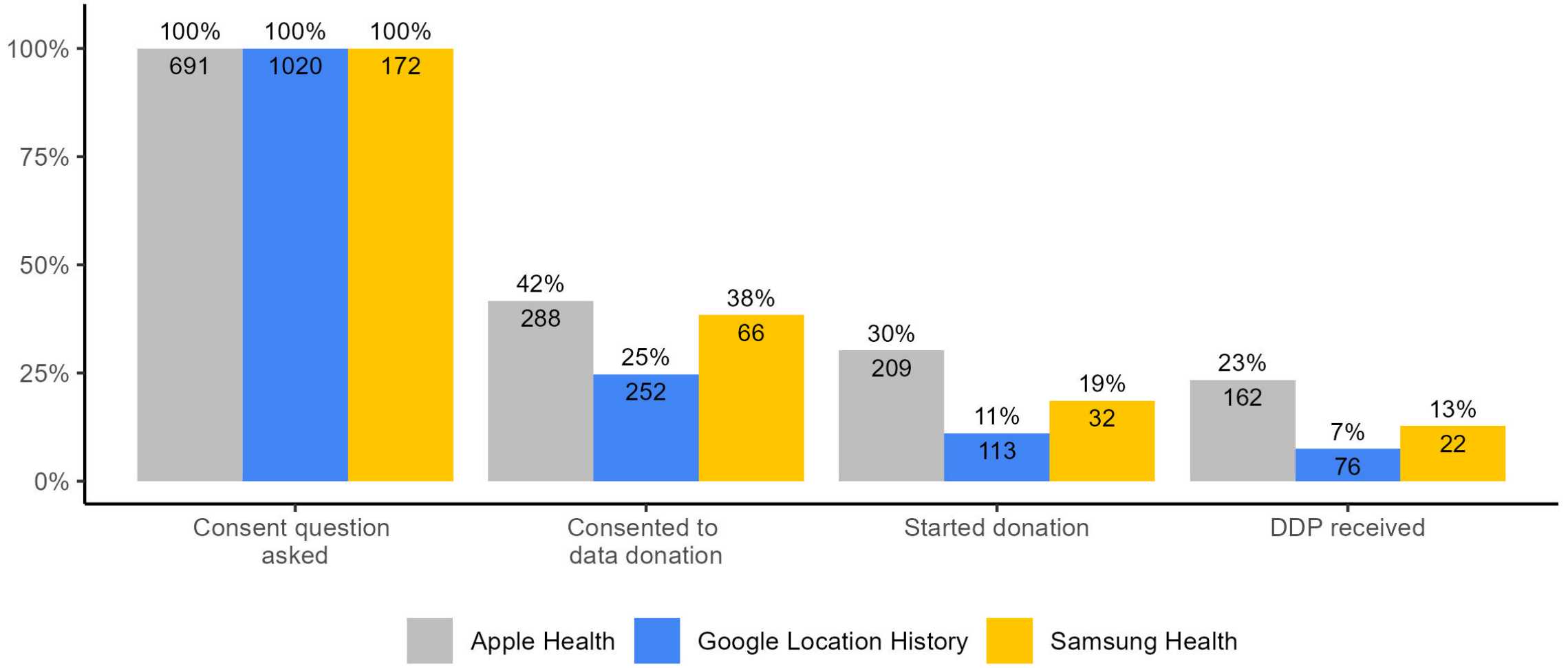


DDP Received



Sign. (p<.05) average marginal effects (AME; points) and 95% confidence intervals (lines) from logistic regression model predicting receiving DDP (conditional on starting data donation); Control variables: gender, age, educational attainment, employment status, monthly personal net income, HH size, urbanicity, general privacy concerns, privacy of information, trust in various organizations, no. of smartphone activities, experiment (not) showing example data, type of data requested; n = 350.

Participation by Health App



Health and PA Bias of Donors

- Self-rated health
  - Very good/Excellent: +2.9 p.p.

- Health-related limitations
  - Daily activities
    - Not at all limited +4.5 p.p.
    - Quite a lot/Very much limited -3.8 p.p.
  - Social activities
    - Not at all limited +3.1 p.p.
  - Work
    - Not at all limited +3.4 p.p.

Health and PA Bias of Donors

- Difficulties performing certain tasks
  - Walk 100m
    - Without any trouble +4.8 p.p.
    - With some trouble -3.2 p.p.
    - With a lot of trouble/Only with an aid or help/Not able -3.3 p.p.
  - Able to sit for 2 hs
    - Without any trouble +3.5 p.p.
  - Walk one flight of stairs
    - Without any trouble +4.6 p.p.
    - With some trouble -3.0 p.p.
    - With a lot of trouble/Only with an aid or help/Not able -3.0 p.p.
  - Walk multiple flights of stairs
    - Without any trouble +3.5 p.p.
    - With a lot of trouble/Only with an aid or help/Not able -3.1 p.p.

Health and PA Bias of Donors

- Difficulties performing certain tasks
  - Crouch, kneel, and crawl
    - Without any trouble +3.5 p.p.
    - With a lot of trouble/Only with an aid or help/Not able -3.2 p.p.
  - Reach above shoulder
    - Without any trouble +4.3 p.p.
    - With some trouble -3.2 p.p.
  - Move around larger objects
    - Without any trouble +4.3 p.p.
    - With some trouble -2.8 p.p.
    - With a lot of trouble/Only with an aid or help/Not able -3.0 p.p.
  - Lift up/carry around things 5kg+
    - Without any trouble +6.1 p.p.
    - With some trouble -4.7 p.p.
    - With a lot of trouble/Only with an aid or help/Not able -3.0 p.p.

Health and PA Bias of Donors

- Physical activity
  - +0.2 days with strenuous physical activity in past 7 days
  - +0.4 days with walking in past 7 days
  - +0.2 hs of sedentary behavior per day
  - Spent time outdoors yesterday +2.8 p.p.

- No bias in ability to pick up small things from a table, chronic illnes, BMI, days with moderate physical activity, days biking, and days running

Conclusions

- Donation of PA data from smartphones as part of a probability online panel is feasible
- Nonparticipation correlates strongly with characteristics related to smartphone ownership and comfort with device use
  - Age, educational attainment, income, smartphone activities, privacy
- Showing participants how data might look like reduces consent
- Apple Health works much better than Google Location History and Samsung Health
- Substantive bias in health and PA outcomes for those who donated vs. all survey respondents
- Next steps: analyzing data from DDPs and compare them to self-reported PA

Thank You!

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