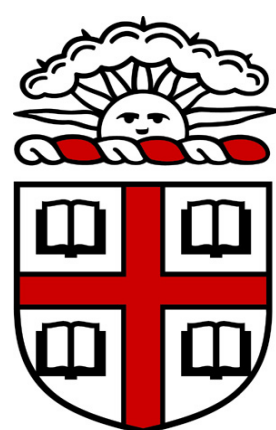# Intervention effects on stage transitions for adolescent smoking and alcohol use acquisition
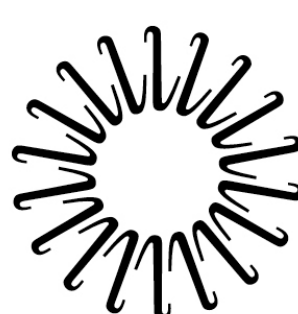
LA Brick[1,2], CR Redding[3], AL Paiva[3], WF Velicer[3]

[1] Division of Behavioral Genetics, Department of Psychiatry, Rhode Island Hospital
[2] Alpert Medical School of Brown University, Providence, Rhode Island
[3] Cancer Prevention Research Center, University of Rhode Island, Kingston, Rhode Island

BACKGROUND

- Cigarette smoking represents the largest preventable cause of death and alcoholic beverages represent the most common psychoactive substance used by young people in the US.[1]
- A recent school-based intervention reported findings from a Transtheoretical Model (TTM) computer-delivered, multiple behavior intervention in middle school students.[2]
- Students in an energy balance intervention effectively reduced smoking and alcohol acquisition relative to the substance use intervention condition, despite no direct treatment.
- In light of these findings, a detailed look at the underlying process of stage change for students who are not yet smokers or drinkers will inform future intervention studies aimed at preventing substance use.

Goals of current study:

1. Characterize the best pattern of stage movement (see Table 1 models #1-4).
2. Test whether the identified pattern was stable from grades six to nine (see Table 1 models #5-8).
3. Determine whether the substance use prevention intervention effectively kept adolescents in acquisition stages (see Table 1 models #9-13).

METHODS

Baseline Sample
- 6th grade school students (N=4,158) were:
  - 47.8% female
  - 65.0% white, 15.6% Hispanic, 3.8% Black, 2.4% Asian, 2.2% American Indian/Alaskan Native, 0.5% Pacific Islander
  - Ranged in age from 10-15 years (M=11.4, SD=0.7)
- School-based, computer delivered, TTM-tailored multiple behavior intervention across 20 Rhode Island Middle Schools, two interventions:
  - Substance Use Prevention (SP): focus on prevention of smoking and alcohol use
  - Energy Balance (EB): focus on physical activity and eating behaviors

Measures
- Stages of change for smoking/alcohol acquisition:
  — acquisition Precontemplation (aPC)
  — acquisition Contenplation (aC)
  — acquisition Preparation (aPR)
  — Smoker/Drinker

*Table 2. Stage distribution by intervention group.*

|	SP Intervention (N=1,974)		EB Intervention (N=2,184)	
	%	N	%	N
Baseline Smoking Stage				
aPC	99.1	2142	98.9	1918
aC	0.2	5	0.6	12
aPR	0.7	15	0.5	9
Baseline Alcohol Use Stage				
aPC	98.1	2074	97.3	1853
aC	1.1	24	1.6	30
aPR	0.8	17	1.1	21

Statistical Analyses
- SAS version 9.4 with the PROC LCA/LTA SAS Macro.
- Markov models to estimate: stage membership and transition probabilities across four time points (6th, 7th, 8th, 9th grade).
- Nested model comparisons to determine best fitting model (see Table 2).[3]
- Full-information maximum likelihood for missing data.

RESULTS
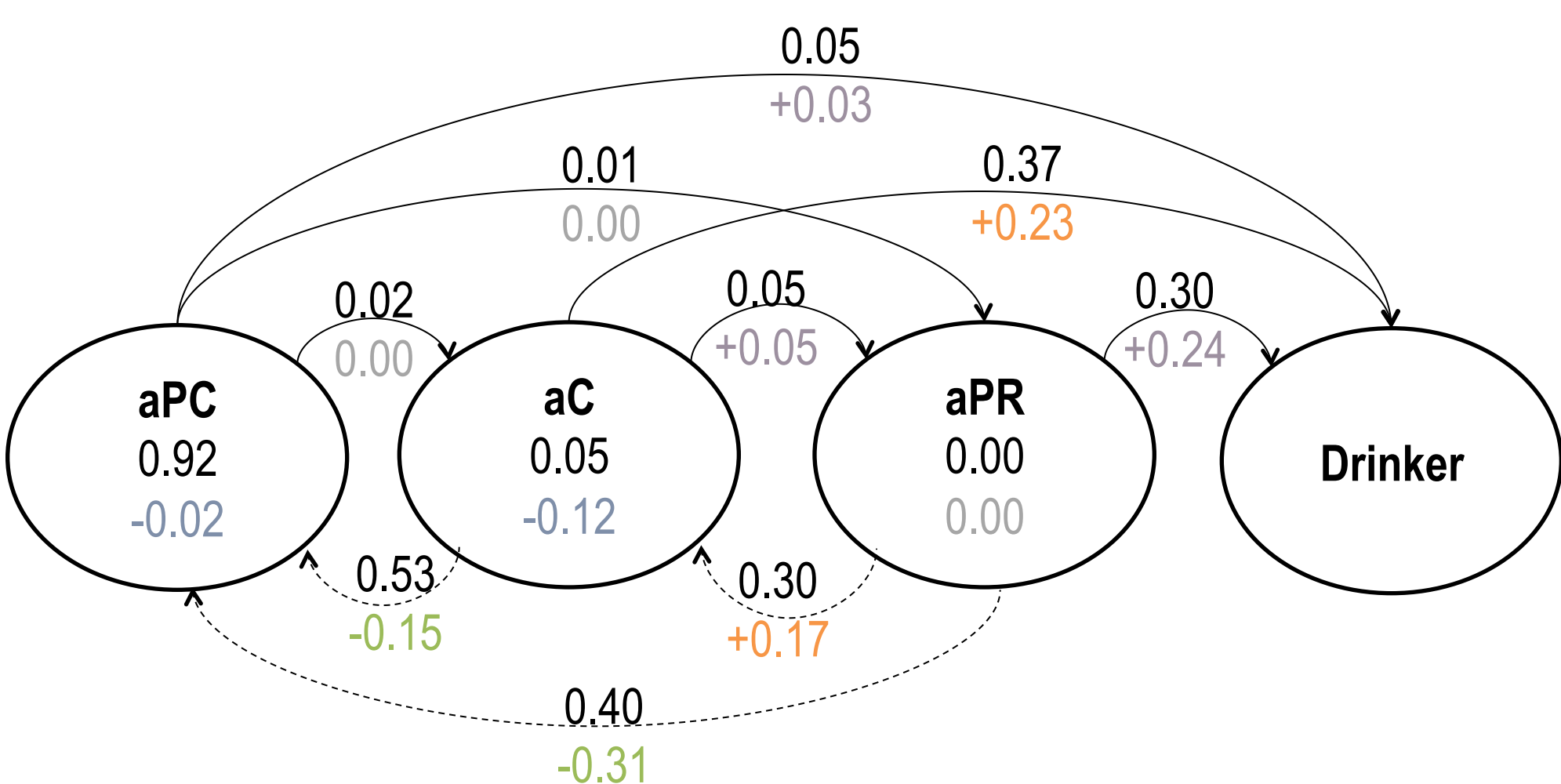
Figure 1. Smoking Transitions (Model 14).
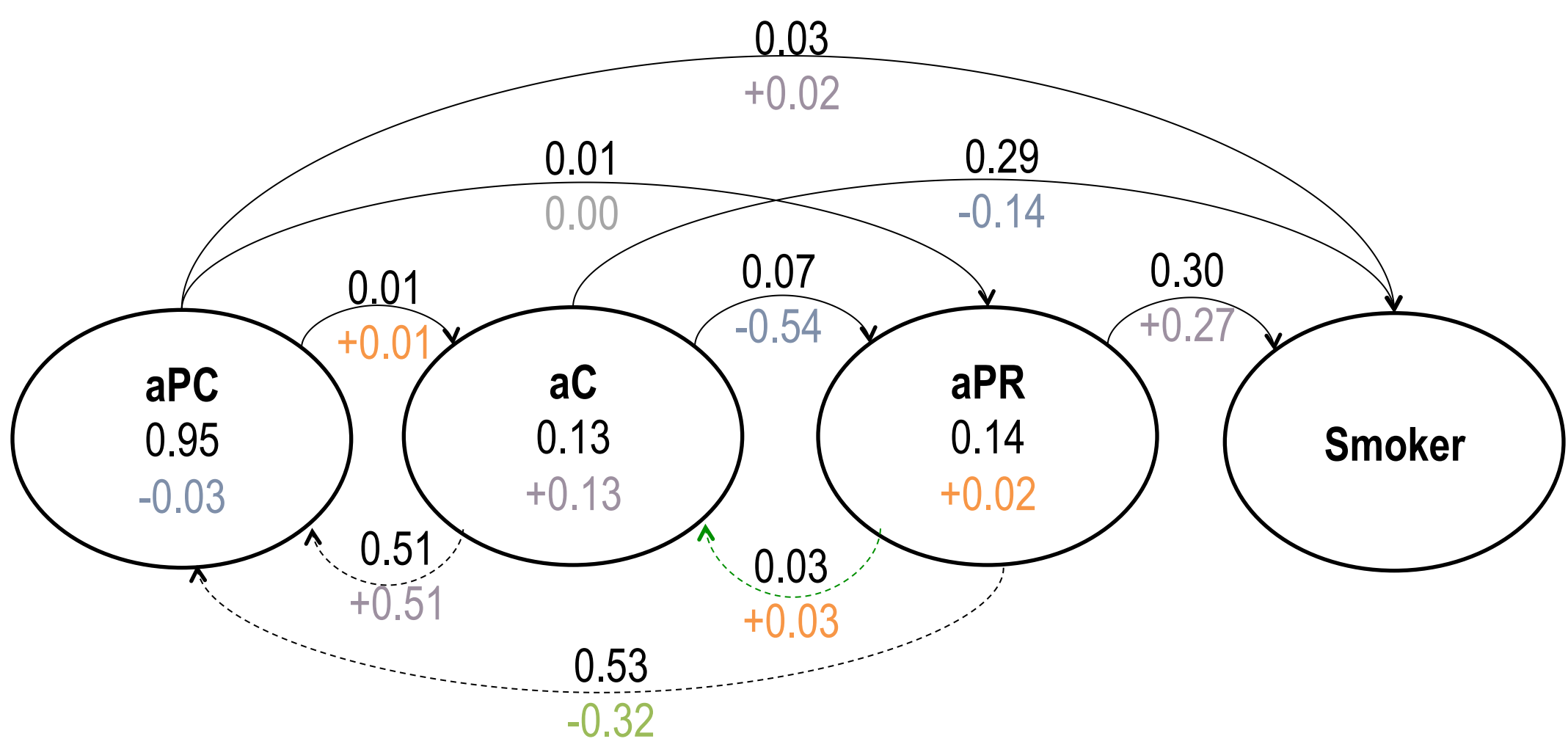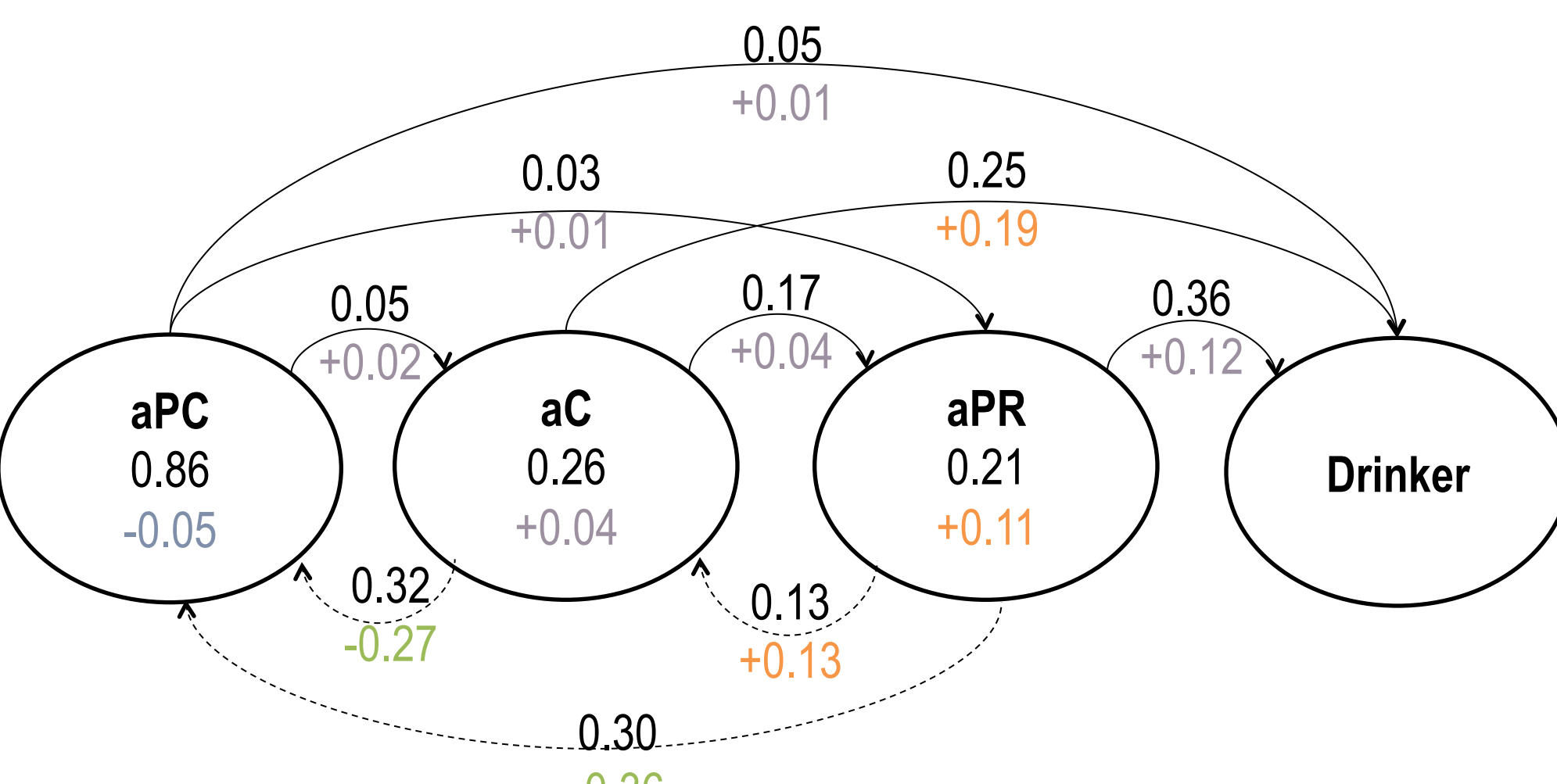

a. Transitions from 6th-7th Grade
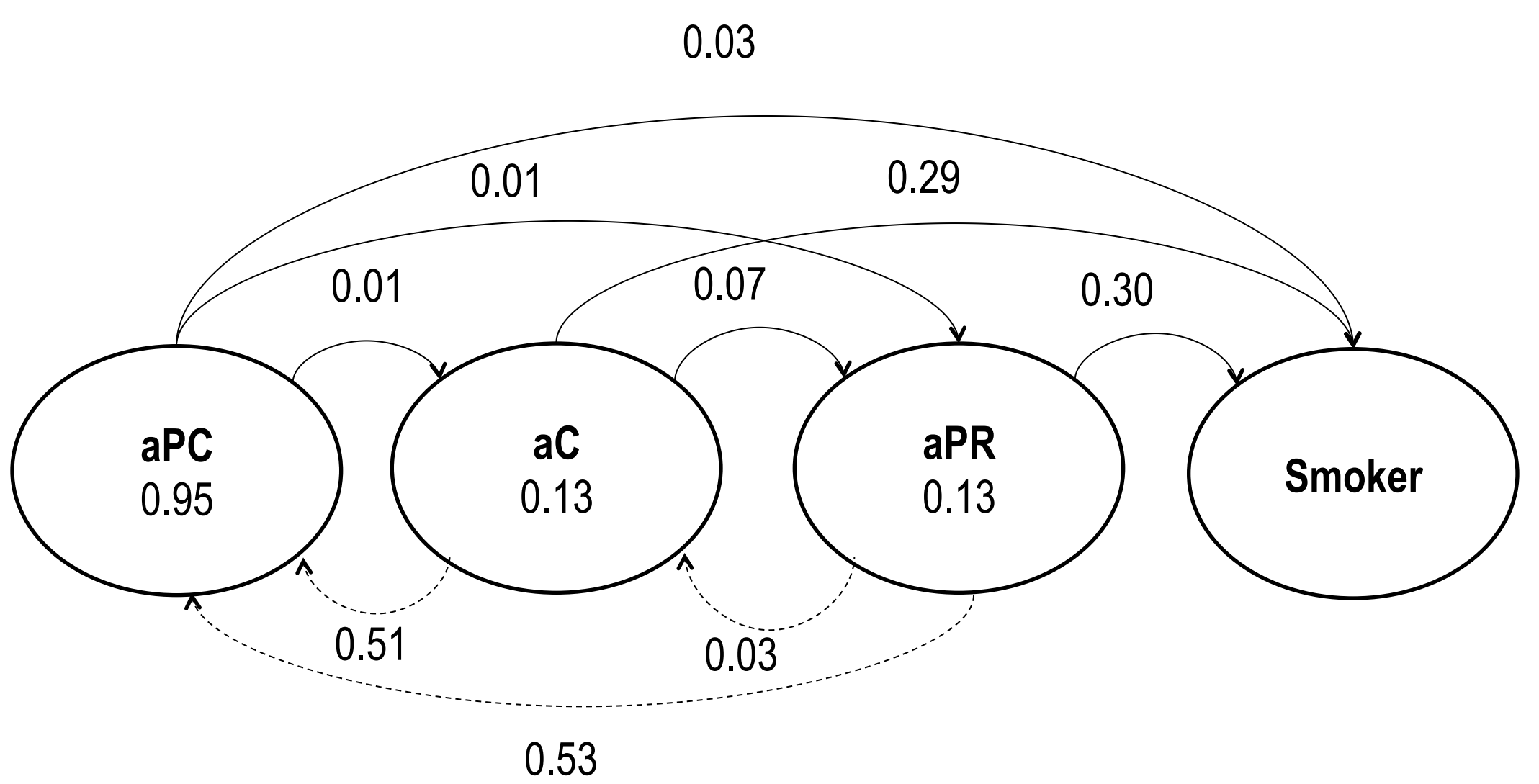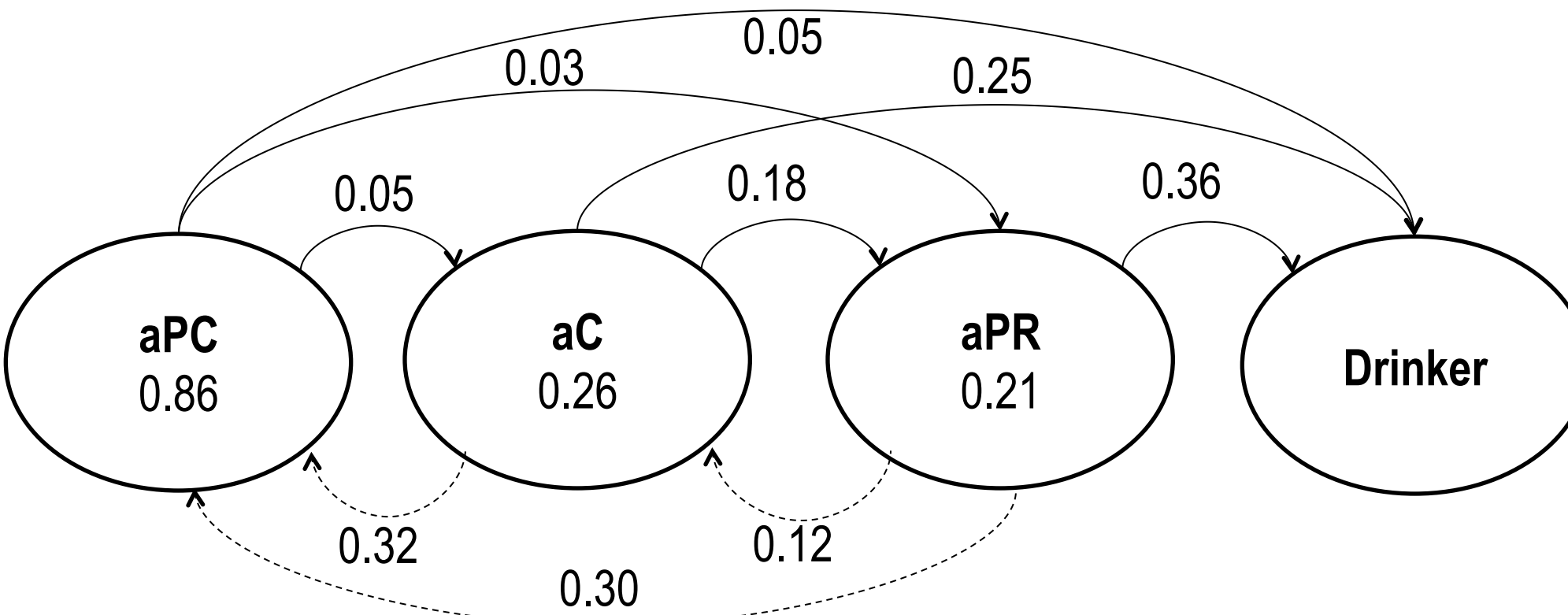

b. Transitions from 7th-9th Grade

RESULTS

Figure 2. Alcohol Transitions (Model 14).

a. Transitions from 6th-7th Grade

b. Transitions from 7th-8th Grade

c. Transitions from 8th-9th Grade

METHODS

Table 1. Summary of model comparisons to determine parsimonious model.

Intervention-specific stage movement patterns (within group comparisons):
1. *Free transition model.* Provide a comparison to more restricted models (#2-8).
2. *Stage movement pattern.* Transitions constrained to two or less stages forward and/or backward.
3. *Stage movement pattern.* Transitions constrained to two or less forward and/or one backward.
4. *Stage movement pattern.* Transitions constrained to one forward and/or one backward.
5. *Stage movement across time.* Transitions from grades 6-7 constrained to equal grades 7-8.
6. *Stage movement across time.* Transitions from grades 7-8 constrained to equal grades 8-9.
7. *Stage movement across time.* Transitions from grades 6-7 constrained to equal grades 8-9.
8. *Stage movement across time.* Transitions from grades six to nine constrained to equal.

Intervention-effects on transition parameters (between group comparisons):
9. *Free transition, multiple-group model.* Provided a comparison to more restricted models (#10-14).
10. *Baseline stage membership probabilities constrained to equal across group.*
11. *Transition probabilities held equal across group.* Identify differences in estimates across grades 6-7.
12. *Transition probabilities held equal across group.* Identify differences in estimates across grades 7-8.
13. *Transition probabilities held equal across group.* Identify differences in estimates across grades 8-9.
14. ***Parsimonious model.*** Integrate the best fitting model from Models 1-13, representing the final, reduced model (see Figures 1 and 2).

CONCLUSION

- **Most students report not being interested in trying smoking or drinking, yet by grade nine ~11% had tried smoking and ~13% had tried drinking.**
- **Findings from this study demonstrated that students in aPC were less likely to try smoking or drinking than students in aC or aPR.**
- **Contrary to the original hypothesis that the substance use intervention would result in lower rates of substance use acquisition, the comparison intervention resulted in a lower number of students transitioning to trying smoking or drinking.**
- **Both interventions, however, appear to have provided protective effects on smoking and alcohol use acquisition in adolescents.**

Figure 3. Summary of main findings.

Transition patterns for smoking.

Transition patterns for alcohol use.

REFERENCES
1. Johnston, L. D., O'Malley, P. M., Miech, R. A., Bachman, J. G., & Schulenberg, J. E. (2015). *Monitoring the Future national survey results on drug use: 1975-2014: Overview, key findings on adolescent drug use.* Ann Arbor: Institute for Social Research, The University of Michigan.
2. Velicer, W. F., Redding, C. A. Paiva, A. L., Mauriello, L. M., Blissmer, B., Oatley, K., . . . Prochaska, J. O. (2013). Multiple behavior interventions to prevent substance abuse and increase energy balance behaviors in middle school students. *Translational Behavioral Medicine, 3*(1), 82-93.
3. Brick, L., Redding, C., Paiva, A., Harlow, L., & Velicer, W. (2017). Intervention effects on stage of change membership and transitions among adolescent energy balance behaviors. *Multivariate Behavioral Research.*