

# Participation Metrics for Accelerometer-Based Research

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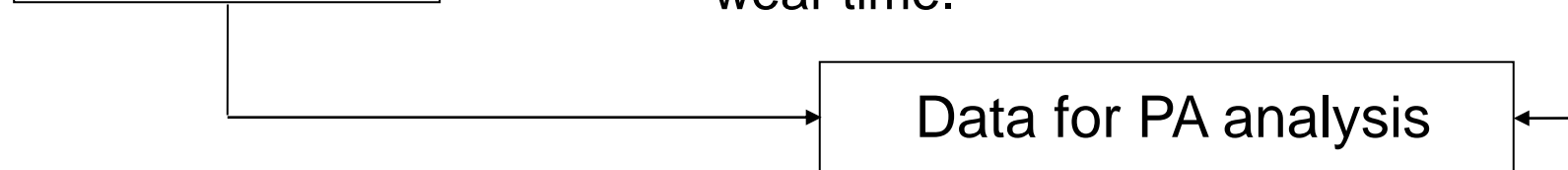
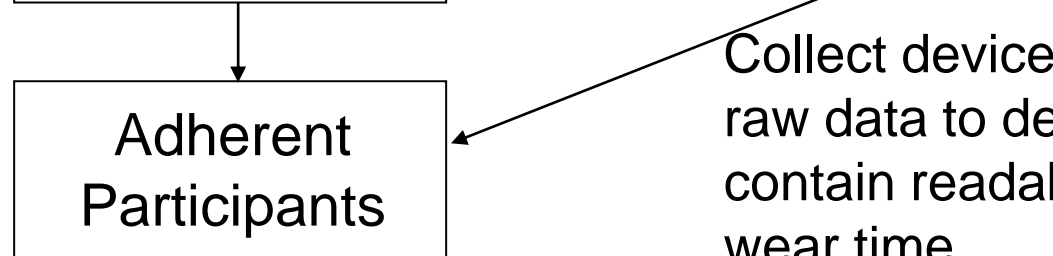
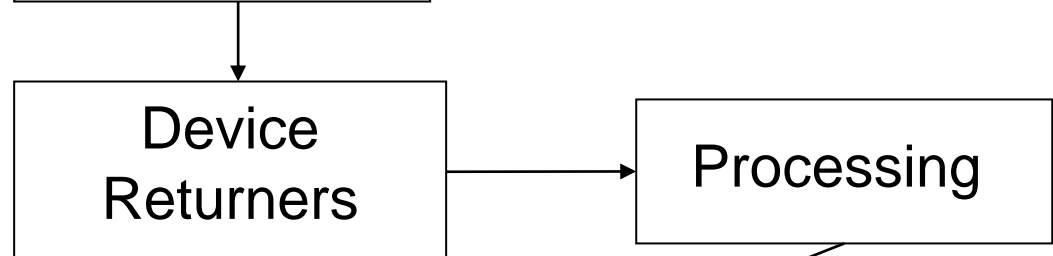
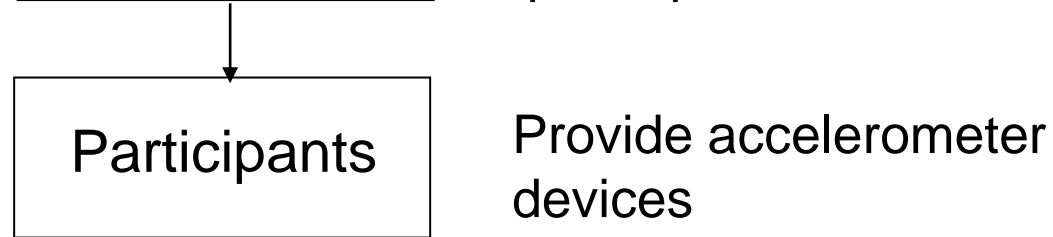
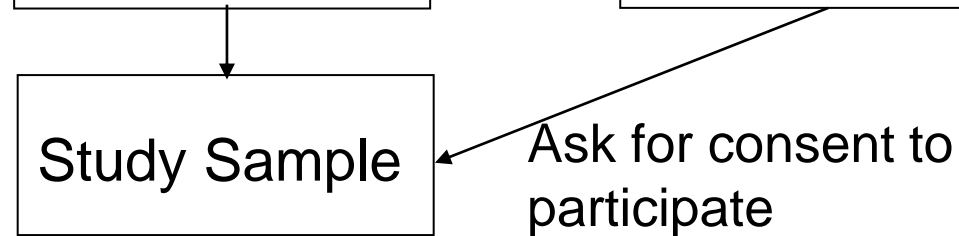
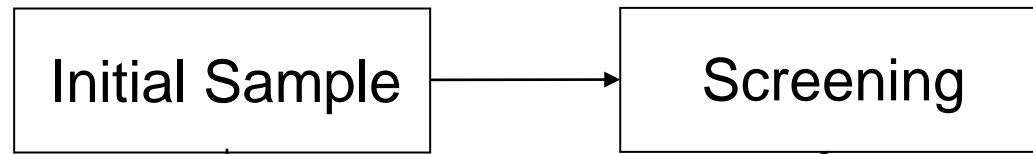
# Physical Activity Measurement

- A key challenge in accelerometer-based studies that ask participants to wear devices (Fitbit, GENEActiv) over some period of time (e.g., 1 week) is **nonparticipation**
  - Misses those who decline to participate, fail to wear devices, fail to return devices, etc.
- However, there is little consistency in how participation rates are reported
- “...it would be advantageous to PA researchers if methods evolved towards a consensus approach. Such a consensus approach would facilitate comparison of results across multiple and diverse studies.” (Troiano et al., 2014: 3)

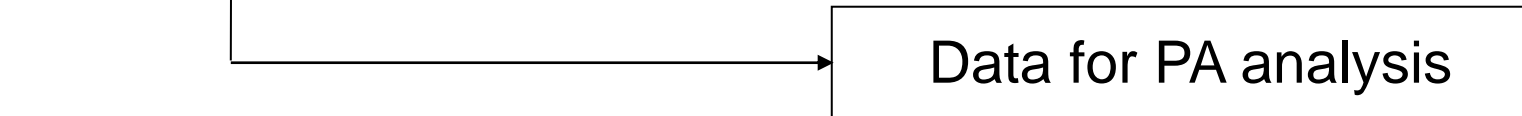
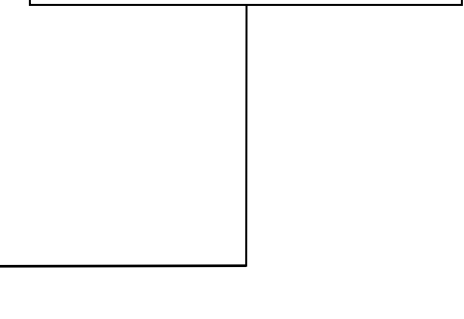
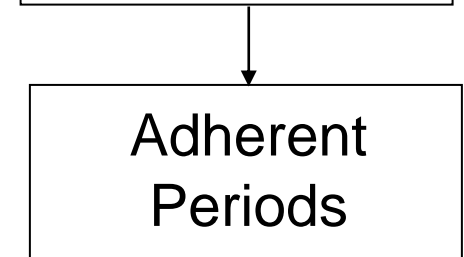
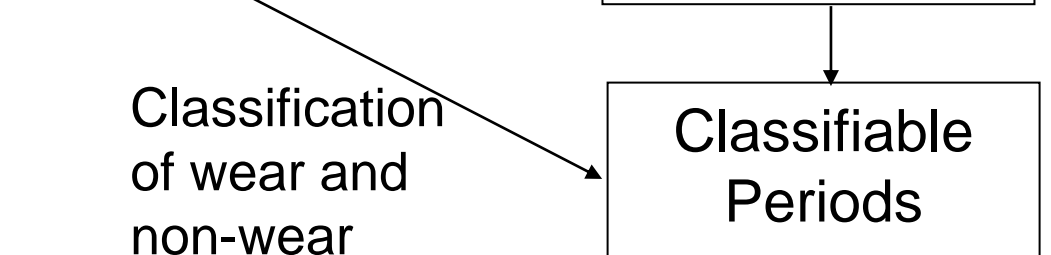
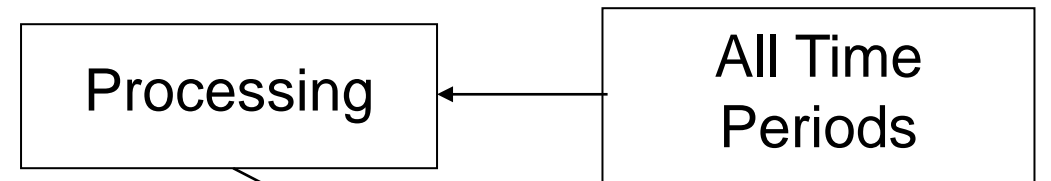
# Our Paper

- Distinguishes between two type of non-participation:
  - (1) missing sample units (sample-level non-participation)
  - (2) missing measurements among sample units (participant-level non-participation)
- Break down each level of non-participation into a series of steps
- Illustrates approach using data from the 2011-2012 and 2013-2014 National Health and Nutrition Examination Survey (NHANES)

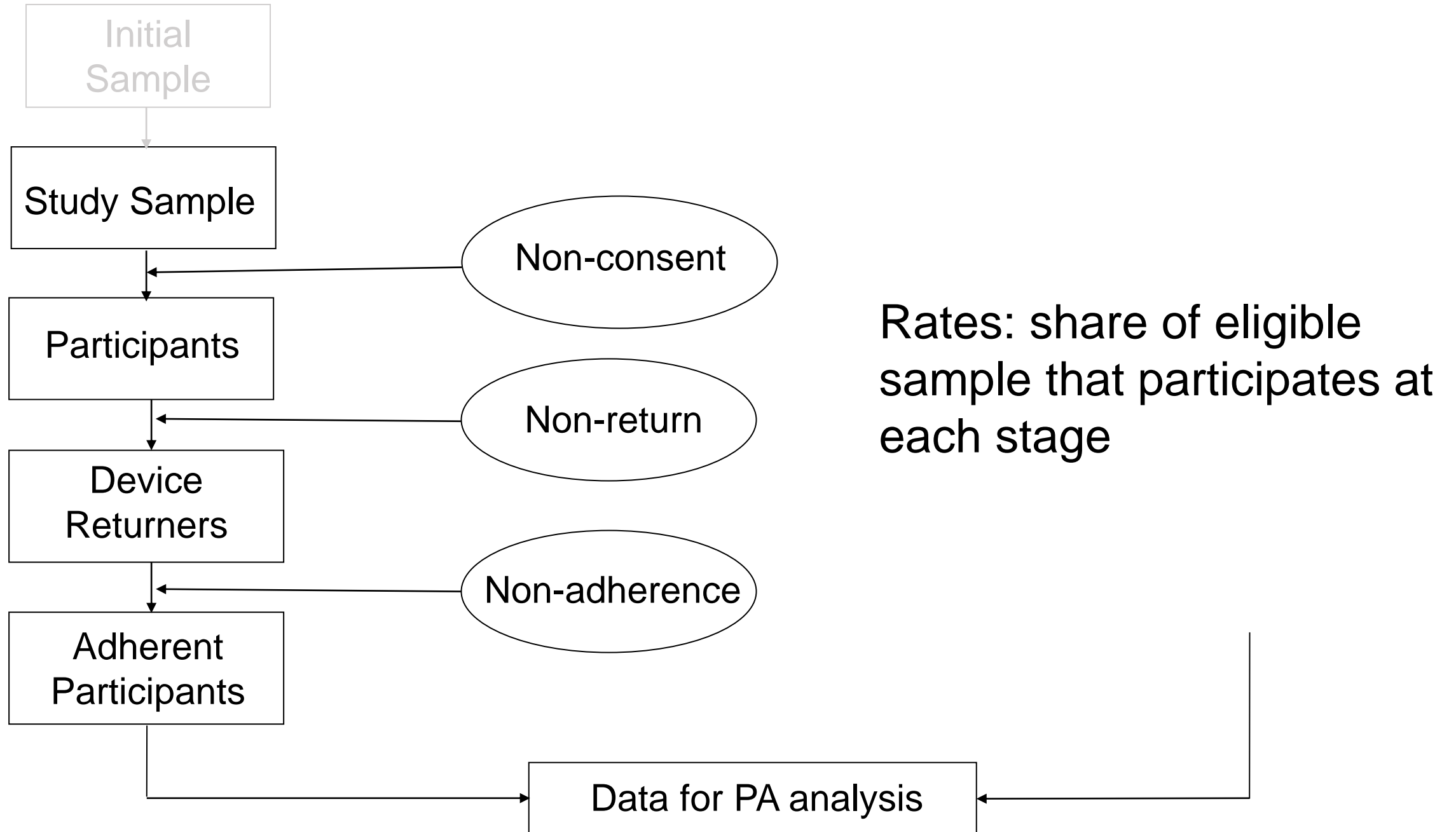
## Sample-Level



## Participant-Level

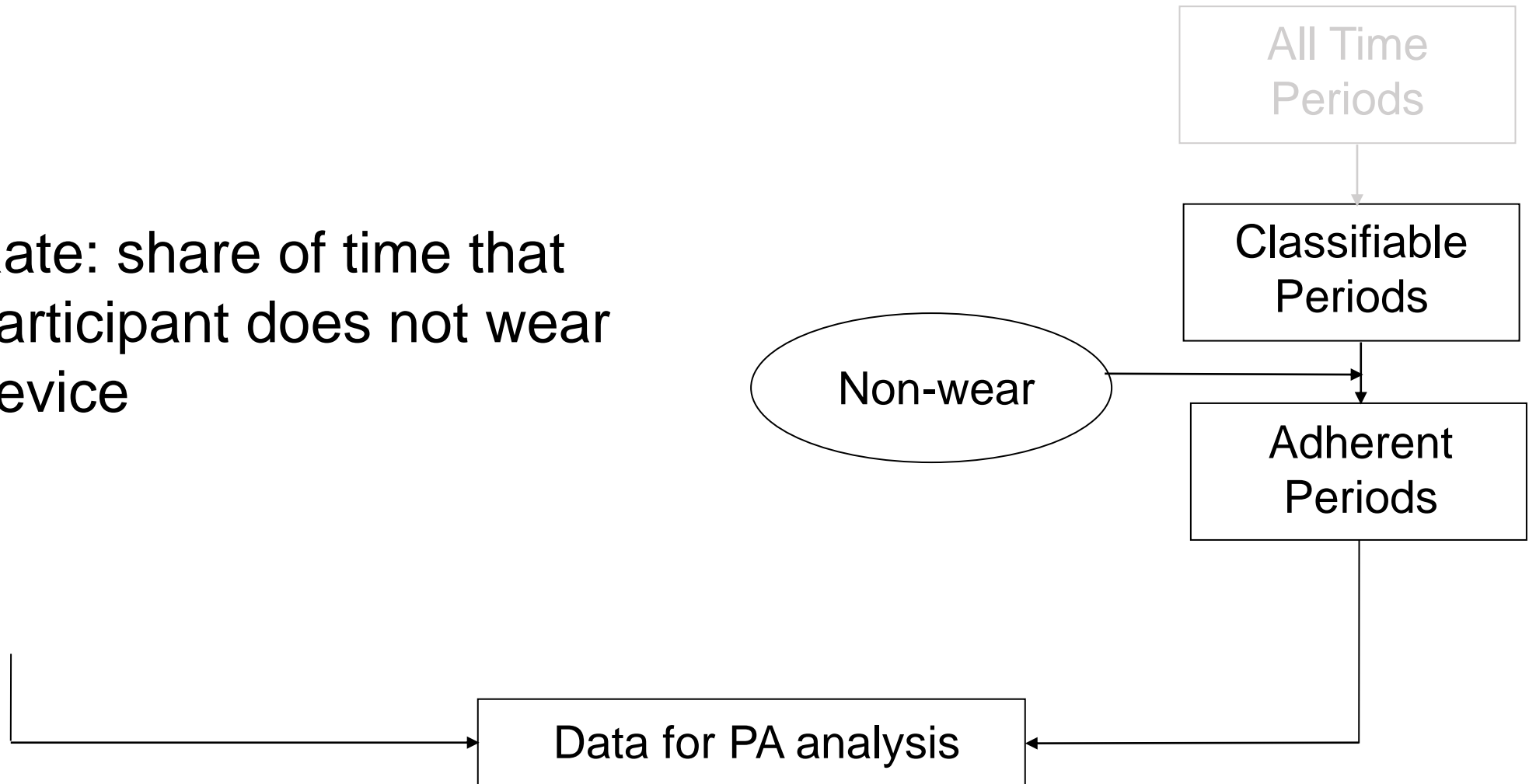


# Sample-Level



Rate: share of time that participant does not wear device

### Participant-Level



# Illustration: NHANES 2011-2012 and 2013-2014

- Cross-sectional study in U.S.
- Participants first interviewed in homes, subsequently examined in Mobile Examination Center (MEC), then given accelerometer
- Data source: Actigraph GT3X+ (waterproof) accelerometer
  - 80 Hz raw data aggregated to 1-minute measurement periods
  - Ages 3 yrs + (6+ for 2011)
- Protocol:
  - 24-hour wear requested over 7 complete days
  - Return device by mail (\$40 incentive paid upon receipt)

# Sample-Level Participation Rates

Step	2011 NHANES		2013 NHANES	
	N	Rate	N	Rate
Study Sample <sup>a</sup>	7,821		8,913	
Returned Device (w/ readable data) <i>Consent/return rate</i>	6,917	<b>88%</b>	7,776	<b>87%</b>
Adherent Participants <sup>b</sup> <i>Adherence rate</i>	6,467	<b>94%</b>	7,114	<b>91%</b>
<i>Net participation rate</i>		<b>83%</b>		<b>80%</b>

<sup>a</sup> Responded to household interview; examined in Medical Examination Center; eligible for accelerometer study

<sup>b</sup> Algorithm-estimated wear time of at least 10+ hours on 4+ days of the 7-day study period.



# Participant-Level Rates

Step	2011 NHANES		2013 NHANES	
	N	Rate	N	Rate
Total Periods (minutes)	10,080		10,080	
Classifiable Periods <sup>a</sup> <i>Classifiable data rate</i>	9,638	<b>96%</b>	9,665	<b>96%</b>
Wear Periods <i>Wear rate</i>	9,119	<b>95%</b>	9,071	<b>94%</b>
<i>Overall Wear Rate</i>		<b>91%</b>		<b>90%</b>

<sup>b</sup> Classifiable into wear vs. non-wear categories, as reflected by algorithm-assigned “confidence value”.

Overall, NHANES was able to measure PA for 90-91% of the measurement periods on 80-83% of the eligible participants.

# Discussion and Conclusion

- Non-participation occurs at two levels
  - missing participants and missing measurements among participants
- Participation steps can be delineated in different ways; unclear which distinctions are most useful
  - more fine-grained categories are probably useful if trying to predict non-participation behavior
  - more general categories are probably sufficient if only trying to characterize amount of missing data
- Next steps are to:
  - define formulas for rates and biases
  - potentially extend to other data sets

# Thank You!

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