

# Moving Toward Personalized Behavioral Medicine: Integrating Smartphone-based GPS Data into a Digital Alcohol Intervention

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## BACKGROUND

- \* Integrating phone-based GPS data into digital intervention provides a low burden method of seeing how daily travel relates to drinking and intervention response.
- \* In prior work, GPS features, such as greater radius of gyration (ROG: how far a person travels from a “central” location), were key predictors of same-day drinking.
- \* Sample-level relations, however, may not represent any individual or subgroup.
- \* Identifying person- & subgroup-specific patterns can inform tailored intervention.

## ANALYSIS PLAN

- \* Group Iterative Multiple Model Estimation (GIMME) network analyses included cases with adequate data and person-level models that converged (n=33).
- \* GIMME and a subgrouping algorithm explored relations between day-level alcohol quantity and 5 GPS variables: radius of gyration (ROG), # of locations visited, # of location clusters visited, total distance traveled, and time at home.
- \* Intervention status (treatment vs control) was included as an exogenous variable. PerturbR evaluated robustness of the identified subgroups.

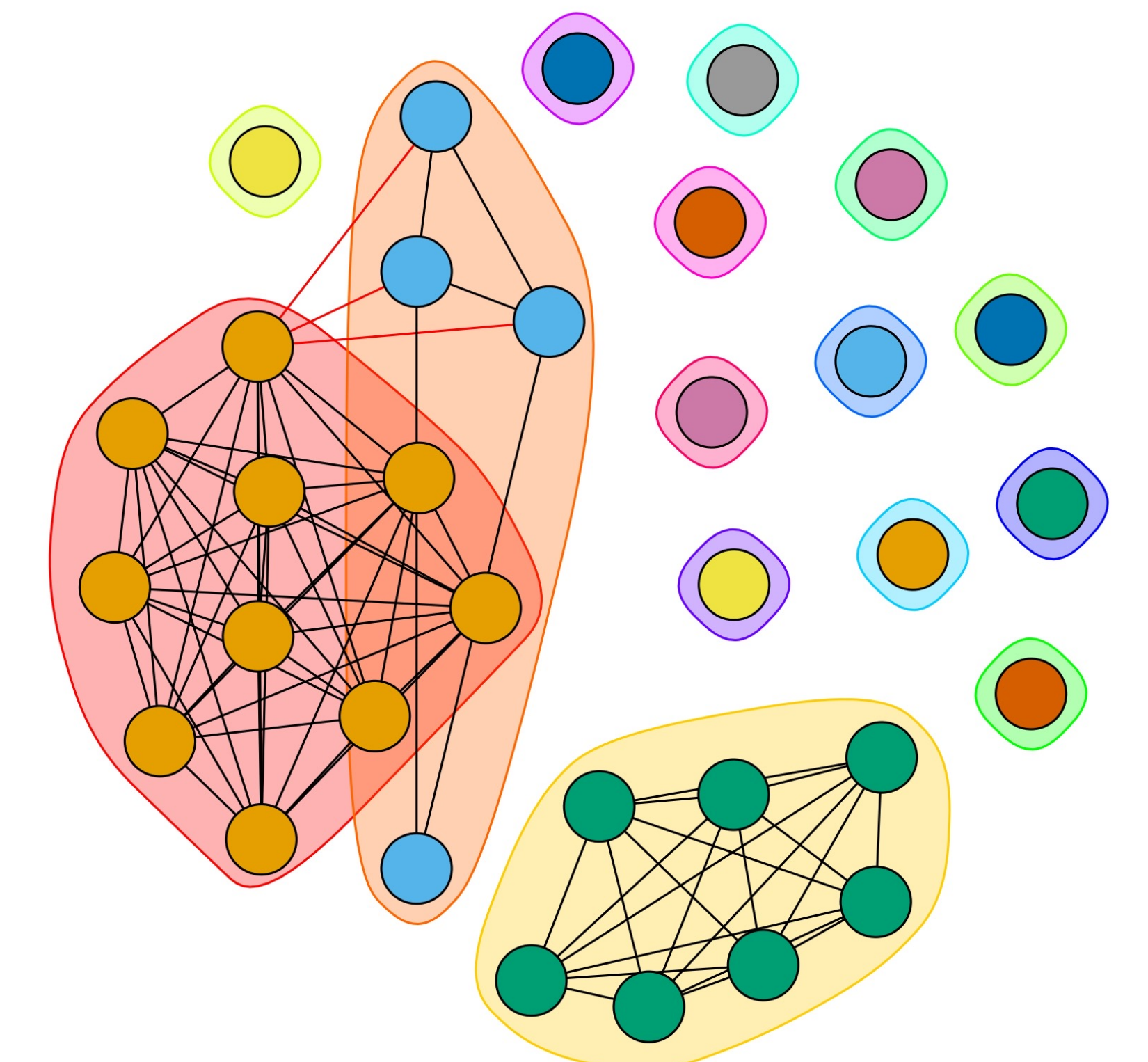
## OBJECTIVE

This exploratory study used a data-driven method to identify network relations between phone-based GPS features and alcohol use in a digital alcohol intervention at sample-, subgroup-, and person-levels to guide tailored intervention.

## RESULTS

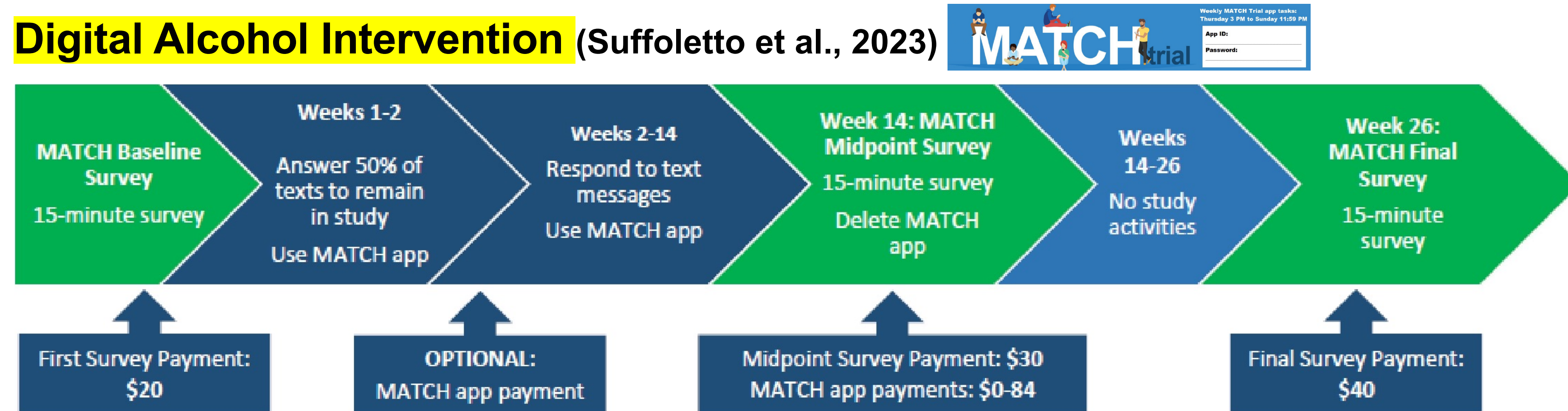
### Sample-level and subgroup associations

- \* GIMME did not identify any sample-level paths, but did identify 3 subgroups with modularity=.57 (values >.30 indicate strong communities; supported by perturbR).
- \* The 3 subgroups represented 30.3%, 21.2% and 12.1% of participants. 12 participants were not assigned to any subgroup (see Fig 1).
- \* All 3 subgroups had a subgroup-specific association involving radius of gyration (ROG): ROG with total distance, time at home, # of locations visited), indicating ROG’s centrality in the network.

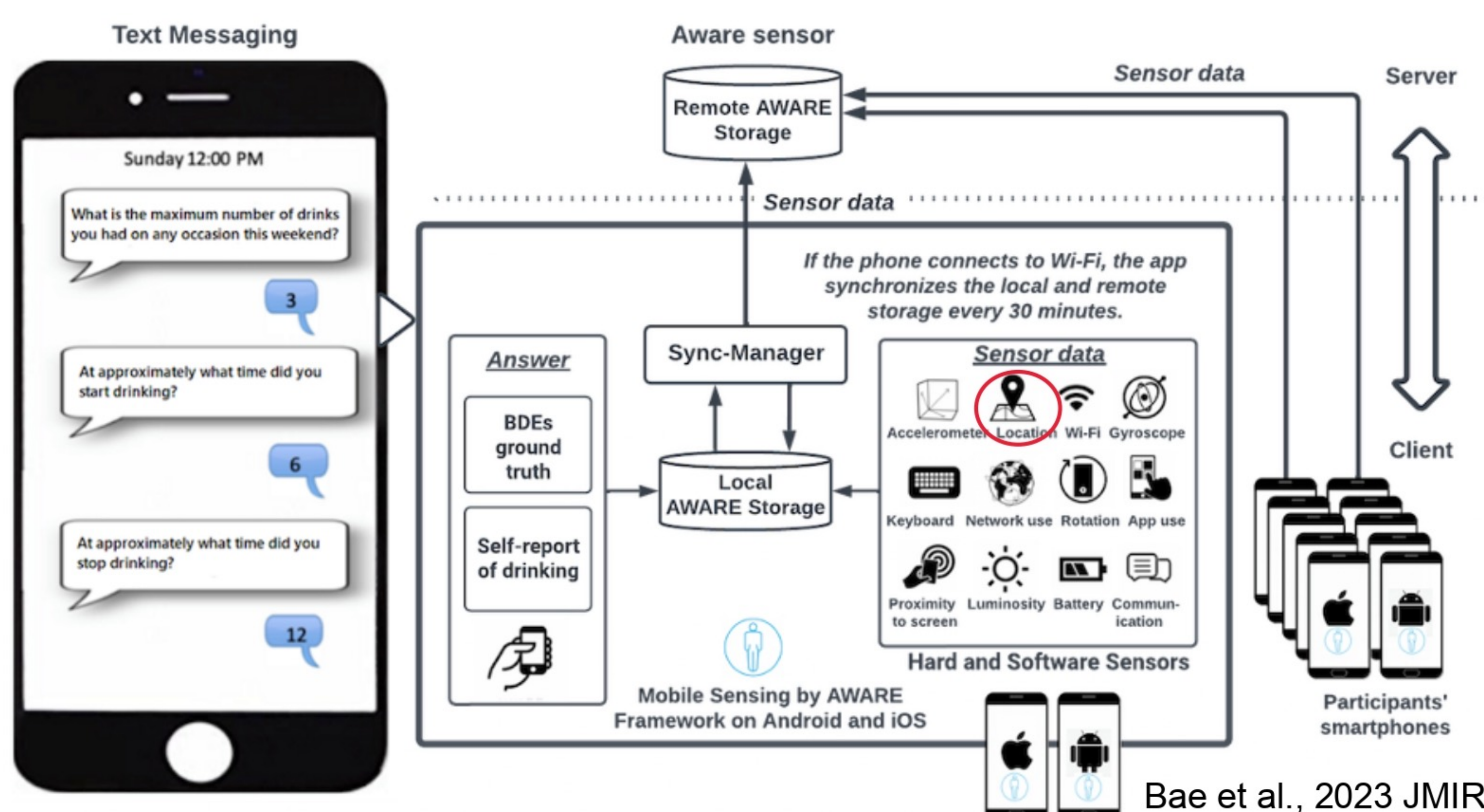


GIMME identified 3 subgroups

## METHODS

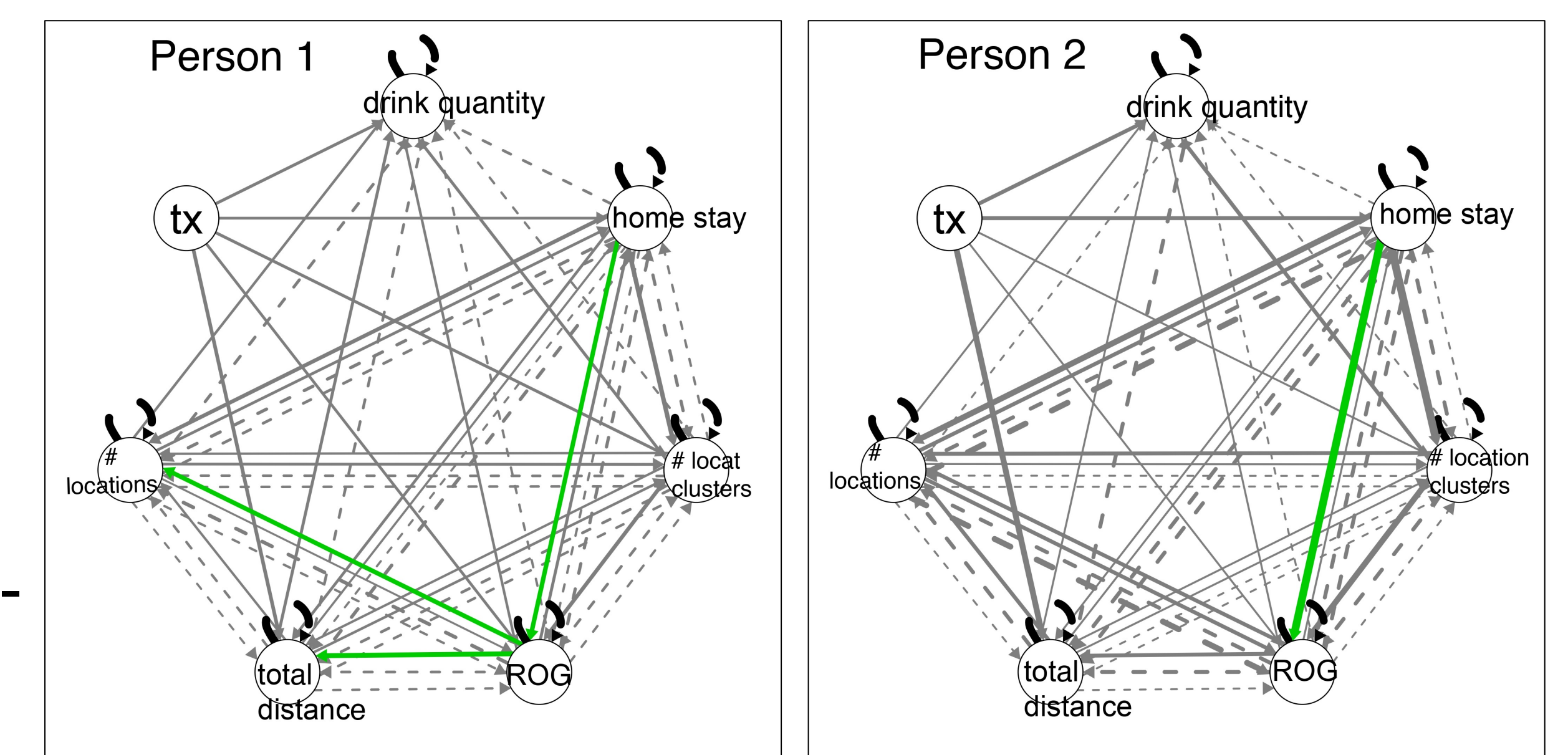


### Combined with smartphone GPS data collection during 12-wk intervention



### Person-level associations

- \* Although subgroups were identified, individuals differed in network associations (in strength and presence) of drinking quantity with GPS-derived travel patterns.
- \* Figures for Person 1 & 2 show example network associations at the person-level.
- Green** = subgroup effect
- Gray** = person-specific effect
- Solid**=contemporaneous effect
- Dashed**=lagged effect
- Thickness**=effect strength
- \* Heterogeneity at individual-level highlights importance of personalized intervention.



## PARTICIPANTS

Young adults (ages 18-25) in the MATCH Study clinical trial (NCT02918565) were asked to participate in a phone sensor substudy. Eligible individuals reported >1 “binge drinking” occasion in the past 30 days and an Alcohol Use Disorder Identification Consumption (AUDIT-C) score of  $\geq 3$  for women and  $\geq 4$  for men). Participants collected daily smartphone GPS data and text message reports of alcohol use for 14 weeks. Analyses included cases with adequate data (n=33).

- 72.7% Female; ages 18-25, mean age=22.4 (SD=2.0)
- 48.5% White, 21.2% Black, 15.2% Hispanic, 15.1% Other race/ethnicity
- 81.8% in intervention (n=27) and 16.2% in control condition (n=6)
- Number of time points: range (78-103), mean = 97.8 (SD=6.0)

## CONCLUSIONS

- \* Network analyses reveal heterogeneity in patterns of association between drinking quantity and GPS travel data, and ROG as a key predictor of alcohol use.
- \* ROG’s association with certain GPS features could be used to trigger context-specific intervention for specific subgroups of young adults.
- \* Use of low burden phone GPS data can help personalize digital alcohol intervention by tailoring “content” to “context” of daily activities to maximize impact.