

# Measurement of Physical Activity in older adults through Data Donation (MPADD)



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NIMLAS Annual Plenary Meeting, December 10, 2024

# Measuring Physical Activity in Older Adults

- Physical activity (PA) foundation of positive health outcomes, especially for aging populations (DiPietro 2001)
  - Accurate measurement of PA not trivial
  
- Potential alternative: data donation → takes advantage of legislation such as GDPR and CCPA
  - Privacy-preserving way of data collection

# Data Donation Apple Health

```
<!-- HealthKit Export Version: 8 -->
<!--
Note: Any Records that appear as children of a correlation also appear as top-level records in this document.
-->
<!--
Note: Heart Rate Variability records captured by Apple Watch may include an associated list of instantaneous beats-per-minute readings.
-->
<HealthData locale="en_AT">
  <ExportDate value="2019-06-18 10:27:20 +0200"/>
  <!-- HKCharacteristicTypeIdentifierDateOfBirth -->
  <!-- HKCharacteristicTypeIdentifierBloodType -->
  <Record type="HKQuantityTypeIdentifierStepCount" sourceName="Florian's iPhone (2)" sourceVersion="11.4" device="<<HKDevice: 0x280f8e170>>, name:iPhone model:iPhone, hardware:iPhone10,6, software:11.4" unit="count" creationDate="2018-07-05 19:05:02 +0200" startDate="2018-07-05 18:26:11 +0200" endDate="2020" value="88"/>
  <Record type="HKQuantityTypeIdentifierStepCount" sourceName="Florian's iPhone (2)" sourceVersion="11.4" device="<<HKDevice: 0x280f8dd60>>, name:iPhone model:iPhone, hardware:iPhone10,6, software:11.4" unit="count" creationDate="2018-07-05 19:05:02 +0200" startDate="2018-07-05 18:36:10 +0200" endDate="2020" value="2827"/>
  <Record type="HKQuantityTypeIdentifierStepCount" sourceName="Florian's iPhone (2)" sourceVersion="11.4" device="<<HKDevice: 0x280f8d450>>, name:iPhone model:iPhone, hardware:iPhone10,6, software:11.4" unit="count" creationDate="2018-07-05 19:05:02 +0200" startDate="2018-07-05 18:42:08 +0200" endDate="2020" value="87"/>
  <Record type="HKQuantityTypeIdentifierStepCount" sourceName="Florian's iPhone (2)" sourceVersion="11.4" device="<<HKDevice: 0x280f8c280>>, name:iPhone model:iPhone, hardware:iPhone10,6, software:11.4" unit="count" creationDate="2018-07-05 19:29:31 +0200" startDate="2018-07-05 18:58:47 +0200" endDate="2020" value="53"/>
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  <Record type="HKQuantityTypeIdentifierStepCount" sourceName="Florian's iPhone (2)" sourceVersion="11.4" device="<<HKDevice: 0x280f8cb40>>, name:iPhone model:iPhone, hardware:iPhone10,6, software:11.4" unit="count" creationDate="2018-07-05 20:04:37 +0200" startDate="2018-07-05 19:31:27 +0200" endDate="2020" value="137"/>
  <Record type="HKQuantityTypeIdentifierStepCount" sourceName="Florian's iPhone (2)" sourceVersion="11.4" device="<<HKDevice: 0x280f8cdc0>>, name:iPhone model:iPhone, hardware:iPhone10,6, software:11.4" unit="count" creationDate="2018-07-05 20:04:37 +0200" startDate="2018-07-05 19:41:27 +0200" endDate="2020" value="8"/>
```

## Aantal stappen

< 1 2 3 4 5 6 7 >

323  
pagina's

Zoeken

Datum	Aantal stappen
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2017-01-01	2513
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2017-01-02	3735
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2017-01-03	3543
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2017-01-04	4515
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2017-01-05	2867
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2017-01-06	3058
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2017-01-07	2992
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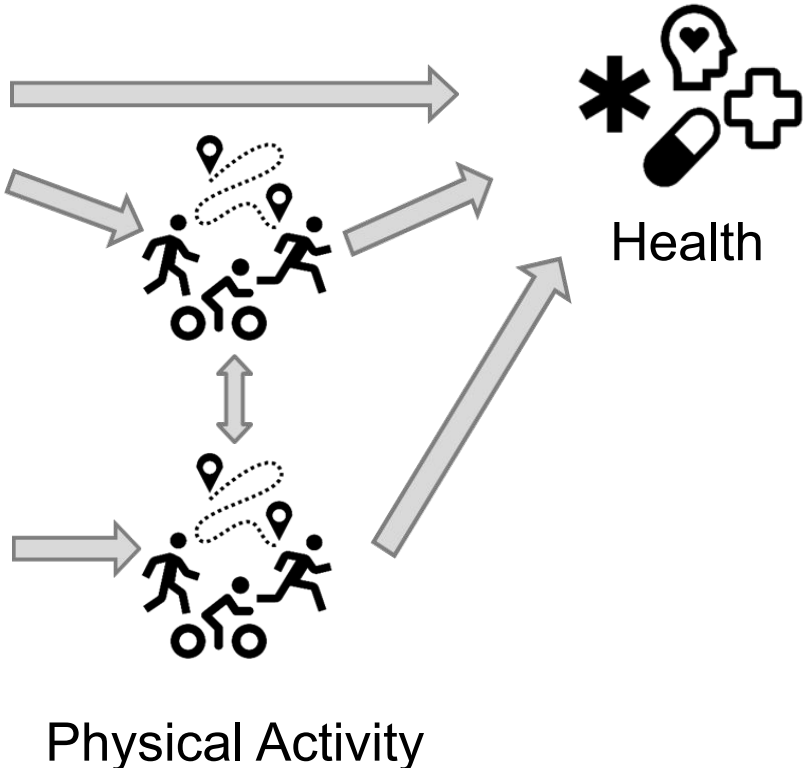
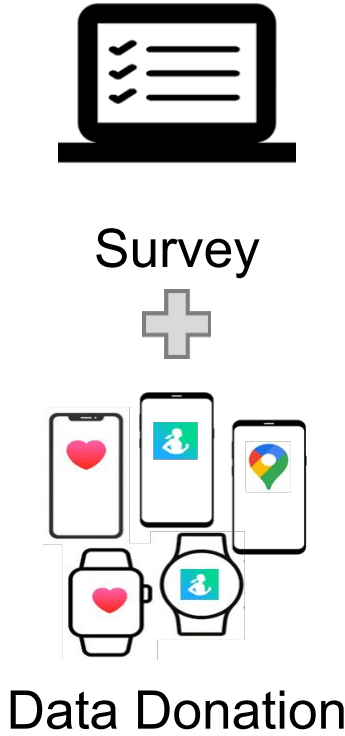
# Study Aims

**Aim 1.** Investigate determinants of consent and selection bias

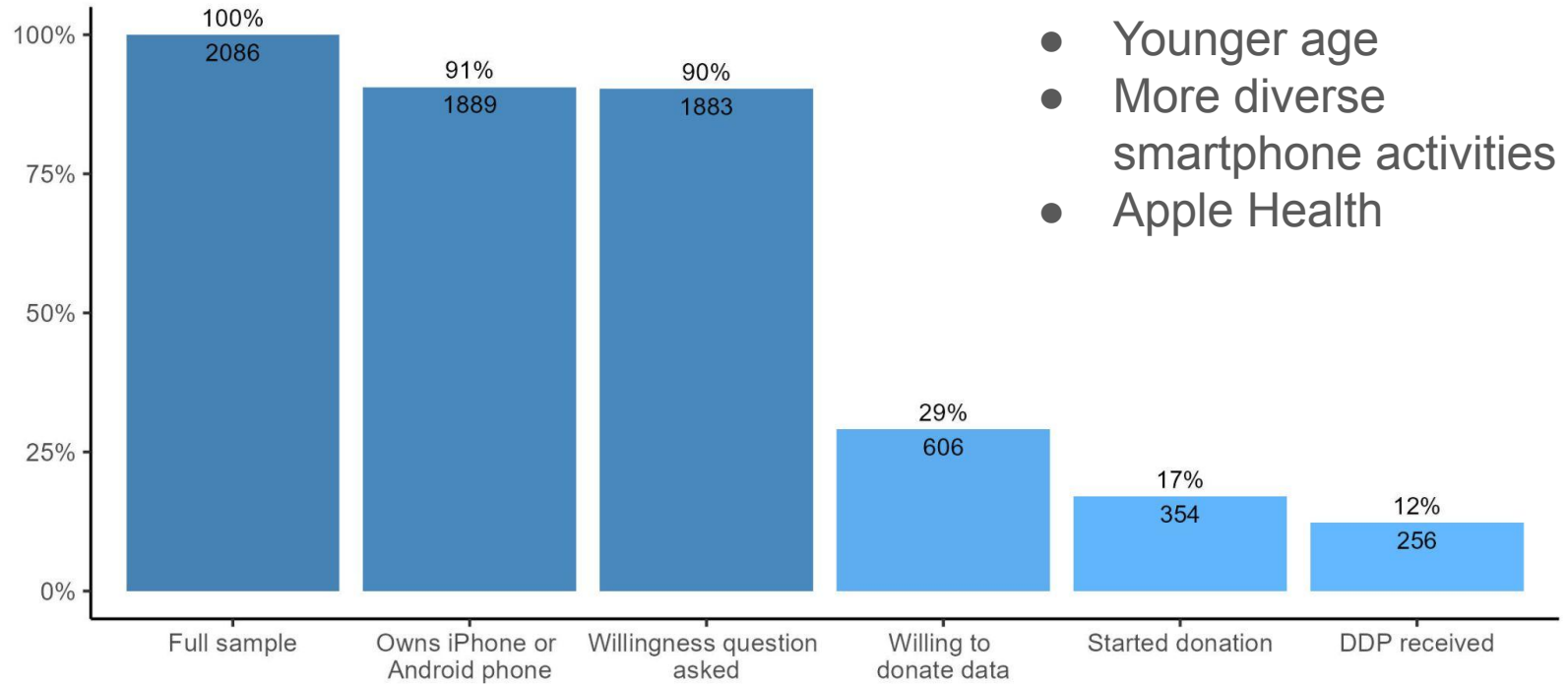
**Aim 2.** Assess the quality of donated PA data

**Aim 3.** Use multi-source PA data to predict health outcomes

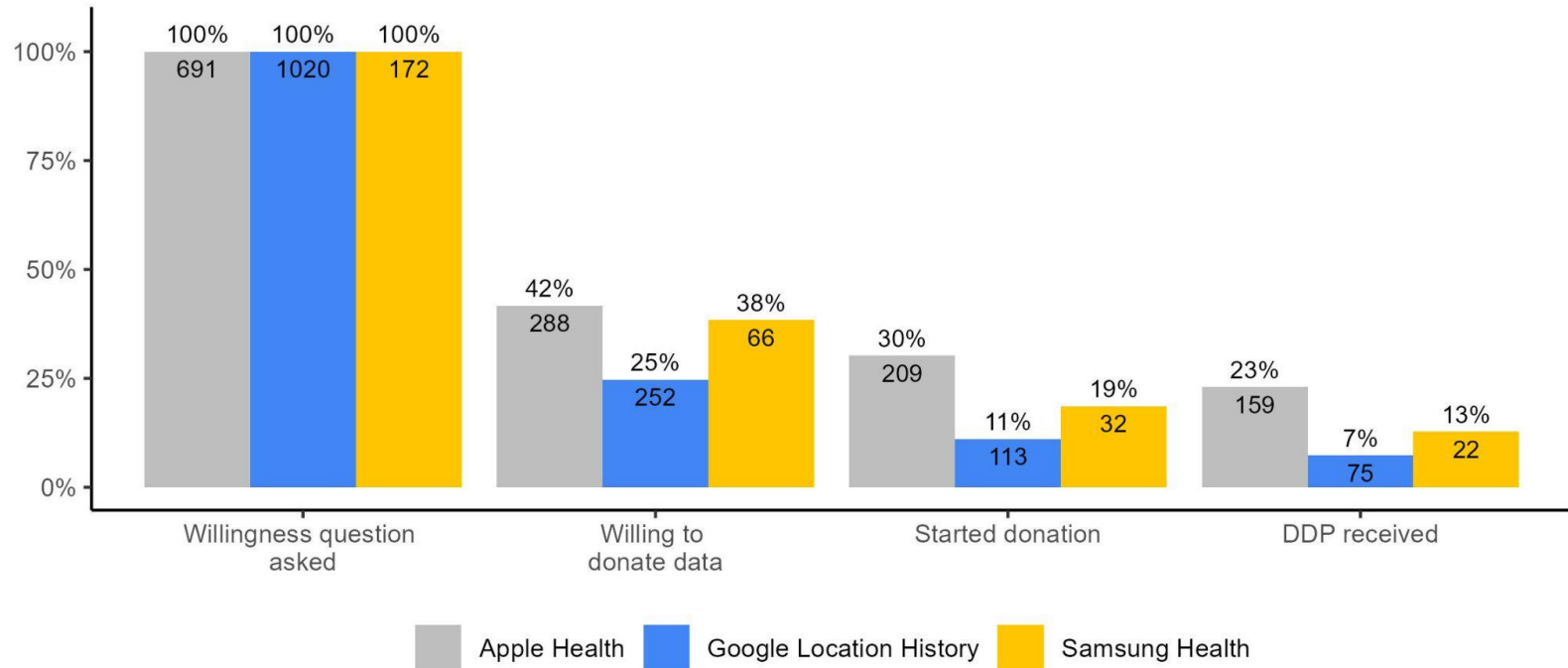
# Design



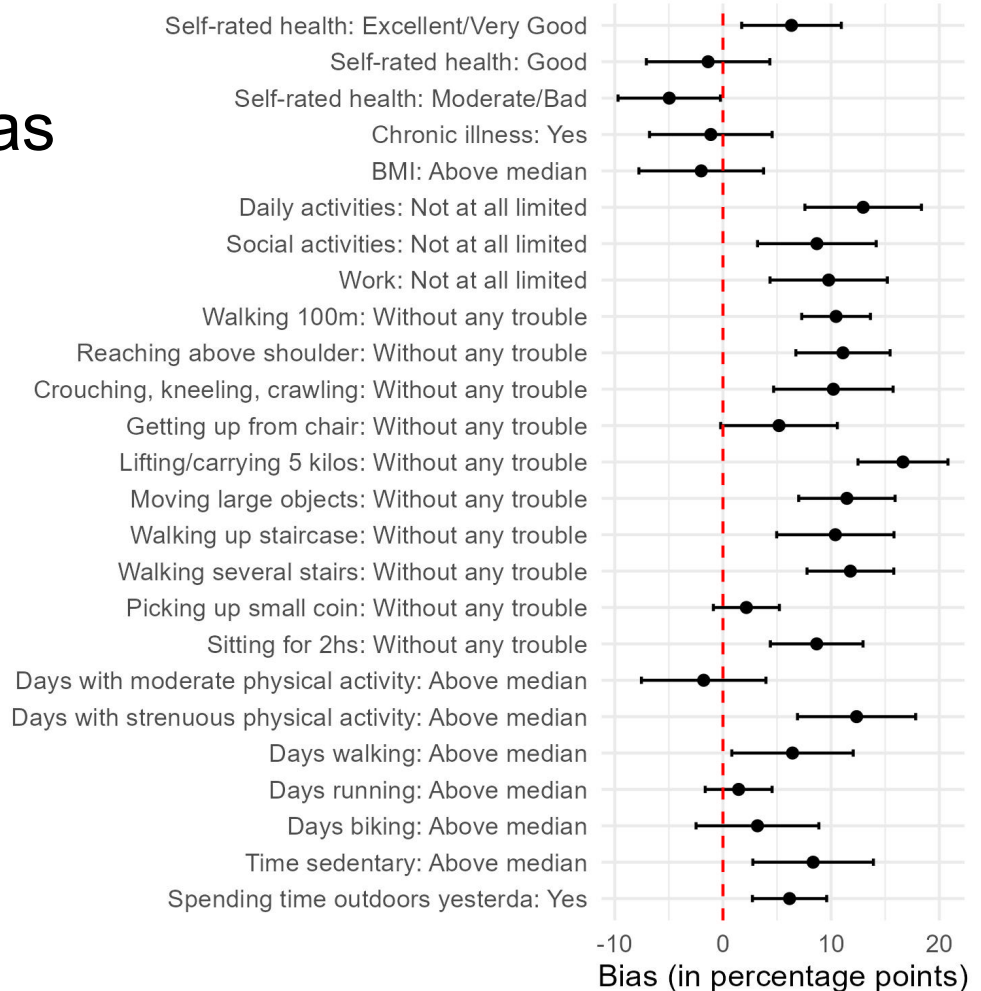
# Aim 1. Consent and Bias



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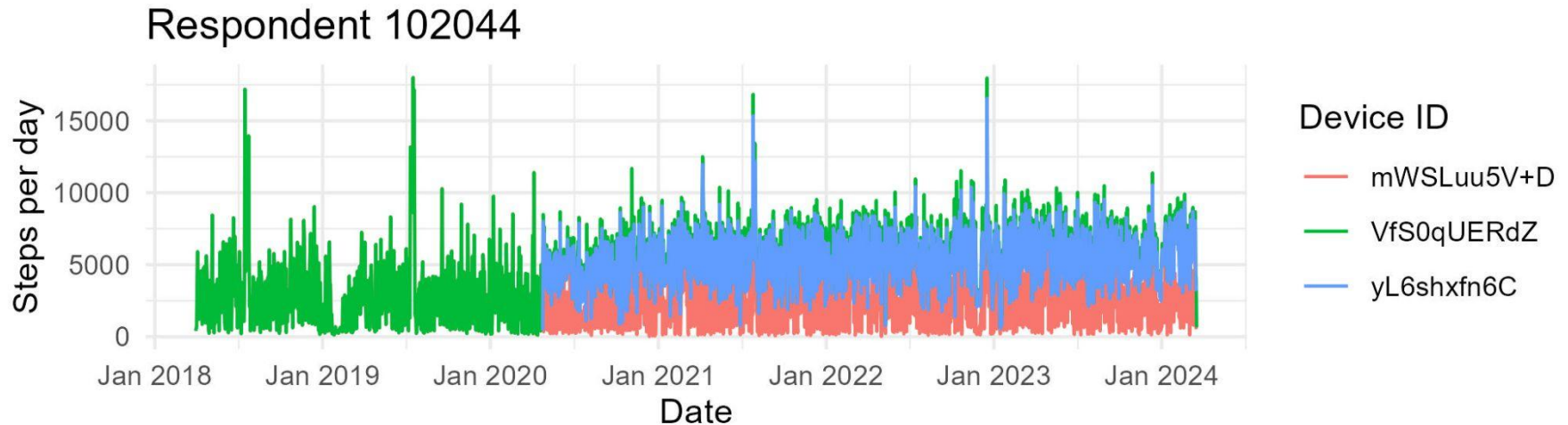
# Aim 1. Consent and Bias





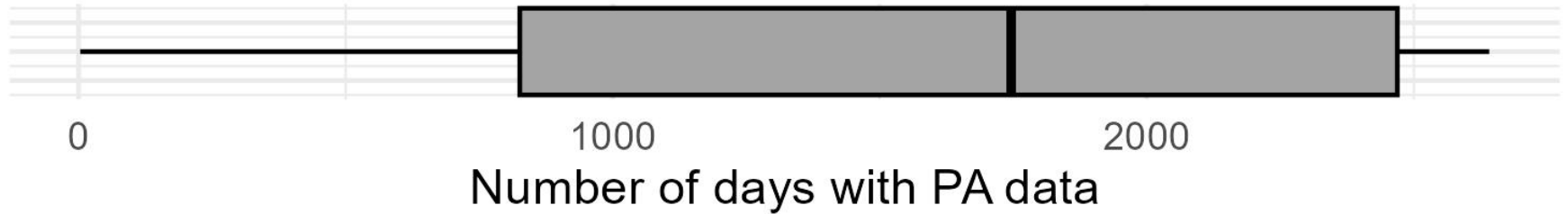
## Aim 2. Quality of Donated Data

- Out of 256 donated DDPs, 213 contained usable data
  - More than 50% of Google Location History DDPs are empty
- Some Samsung DDPs include data from multiple devices

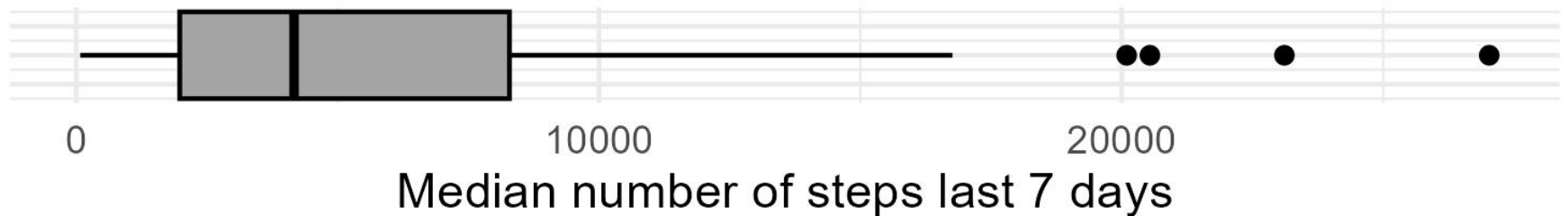


## Aim 2. Quality of Donated Data

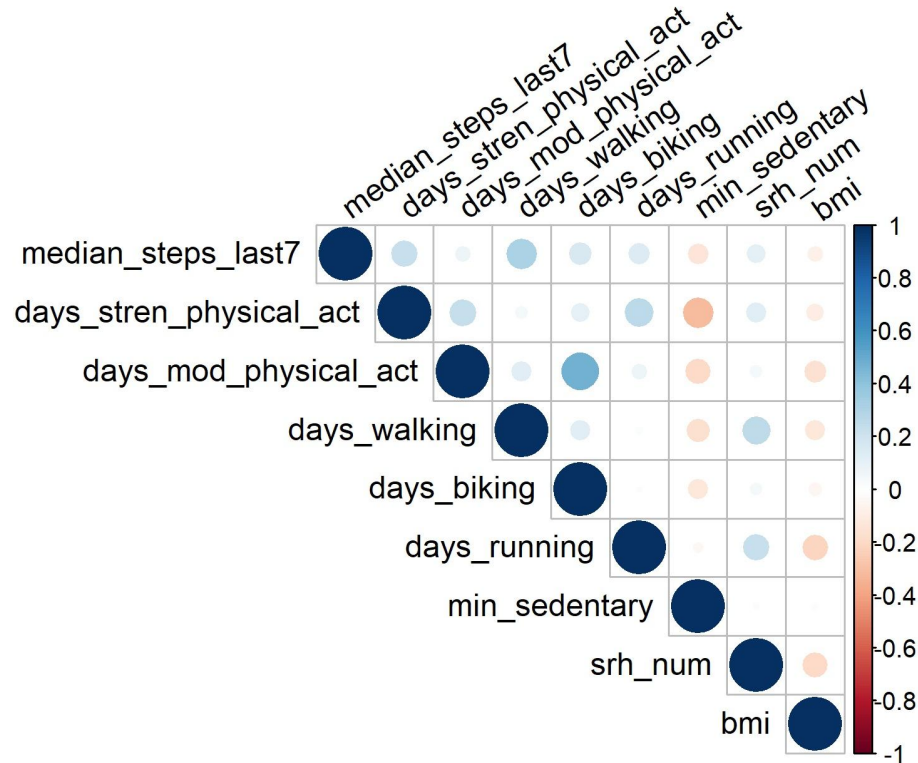
- No. of days with PA data: median = 1,746



- Median no. of steps last 7 days: median = 4,950




# Aim 3. Predicting Health Outcomes



# Summary

- Data donation from smart devices can provide detailed PA data from older adults over longer periods of time
  - Especially data donation from Apple Health seems to be relatively convenient
  - Google does not work well
- Selection in participation mainly driven by age and health status
  
- Next (final) steps:
  - Develop measurement model that creates latent variables for PA from both donated and self-reported data
  - Implementation in larger-scale existing studies (SHARE)

# THANK YOU!



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- **6th Mobile Apps and Sensors in Surveys (MASS) workshops: June 4-5, 2025 in London**
  - <https://massworkshop.org/2024/10/14/call-for-papers-for-6th-mass-workshop-london/>

# Acknowledgement

- Research reported in this presentation was supported by the National Institute On Aging of the National Institutes of Health under Award Number R24AG077012. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.
- We are thankful for a Pilot Project Grant from the Network for Innovative Methods in Longitudinal Aging Studies (NIMLAS).
- This study is part of the Digital Data Donation Infrastructure Project (D3I), made possible by the Platform Digitale Infrastructuur SSH.