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Mathematical and Computational Modeling of Social Norms and College Drinking

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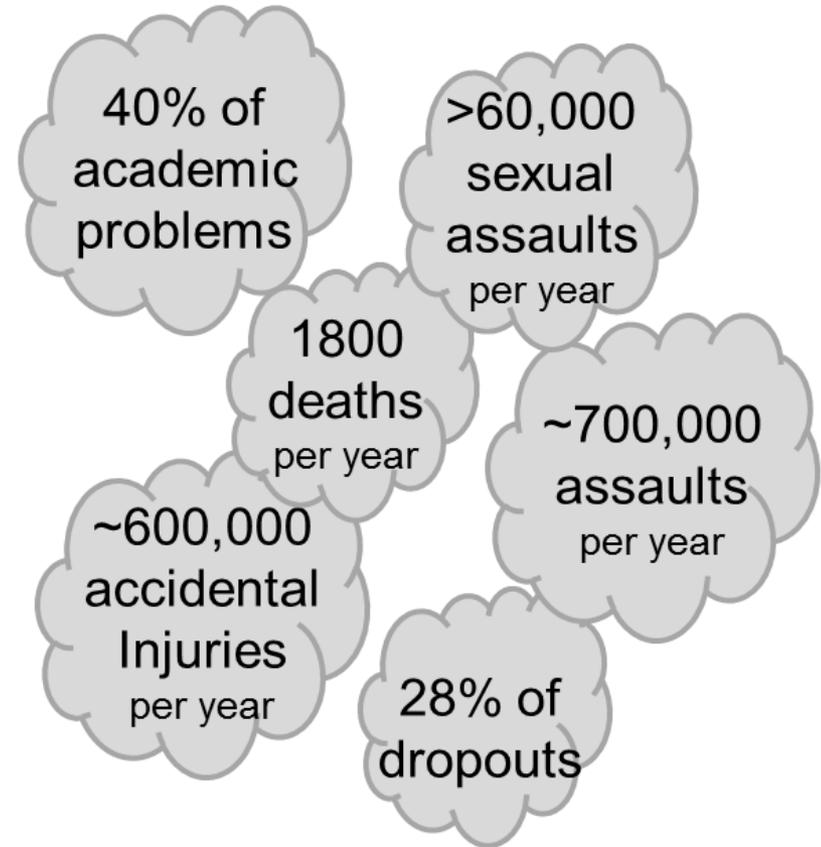


- We are interested in understanding Social Norms Theory (SNT) as it pertains to college drinking
 - NIH has invested millions of dollars in Social Norms-based interventions
- SNT assumes a causal relationship between misperceptions about drinking of others and personal drinking
- We are translating theories from social psychology into quantitative models to understand this potential causal relationship
- We apply quantitative models to examine the potential effectiveness of complex, expensive intervention strategies based on SNT

What is Special about College Drinking?



- Alcohol is a factor in several problems
- Heavy Episodic Drinking (HED) is essentially a college drinking behavior
 - 5 or more drinks for men, 4 or more for women, at a single drinking event
 - College age people not in college rarely engage in HED behavior
 - It's becoming a high school problem too
- HED behavior correlates strongly with many of these negative outcomes
- HED behavior is a social behavior
- Individual-based interventions are difficult to implement
 - HED individuals are difficult to identify
 - HED ~40% of the population

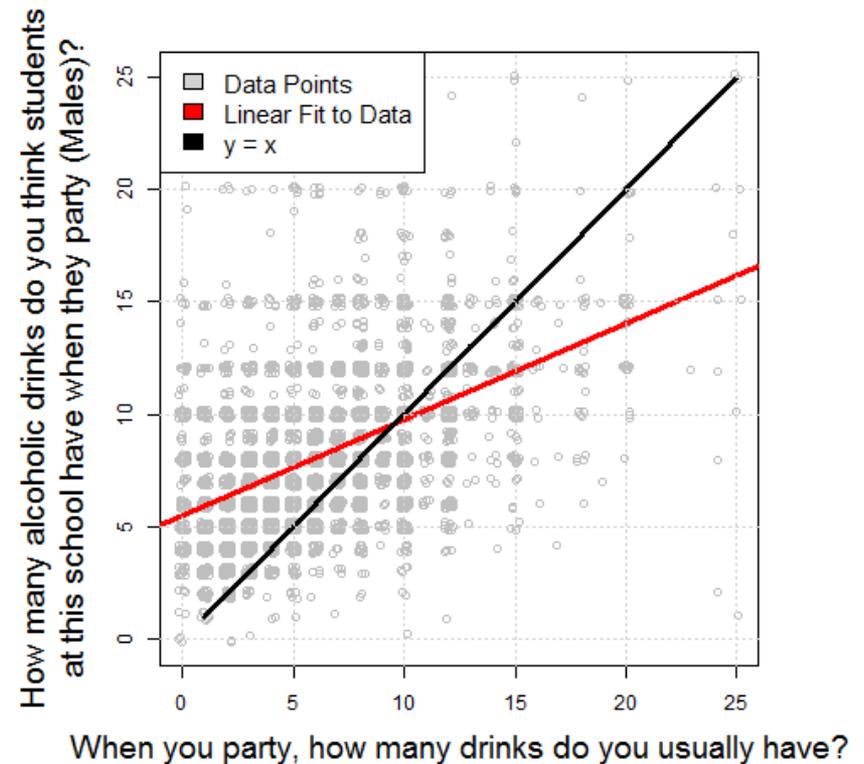
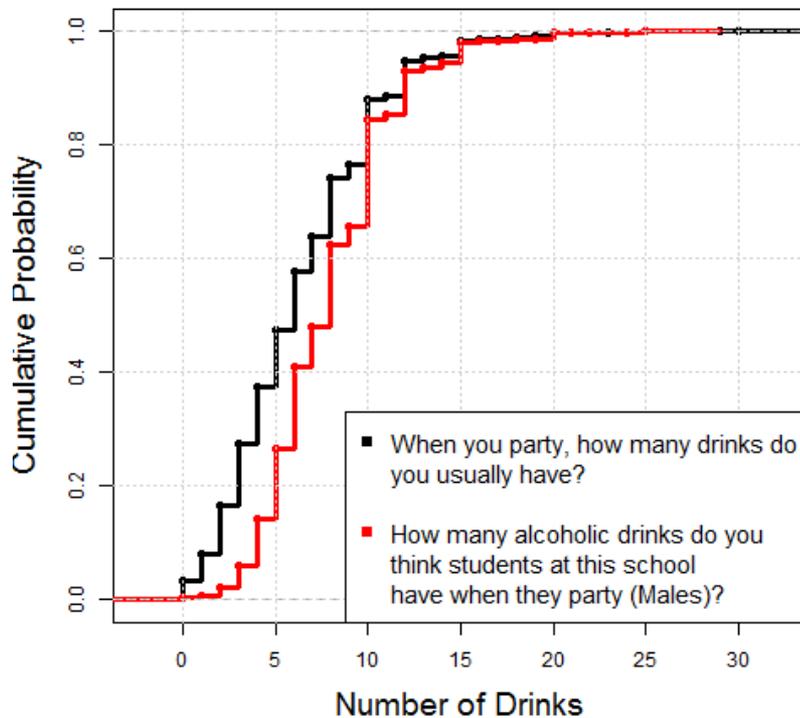


Social Norms Theory and College Drinking



- Social Norms are the normative/accepted behaviors within social groups
- College students tend to overestimate “normative” or typical drinking behavior
- Students with higher perception of typical drinking tend to drink more

Data from the Social Norms Marketing Research Project (SNMRP)



- **SNT posits that misperception drives drinking (Why?)**



- In interactions with others, individuals modify behavior to receive appraisals that verify an identity standard
 - **Identity verification (IV)**, a component of identity theory
- In a group, drinkers have a tendency to match confederates' drinking rates
 - **Peer influence (PI)**, from social identity theory
- Individuals will also have a tendency to drink to their identity standard
 - **Self-monitoring (SM)**, (social self)
 - High self-monitors attempt to fit in with the crowd, while low self-monitors tend to disregard social pressure
- These are observed causal mechanisms in social psychology



- Agents have a number of attributes related to personal drinking, perception of others' drinking, and friendships
- Agents congregate into small groups
 - Determined largely by friendships
 - Membership is dynamic
- Identity Verification
 - Agents receive appraisals from others
 - The median of these appraisals forms the identity verification standard
- Peer Influence
 - Observe others' behaviors and act accordingly
 - The median of others' drinking forms the peer influence standard
- Self-monitoring
 - The individual's identity meaning forms the self-monitoring standard
- Each individual drinks according to a convex combination of these three
 - The weights of the convex combination are agent attributes



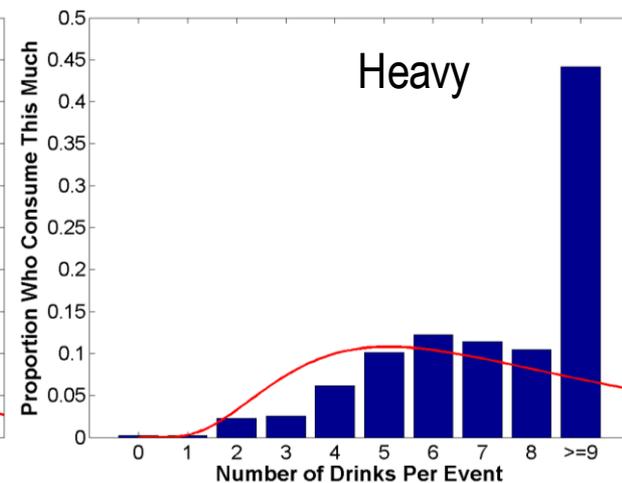
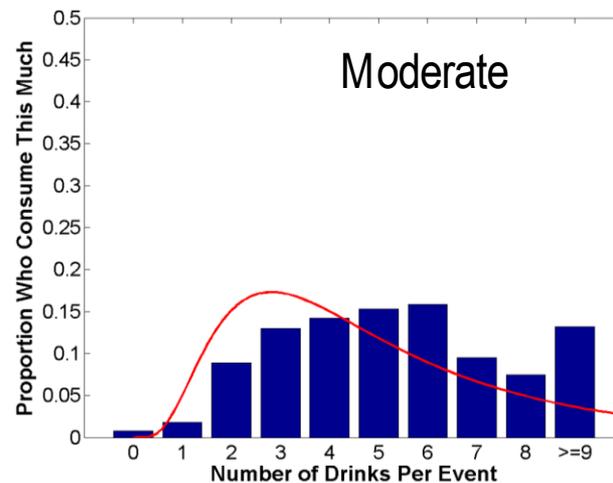
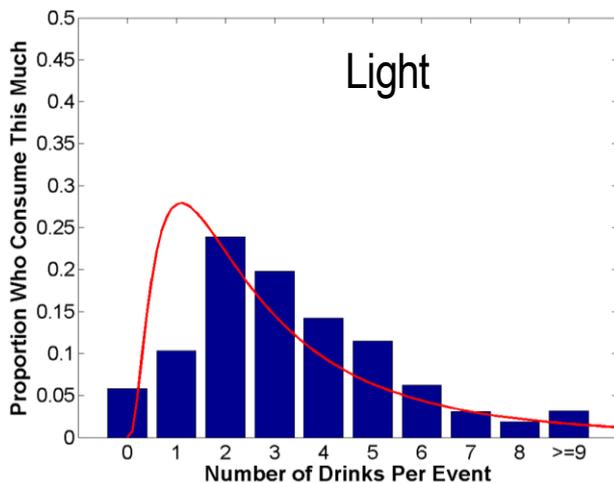
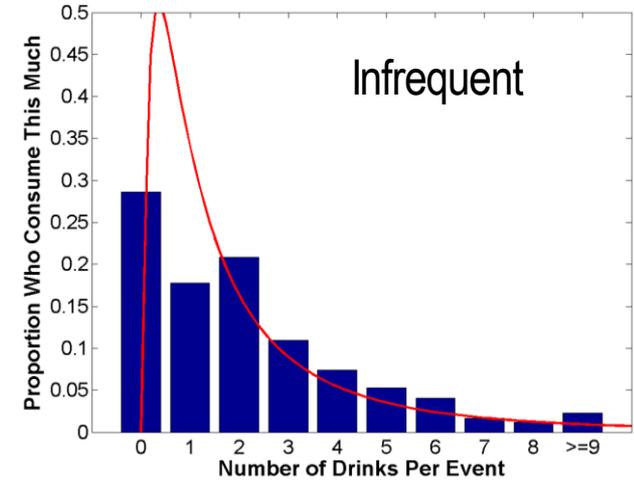
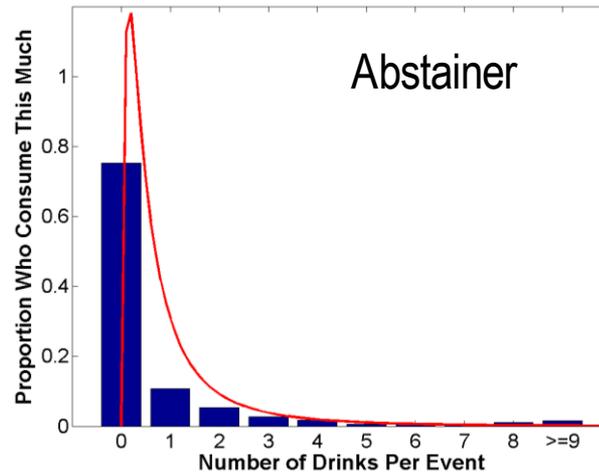
- Agents have a simple trait variable, used to assess friendships
 - Real number $[0,1]$, may be correlated with drinking identity
- Agents have a drinking identity
 - Abstainer, Infrequent, Light, Moderate, Heavy
- Drinking identity has a meaning.
 - Each of the five identities has a probability distribution
 - Those probability distributions model drinks per event
- Agents have meanings for all identities to provide appraisals to others
 - This is the model of misperception
 - Positive random perturbations are added to each of the five identity meanings
- Agents have three weights (which sum to one) for the three mechanisms of drinking (IV, PI, SM)

Parameterizing Identities and Meanings



Harvard College Alcohol Study (CAS) provides identities and meanings

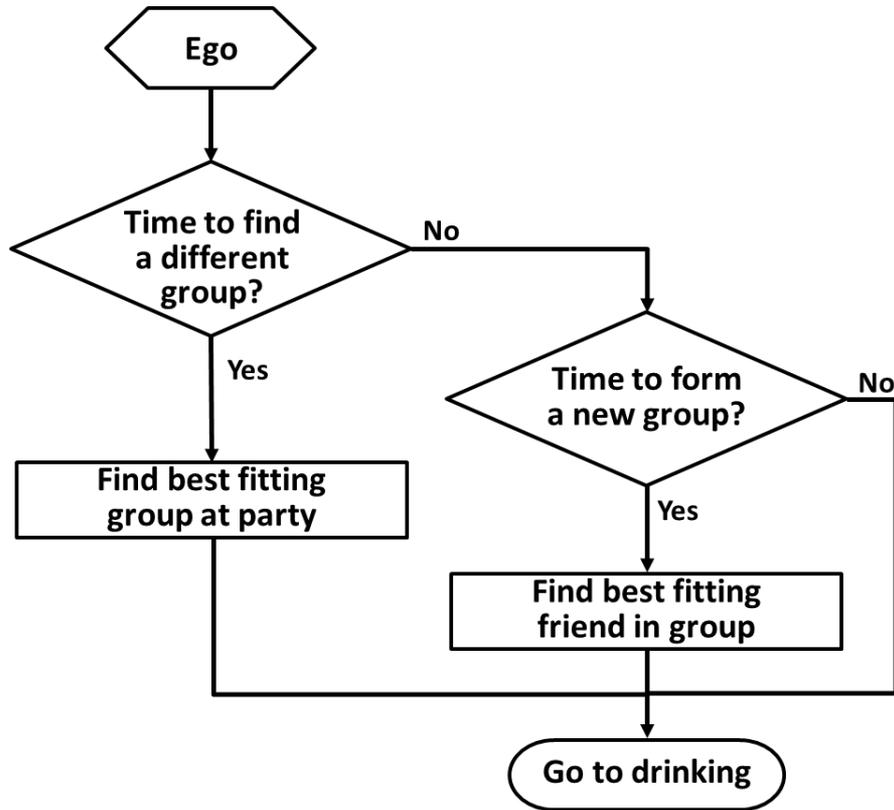
<i>Drinking Type</i>	<i>Proportion</i>
Abstainer ~ D_1	0.0488
Infrequent ~ D_2	0.2798
Light ~ D_3	0.2453
Moderate ~ D_4	0.3616
Heavy ~ D_5	0.0645



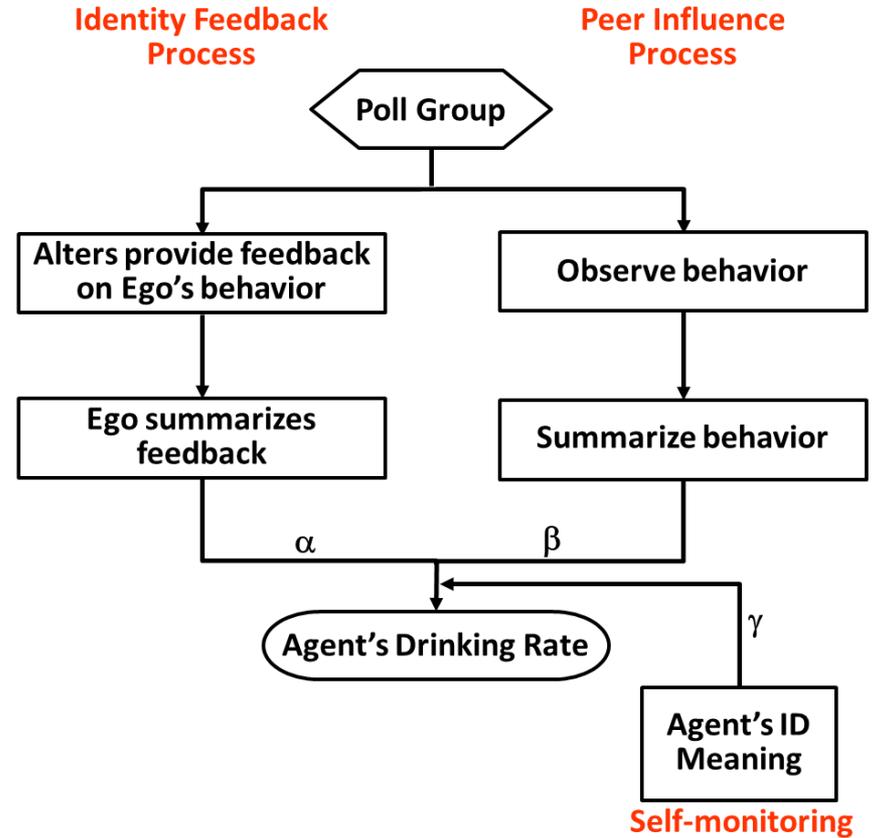
SNMRP data suggests misperception has mean 2 drinks and standard deviation 4 drinks



Grouping Activities

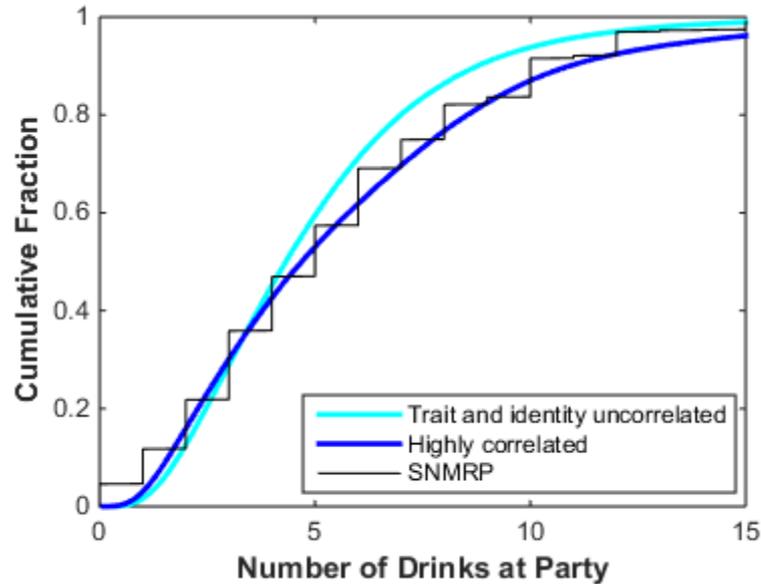


Drinking Activities

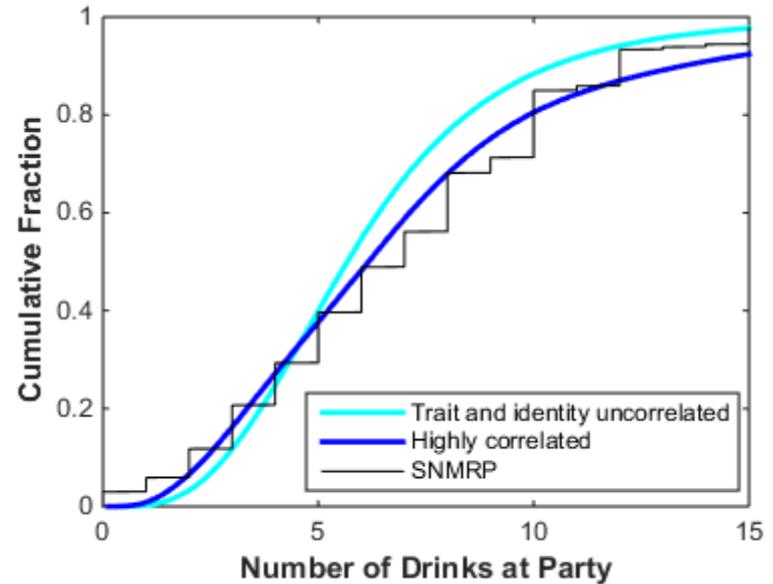




Drinks While Partying at Light Drinking Schools



Drinks While Partying at Heavy Drinking Schools



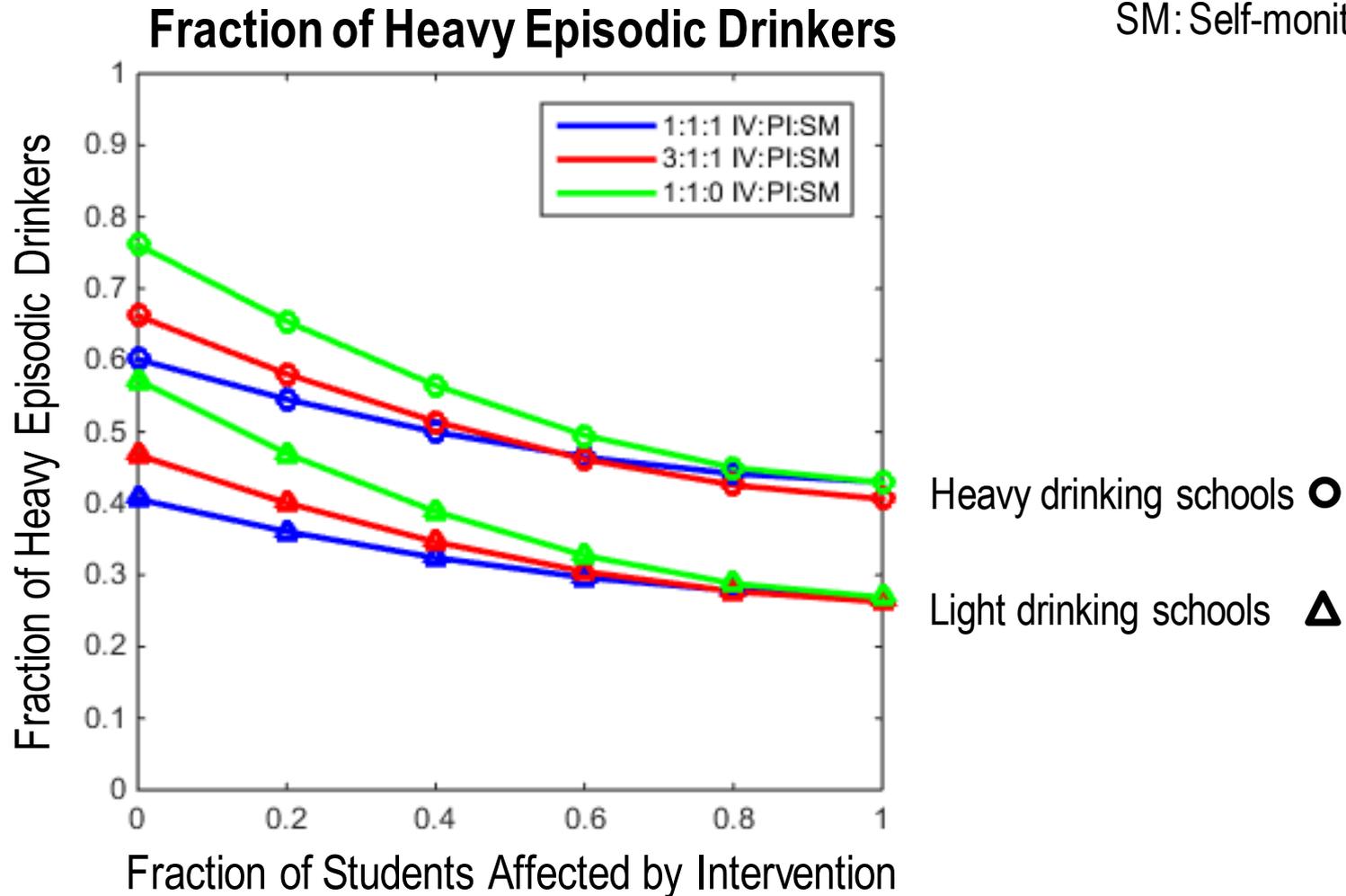


- Misperception enters the model through the feedback appraisal process of Identity Verification
- The effectiveness of the Social Norms Campaign will depend on how we can modify that: we want to convert appraisal sensitivity into low self-monitoring
 - Provide accurate feedback appraisals to others
 - Reject inaccurate feedback from others
- Parameters are:
 - The fraction of the population that are affected by this conversion
 - The weightings of the three drinking pressures
 - The drinking environment at the school, as embodied by the distributions of identities and meanings



- IV, PI, and SM: 3 different parameterizations
- Traits and identities **uncorrelated**

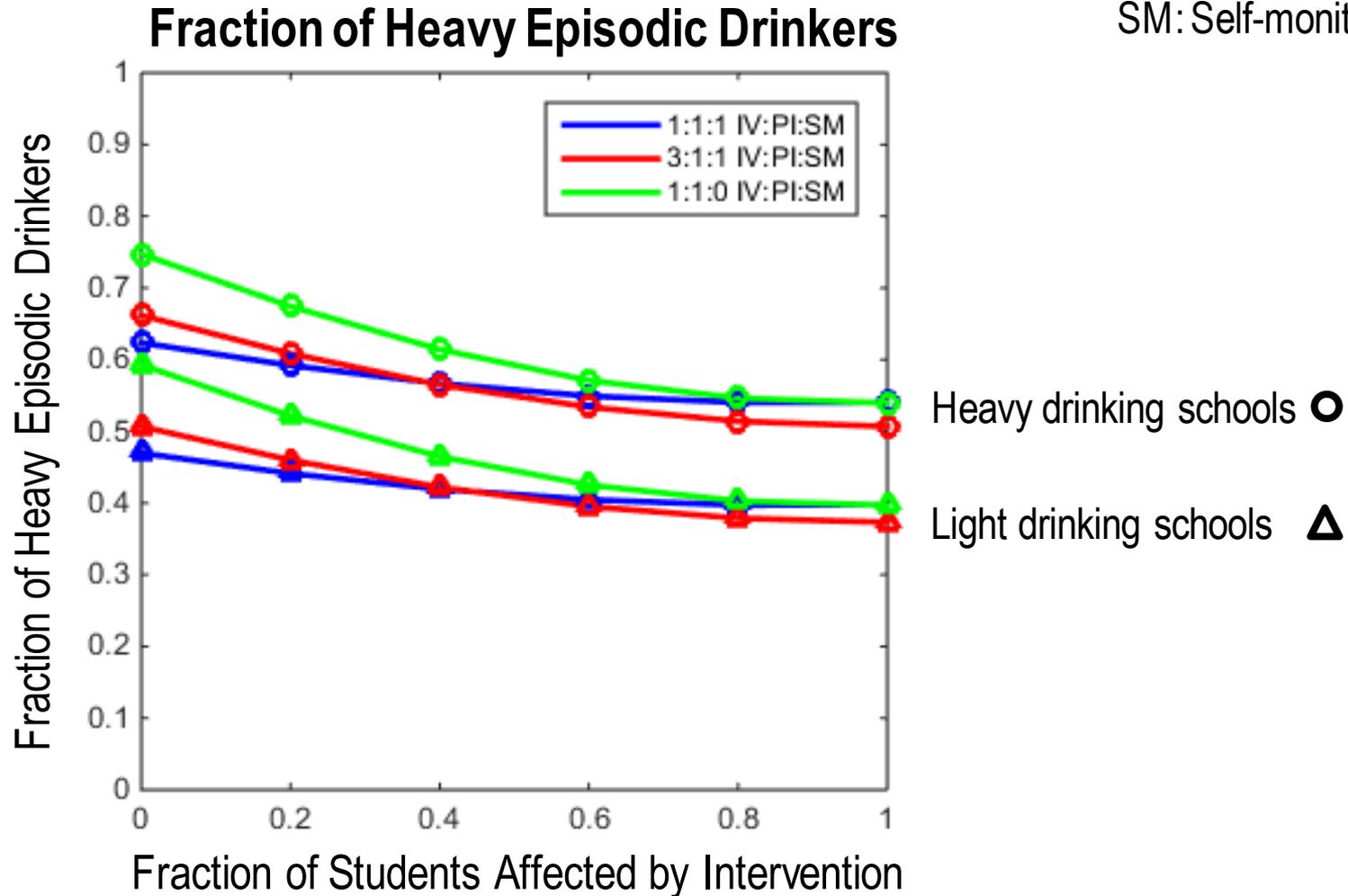
IV: Identity verification
PI: Peer Influence
SM: Self-monitoring





- IV, PI, and SM: 3 different parameterizations
- Traits and identities **highly correlated**

IV: Identity verification
PI: Peer Influence
SM: Self-monitoring





- Simulation modeling can convert social theory into computational practice
 - Survey data has been used to develop many relevant parameters
- A widely applied intervention technique has been investigated
 - Highly correlated friendships and drinking identities → SNM campaigns have little or negative (increased drinking) effects
 - SNM campaigns can be effective (decreased drinking) for high self-monitors
 - In this study, the difference in drinking between light and heavy drinking schools is greater than the difference resulting from the SNM campaign.
- Next steps: longer term modeling, environmental issues
- Survey and experimental research is needed on social forces and identity