Appendices for "**Peer Network Processes in Adolescents' Health Lifestyles"**

These supplementary materials accompany our paper "Peer Network Processes in Adolescents' Health Lifestyles." Here, we provide the full model results from which the figures in the paper are drawn (for both the LCA and SAB models) and elaborate effects in the full model results beyond the focal effects interpreted in the paper.

Full Results, Fit Statistics & Interpretation of Controls

LCA Results

Table A2 presents the full set of class-conditional response probabilities.[1] To summarize these values in the main text, we converted these *rho*s to a set of radar plots, which modified the class-specific probabilities in two ways. First, we normalized each variable's value into a single index ranging from 0-1.[2] Second, we reverse coded indicators as necessary to ensure all normalized values had the healthiest category coded as '1' and the least healthy category coded as '0.'[3] As noted in the main text, this normalization and reverse-coding was for presentation purposes only and was not included in the LCA fitting process.

SAB Model Fit

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[1] The LCA results corresponding to the 2-class solution for Sunshine Wave II are available from the third author on request.

[2] For dichotomous variables, these merely take the probability of LCA class-members having the variable present. For trichotomous variables, we multiplied the category specific response probabilities by a scaling factor to reflect the proportion of members in each class who are likely to select the highest category on each variable. For the sexual activity variable, no sex is the lowest category, sex with a condom the middle category, and sex without a condom the highest level.

[3] This required subtracting the results of step 1 from zero for the following variables: smoking, drinking, chewing tobacco, drug use, screen time, and sexual activity.

We considered the standard tests of network fit, which consist of how well the model is able to reproduce the observed Wave II distributions of global features not explicitly modeled (i.e., distributions of indegree, outdegree, geodesic distances and the triad census; Ripley et al. 2019, Snijders, van de Bunt and Steglich 2010). The violin plots presented in panels 1-4 of Figures A1 and A2 show how well the distribution of these network features derived from simulations of network and LCA class evolution based upon the fitted model (i.e., the "violins") corresponded with what was observed at Wave II (red points).

Additionally, to evaluate fit of the behavior (LCA) function, we assessed the distribution of actors across classes, and how well the model recreated the assortativity between friends' LCA classes at Wave II, by measuring the proportion of friendships falling into each of the 9 combinations of ego LCA class and alter LCA class (i.e., same and different LCA classes). The violin plots in panels 5 and 6 of Figure A1 and A2 respectively show how well the model reproduced the number of members of each LCA class, and the mixing patterns between those classes.

In combination, these tests provide assurance that the estimated models were sufficiently able to recreate changes in characteristics of the observed networks and LCA class memberships.

Control Effects

It is worthwhile to interpret the additional effects in the behavior function, since the model relies on a two-mode behavior function that is less commonly used and may be unfamiliar to readers. To begin, the outdegree effect represents the probability of selecting a class, net of other model effects. Like the outdegree effect in the network function, it is negative, suggesting

that having or adding ties is costly and unlikely to be done unless other model effects are at work. The two "Outdegree * LCA Class" interactions reflect the likelihood of adolescents adopting each class, relative to the healthy class. Estimates indicate that net of other effects in the model, adolescents were least likely to adopt or stay in the discordant class and most likely to adopt or stay in the unhealthy class. In combination these effects represent the distribution of memberships across classes (similar to the linear and quadratic effects with a traditional SABM behavior function).

The final effects in the behavior function refer to how individual attributes affected class membership. We included a main effect for each attribute, which represents the likelihood of choosing the healthy class, while interactions for the discordant and unhealthy classes represent deviations from the main effect. For example, the female effects in Sunshine indicate that when considering which LCA class to adopt, females were more likely to prefer the discordant class over the healthy class than were males. Additional effects in Sunshine indicate that older students were increasingly likely to choose the discordant class; Asian students were more likely than white students to choose the healthy class, and less likely than white students to choose the discordant or unhealthy classes; and higher GPA students were more likely to adopt the healthy class, and less likely to adopt the unhealthy class. We also observe a marginally significant effect whereby Black students were less likely to belong to the discordant class than white students. In Jefferson, the only significant effects related to GPA. Like Sunshine, higher GPA students were more likely to choose the healthy class and less likely to choose the unhealthy class, compared to lower GPA students.

References

Ripley, Ruth M, Tom AB Snijders, Z. Boda, A. Voros and Paulina Preciado. 2019. "Manual for

Rsiena." *University of Oxford: Department of Statistics, Nuffield College*.

Snijders, Tom A. B., Gerhard van de Bunt and Christian E. G. Steglich. 2010. "Introduction to

Stochastic Actor-Based Models for Network Dynamics." *Social Networks* 32:44-60.

Appendix Tables

Table A1. Fit Statistics for LCA, by School and Wave

	Classes	Adj-BIC	Log-Likelihood	G^2	AIC
Jefferson Wave I	2	2419	-6343	2309	2371
	3	2390	-6301	2223	2317
	4	2401	-6278	2178	2304
	5	2422	-6260	2141	2299
	6	2450	-6245	2113	2303
	7	2476	-6230	2082	2304
	8	2510	-6219	2060	2314
Jefferson Wave II	2	2013	-4750	1912	1974
	3	1973	-4703	1819	1913
	4	1980	-4680	1773	1899
	5	1997	-4663	1738	1896
	6	2014	-4645	1703	1893
	7	2037	-4631	1673	1895
	8	2059	-4615	1643	1897
Sunshine Wave I	2	2818	-12230	2685	2747
	3	2815	-12195	2615	2709
	4	2835	-12171	2566	2692
	5	2844	-12141	2507	2665
	6	2868	-12119	2462	2652
	7	2903	-12102	2429	2651
	8	2942	-12088	2400	2654
Sunshine Wave II	2	2450	-8420	2329	2391
	3	2453	-8390	2270	2364
	4	2473	-8368	2226	2352
	5	2490	-8346	2181	2339
	6	2518	-8328	2147	2337
	7	2551	-8313	2117	2339
	8	2582	-8298	2085	2339

Table A2. Class Conditional Response Probabilities from Latent Class Analyses, by School and Wave

	Jefferson, Wave I			Jefferson, Wave II			Sunshine, Wave I			Sunshine, Wave II		
	Healthy	Mixed	Unhealthy	Healthy	Mixed	Unhealthy	Healthy	Mixed	Unhealthy	Healthy	Mixed	Unhealthy
Smoking												
None	0.86	0.31	0.12	0.81	0.43	0.07	0.95	0.95	0.44	0.96	0.94	0.40
Infrequent	0.10	0.40	0.13	0.13	0.43	0.10	0.06	0.00	0.30	0.04	0.05	0.33
Frequent	0.05	0.30	0.75	0.06	0.13	0.83	0.00	0.05	0.26	0.00	0.01	0.27
Drinking												
None	0.57	0.13	0.09	0.65	0.20	0.15	0.77	0.42	0.11	0.87	0.76	0.22
Moderate	0.20	0.07	0.08	0.14	0.00	0.05	0.08	0.36	0.04	0.05	0.08	0.10
Heavy/Problem	0.23	0.80	0.82	0.22	0.80	0.80	0.15	0.23	0.86	0.08	0.16	0.68
Other Tobacco Use	0.02	0.48	0.15	0.02	0.32	0.23	0.02	0.01	0.07	0.07	0.00	0.06
Drug Use	0.02	0.37	0.61	0.03	0.27	0.52	0.02	0.17	0.55	0.03	0.02	0.51
Physical Activity												
Heavy	0.38	0.64	0.18	0.27	0.61	0.17	0.30	0.33	0.28	0.56	0.01	0.25
Moderate	0.27	0.18	0.38	0.33	0.31	0.34	0.34	0.25	0.36	0.31	0.33	0.32
Light	0.35	0.18	0.45	0.40	0.08	0.49	0.36	0.41	0.36	0.13	0.67	0.44
Screen Time												
Low	0.51	0.57	0.60	0.63	0.66	0.56	0.37	0.63	0.39	0.44	0.43	0.43
Moderate	0.30	0.23	0.22	0.17	0.24	0.25	0.34	0.12	0.32	0.28	0.32	0.29
High	0.19	0.19	0.18	0.20	0.10	0.19	0.30	0.25	0.29	0.28	0.24	0.29
Sexual Activity												
None	0.82	0.38	0.15	0.79	0.60	0.17	0.75	0.24	0.25	0.73	0.65	0.30
Condom @ last sex	0.12	0.51	0.40	0.14	0.38	0.48	0.14	0.53	0.34	0.19	0.17	0.39
No Condom @ last sex	0.06	0.11	0.45	0.07	0.02	0.35	0.12	0.23	0.41	0.08	0.19	0.30
Health Care Use	0.52	0.62	0.48	0.49	0.80	0.44	0.38	0.54	0.33	0.45	0.25	0.38
Sufficient Sleep	0.74	0.84	0.55	0.75	0.79	0.62	0.70	0.56	0.58	0.80	0.56	0.55
Regular Seatbelt Use	0.70	0.44	0.39	0.75	0.64	0.36	0.75	0.80	0.52	0.71	0.77	0.56
Distribution	**0.49**	**0.19**	**0.33**	**0.41**	**0.19**	**0.40**	**0.53**	**0.15**	**0.32**	**0.26**	**0.35**	**0.39**

"Heat map" legend: Dark gray = least healthful class for that indicator; light gray = significantly (p < .05) less healthy than than sample mean; bold = significantly more healthy than sample mean; underlined= most healthy class for that indicator; white = not significantly different from sample mean, or row not coded (middle categories).

Table A3. SABM Parameters, by School

	Jefferson			Sunshine		
	b	SE		b	SE	
Behavior Function (LCA Class)						
Friend w/ same LCA Class [a]	**0.429**	**0.098**	***	**0.260**	**0.096**	***
Outdegree	-1.146	0.187	***	-0.505	0.112	***
Outdegree * LCA Discordant Class [b]	-0.561	0.215	***	-0.368	0.120	***
Outdegree * LCA Unhealthy Class [b]	0.692	0.194	***	0.210	0.167	
Female	-0.084	0.241		-0.511	0.170	***
Female * LCA Discordant	-0.347	0.414		1.128	0.304	***
Female * LCA Unhealthy	0.247	0.376		0.375	0.294	
Age	0.035	0.132		-0.103	0.103	
Age * LCA Discordant	-0.111	0.207		0.308	0.109	***
Age * LCA Unhealthy	0.070	0.198		0.019	0.126	
Hispanic [c]	-	-		0.240	0.305	
Hispanic * LCA Discordant	-	-		-0.631	0.423	
Hispanic * LCA Unhealthy	-	-		-0.259	0.369	
Black	-	-		0.222	0.315	
Black * LCA Discordant	-	-		-0.632	0.384	†
Black * LCA Unhealthy	-	-		-0.259	0.369	
Asian/PI	-	-		0.612	0.301	*
A/PI * LCA Discordant	-	-		-0.820	0.380	*
A/PI * LCA Unhealthy	-	-		-0.910	0.382	**
GPA	0.365	0.186	*	0.304	0.095	***
GPA * LCA Discordant	0.225	0.326		-0.064	0.164	
GPA * LCA Unhealthy	-1.266	0.292	***	-0.829	0.157	***
Parental Education	0.045	0.143		-0.131	0.084	
Parental Education * LCA Discordant	0.093	0.222		0.189	0.122	
Parental Education * LCA Unhealthy	-0.312	0.210		0.162	0.099	
Rate	1.452	0.115	***	2.583	0.183	***
Network Function						
LCA (same category) [d]	**1.008**	**0.117**	***	**3.159**	**1.435**	***
Outdegree	-3.890	0.292	***	-6.996	0.863	***
Reciprocity	2.735	0.119	***	3.882	0.346	***
Transitive Triplets	0.829	0.052	***	1.793	0.304	***
Transitive Triplets * Reciprocity	-0.747	0.073	***	-1.631	0.355	***
Indegree – Popularity (sqrt)	0.372	0.142	***	0.055	0.321	
Outdegree – Popularity (sqrt)	-0.757	0.110	***	-1.172	0.246	***
Indegree – Activity (sqrt)	0.150	0.078	†	0.055	0.420	
Course Overlap [e]	0.765	0.087	***	2.168	0.450	***
Extracurricular Activity Overlap [e]	0.253	0.076	***	0.379	0.200	†

[cont'd on next page]

[Table 3 continued]

Homophilous Selection[f]						
Gender (same category)	0.162	0.047	***	0.476	0.091	***
Grade-level (similarity)	0.698	0.081	***	0.590	0.080	***
Race (same category)	-	-		1.296	0.111	***
GPA (similarity)	0.669	0.129	***	0.590	0.080	***
Parental Education (similarity)	0.312	0.127	**	0.446	0.234	†
Attribute-Based Popularity[g]						
Grade-level	-0.008	0.032		0.356	0.104	***
GPA	0.000	0.034		0.256	0.106	*
Parental Education	0.099	0.029	***	0.003	0.050	
Rate	12.694	0.668	***	4.989	0.665	***

*** p<0.001, ** p<0.01, *p<0.05, †p<0.10

NOTES
[a] Specified using the "to" shortname within RSiena.
[b] Reference category for the LCA Class and LCA Class-based interactions is the Healthy class.
[c] Reference category for race/ethnicity variable is non-Hispanic white.
[d] Specified using the "from" shortname within RSiena.
[e] Measured at the dyadic level and specified using the "X" shortname within RSiena.
[f] Homophilous selection was operationalized differently for continuous attributes, which use a rescaled function of absolute difference, and categorical attributes, where dyad members are designates as either 1=same or 0=different. RSiena shortnames are in parentheses.
[g] Specified using the "altX" shortname within RSiena.

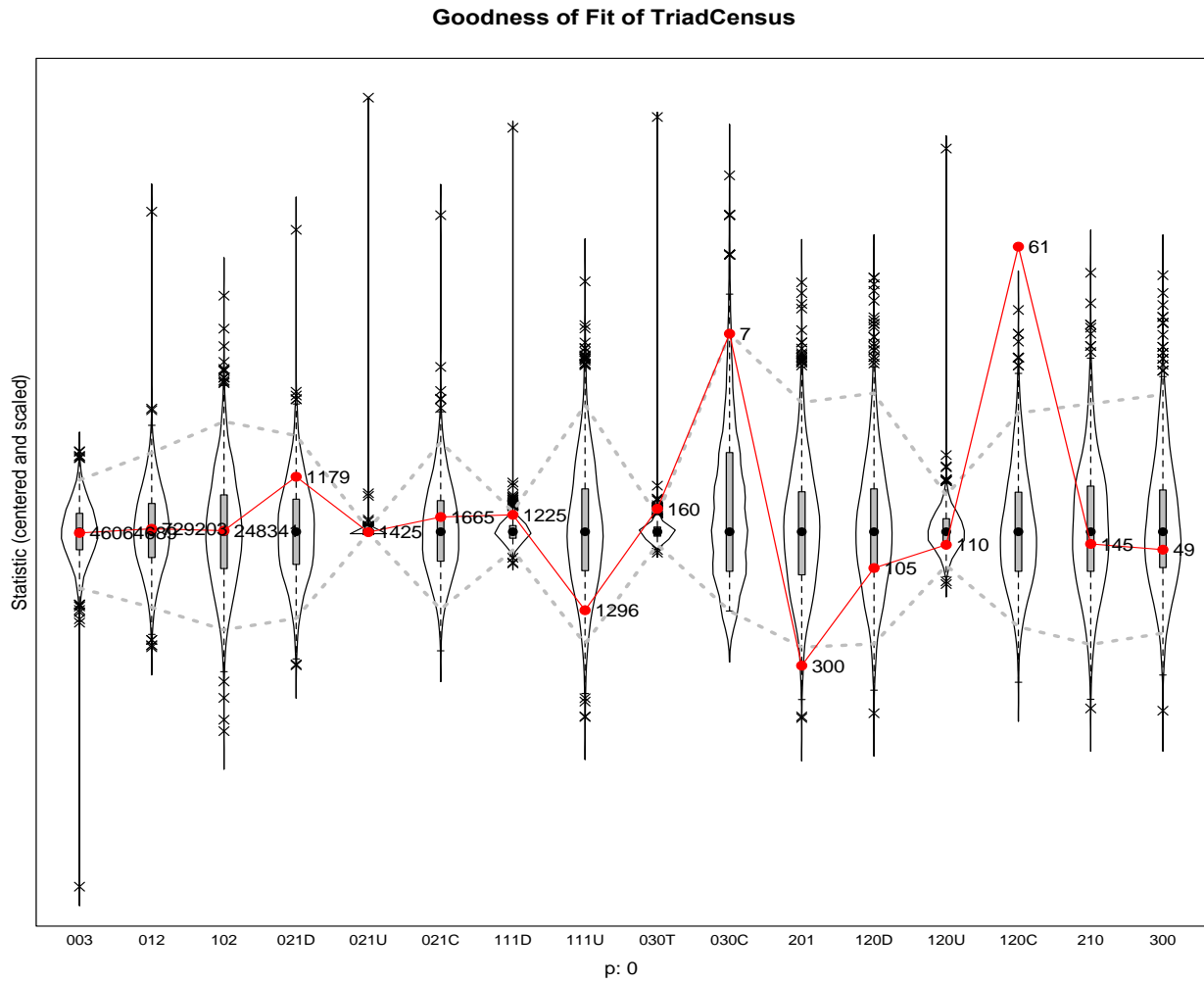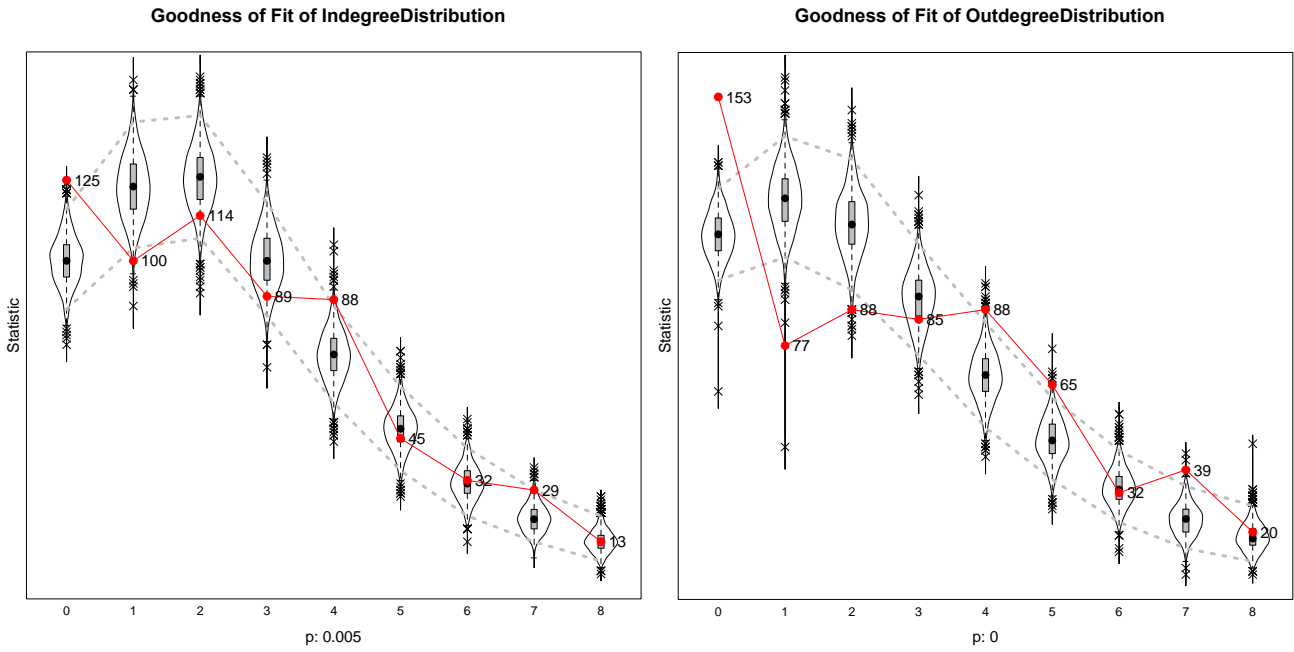# Figure A1. SABM Goodness of Fit Statistics, Jefferson High School
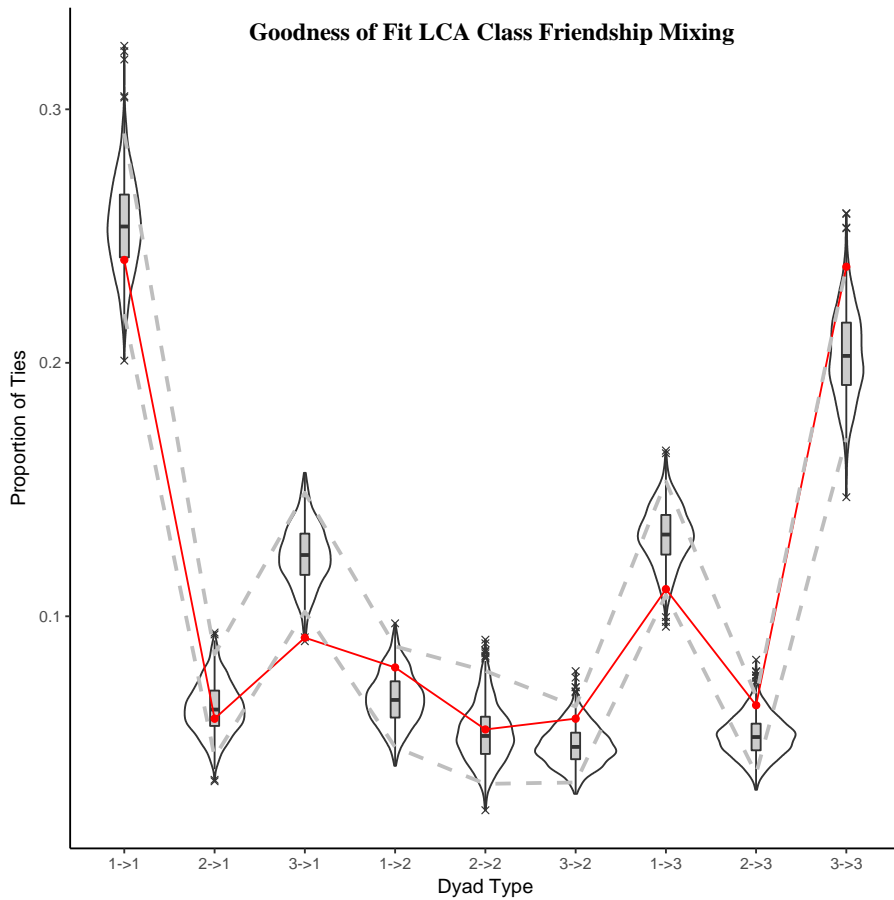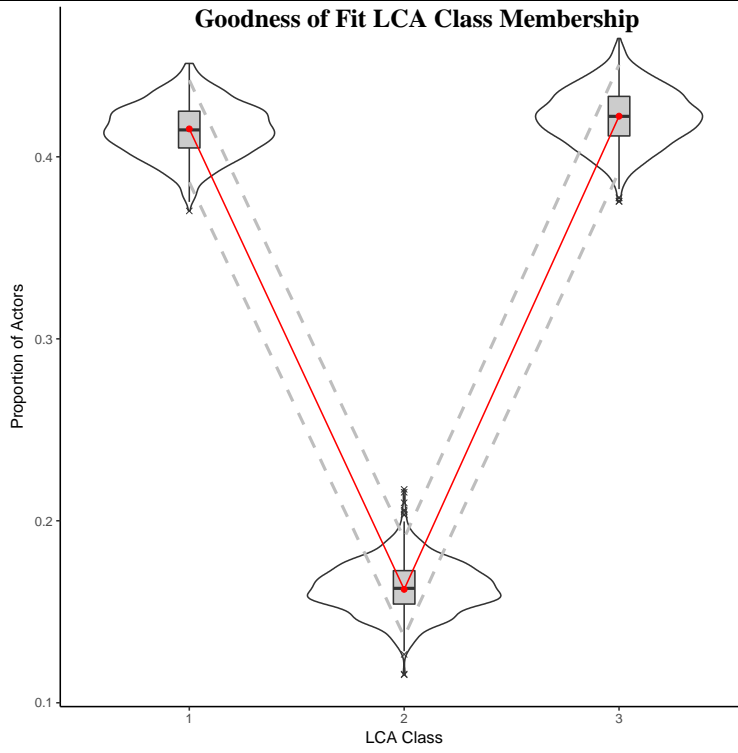
Goodness of Fit of IndegreeDistribution

Goodness of Fit of OutdegreeDistribution

Goodness of Fit of TriadCensus

Goodness of Fit of GeodesicDistribution

Goodness of Fit LCA Class Membership

Goodness of Fit LCA Class Friendship Mixing

Figure A2. SABM Goodness of Fit Statistics, Sunshine High School

Goodness of Fit of IndegreeDistribution

Goodness of Fit of OutdegreeDistribution

Goodness of Fit of TriadCensus

Goodness of Fit of GeodesicDistribution
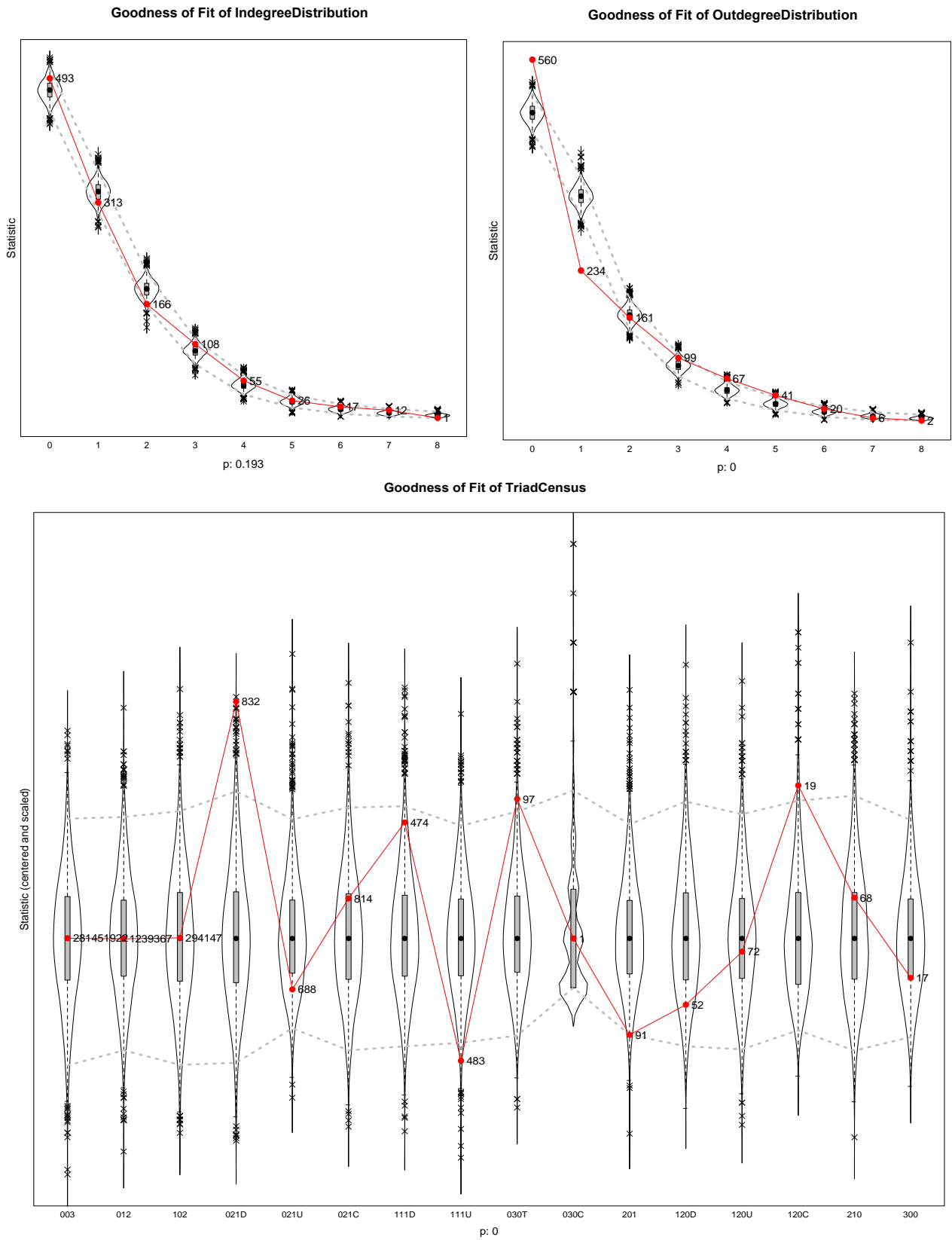
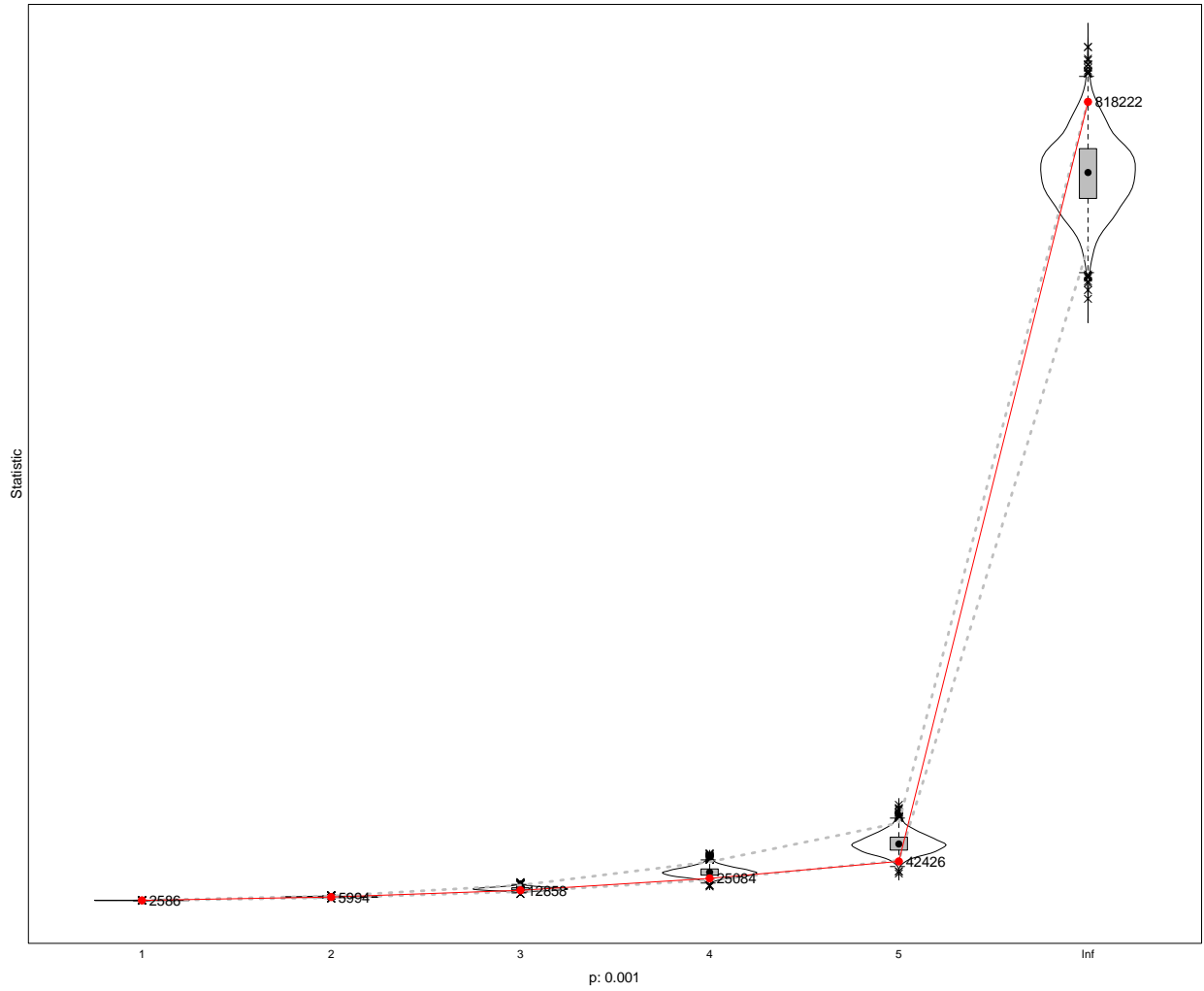# Figure A2. SABM Goodness of Fit Statistics, Sunshine High School (cont'd)

Goodness of Fit LCA Class Membership

Goodness of Fit LCA Class Friendship Mixing