



Social Selection and Smoking Initiation in Middle School Friendship Networks

Harold D. Green Jr.¹, Kayla de la Haye¹,
Elizabeth J. D'Amico¹, Joan S. Tucker¹,
Mariana Campos Horta²

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¹RAND Health, ²Princeton University

Smoking: Scope of the Problem

- The latest national data from Monitoring the Future indicate the decrease in smoking among middle school youth is not as great as in other grades.
- Current estimates show that 22% of adolescents have tried smoking by the end of 8th grade.
- This suggests renewed attention to middle-school smoking initiation as a worthy focus for intervention.

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Smoking: Focus on Hispanic Health

- Hispanic youth initiate smoking at rates between those of African Americans and whites
 - By eighth grade are smoking at frequencies equal to white youth, the most frequent smokers.
- Hispanics experience greater cigarette-related mortality and morbidity compared to other ethnic groups.
- To reduce the number of younger Hispanic smokers and limit the consequences of cigarette-related health outcomes, it is crucial to expose Hispanic youth to smoking prevention or cessation programming during the middle school years.

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Smoking: Selection and Influence

- Cross-sectional and prospective studies have found that exposure to pro-smoking peer behaviors and attitudes is associated with youth smoking initiation.
- There is growing evidence that adolescents also seek out friends who are similar to them in terms of smoking.
- Several longitudinal network studies have shown that selection effects may be stronger than influence processes relative to smoking behavior among US and European adolescents.

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Smoking: Substance Use Prevention

- Little research has addressed the differential influence of peers on the smoking behavior of other racial/ethnic subgroups, such as Hispanics.
- Few studies have investigated the effect of selection and influence on delay of smoking initiation.
- Little is known about the role peer selection and influence may play in the transmission of positive anti-smoking attitudes and behaviors
- Little research (if any) has addressed the role of peer relationships in the context of a substance use prevention program as a contributing factor to delay of smoking initiation.

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Project CHOICE/IDEA

- CHOICE is a voluntary after-school substance-use prevention program for middle-school students that targets tobacco and other substance use.
- Findings from CHOICE pilot suggested that the program's effects extend beyond those students who participated in CHOICE to the student body as a whole.
- This study investigates how direct and indirect influence and selection may account for these broader effects of project CHOICE

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Research Design: RCT Sub-Study

- 16 schools in LA metro area were matched along demographic factors, 1 of each pair randomly assigned to receive CHOICE
- RCT required administrative approval, active consent, student assent, IRB approvals, Certificate of Confidentiality
- Data included school-wide surveys, CHOICE attendance, CHOICE attender surveys, friendship survey

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Friendship survey

- Students were asked to nominate up to 10 friends.
- Nominations could only be matched to consented students.
- Friendship survey was on last page of the behavioral survey.

| School 14 | Fall 08 | Spring 09 |
|----------------------------------|---------|-----------|
| Students consented* | 639 | 656 |
| % of consented students surveyed | 69 | 84 |
| % of consented students matched | 88 | 86 |

*consents are cumulative numbers

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This survey asks about your friends at this school

- 1) In the spaces below, write the first and last names of the friends at this school that you hang out with. You can name up to 10 friends.
- 2) Next to each name, write what grade your friend is in and whether this friend is male or female.
- 3) If you have no friends at this school, please fill in the bubble at the bottom of this form.

REMEMBER: WRITE IN ALL CAPITAL LETTERS AND WRITE AS CLEARLY AS POSSIBLE

| | | |
|--|---|--|
| | Grade | Fill in one bubble |
| 1 | <input type="radio"/> 6th <input type="radio"/> 7th <input type="radio"/> 8th | <input type="radio"/> Male <input type="radio"/> Female |
| 2 | <input type="radio"/> 6th <input type="radio"/> 7th <input type="radio"/> 8th | <input type="radio"/> Male <input type="radio"/> Female |
| 3 | <input type="radio"/> 6th <input type="radio"/> 7th <input type="radio"/> 8th | <input type="radio"/> Male <input type="radio"/> Female |
| 10 | <input type="radio"/> 6th <input type="radio"/> 7th <input type="radio"/> 8th | <input type="radio"/> Male <input type="radio"/> Female |
| <input type="radio"/> I have no friends at this school | | |

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Analytic Strategy

Investigate the co-evolution of networks and smoking initiation using SIENA

Include effects for project CHOICE participation: influence and selection.

Demographic variables and parent smoking behaviors as controls.

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Stochastic Actor-Based Models (SABM)

Model the network and behavioral evolution in continuous time as a series of micro steps. At each step actors decide to form, keep, or break ties based on their degree of satisfaction with their local network.

The probabilities of tie changes are in part endogenously determined as a function of the network structure, and in part exogenously, as a function of actor attributes.

Two parts: One part estimates the impact of the relation on the behavior (influence processes). Another part estimates the impact of behavior on the relationship choices (selection processes).

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| | Treatment School 1 | Control School 1 | Treatment School 2 |
|-------------------------------------|--------------------|------------------|--------------------|
| Friendship Network | | | |
| Network size | 380 | 592 | 429 |
| % Missing ties w1* | 10% | 13% | 12% |
| % Missing ties w2 | 7% | 11% | 7% |
| Network density w1 | 0.023 | 0.018 | 0.020 |
| Network density w2 | 0.018 | 0.016 | 0.018 |
| Smoking behavior | | | |
| % smoking w1 | 14% | 12% | 10% |
| % smoke initiation (w1-w2) | 5% | 8% | 6% |
| % smoking lifetime measure missing | 11% | 9% | 7% |
| Participation in Project CHOICE | | | |
| % CHOICE Participants | 13% | | 11% |
| Analytic Sample Characteristics | | | |
| % Hispanic | 84% | 83% | 54% |
| %Non-Hispanic White | 1% | 1% | 18% |
| %Asian | 7% | 10% | 10% |
| %African-American | 3% | 0% | 6% |
| % Native Hawaiian/ Pacific Islander | 1% | 1% | 1% |
| %Multi-ethnic | 4% | 4% | 11% |
| %High Grades (As and Bs) | 33% | 31% | 29% |
| %Low Grades (C or below) | 12% | 11% | 15% |
| %Parent Smokes | 29% | 27% | 29% |
| %Sibling Smokes | 17% | 16% | 24% |

Measures

- **Primary Variables**
 - Friendship nominations
 - CHOICE participation
 - Friends' CHOICE participation
 - Friends' current smoking
 - Smoking Initiation/Lifetime Smoking
- **Covariates**
 - Gender
 - Grade
 - Hispanic ethnicity
 - Parental Smoking
 - Academic Performance

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Model Specification

- **Selection**
 - Covariate ego
 - Covariate alter
 - Covariate squared alter
 - Same covariate
 - Similar covariate
 - Rate
 - Endogenous network parameters
- **Influence**
 - Effect from CHOICE
 - Alter's CHOICE participation
 - Alter's Smoking
 - Parental Smoking
 - Hispanic ethnicity
 - Rate
 - (monotonic behavior)

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Model Results: Selection and Influence

- **Selection**
 - Grade (s)
 - Gender (s)
 - Hispanic Ethnicity (s)
 - Academic Performance (s)
 - Smoker (d)
 - CHOICE (s)
- **Influence**
 - Alter smoking
- **Direct CHOICE effects non-informative because they are perfect predictors of non-initiation**

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Limitations

- Matching led to missing data
- While initiation is at rates equal to or greater than the national average for this age group, it may be fairly rare for SIENA analyses
- High network rate parameters suggest that missing structural data may influence these models
- May not generalize to other Hispanic populations or to other adolescent populations or to other behaviors

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Implications: Selection and Influence

- Similar to recent studies, selection seems more evident than influence in these coevolutionary models
- We have smokers choosing non-smokers as friends and vice versa, suggesting the opportunity for nonsmokers (the large majority) to encourage cessation among smokers
- There are no effects specific to Hispanics, which may suggest that ethnicity doesn't moderate influence and selection processes

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Implications: CHOICE

- CHOICE perfectly predicted non-initiation, some evidence for success but not confirmed in these models.
- No evidence of indirect impact of CHOICE on influencing smoking initiation.
- Consonant with peer clustering theory, CHOICE participants select each other as friends, which may create micro-environments that encourage protective anti-smoking attitudes.

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Model Specification

| Effect Name | Description |
|--|---|
| <i>Effects predicting friendship choice</i> | Network rate parameter Represents the rate of network change between waves |
| Outdegree | Tendency to send friendship ties |
| Reciprocity | Tendency to reciprocate friendship ties |
| Transitive triplets | Tendency to nominate a friend who is a friend of a current friend |
| 3-cycles | Tendency to nominate friends that result in "3-cycles" (where i nominates j , j nominates k , and k nominates i). A negative effect is indicative of local hierarchies |
| Covariate ego | Effect of the attribute on outgoing friend nominations |
| Covariate alter | Effect of potential friends' attribute on receiving a friendship nomination |
| Covariate squared alter | Effect of a potential friends' continuous covariate squared on receiving a friendship nomination |
| Same covariate | Tendency to select friends with the same binary attribute |
| Similar covariate | Tendency to select friends who are similar on a continuous attribute |
| CHOICE ego | Effect of student's CHOICE participation on outgoing friend nominations |
| CHOICE alter | Effect of potential friends' CHOICE participation on receiving a friendship nomination |
| Same CHOICE | Tendency to select friends with the same CHOICE participation status |
| Smoker ego | Effect of adolescent's current smoking behavior on outgoing friend nominations |
| Smoker alter | Effect of potential friends' current smoking behavior on receiving a friendship nomination |
| Same smoker | Tendency to select friends with the same current smoking status (non smoker/smoker) |
| <i>Effects predicting smoking initiation</i> | Smoking rate parameter Represents the rate of smoking initiation between waves |
| Alters' CHOICE participation | Effect of friends' CHOICE participation on adolescent's smoking initiation. |
| Alters' current smoking status | Effect of friends' current smoking on adolescent's smoking initiation |
| Effect from CHOICE | Effect of adolescent's own participation in CHOICE on smoking initiation |
| Smoking behavior of parents | Effect of parental smoking on adolescent's smoking initiation |
| Hispanic ethnicity | Effect of being Hispanic on adolescent's smoking initiation |

*Ego refers to a focal student and alter refers to ego's friend.

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| Parameter | CHOICE 1 | | CHOICE 2 | | Non-CHOICE | |
|---|-----------------|--------------|-----------------|--------------|-----------------|--------------|
| | Estimate | S.E. | Estimate | S.E. | Estimate | S.E. |
| <i>Effects predicting friendship choice</i> | | | | | | |
| Network rate | 22.192 | 2.686 | 33.802 | 2.128 | 26.591 | 1.619 |
| Outdegree (density) | -4.544** | 0.180 | -4.933** | 0.225 | -4.135** | 0.093 |
| Reciprocity | 2.104** | 0.109 | 2.314** | 0.079 | 2.315** | 0.067 |
| Transitive triplets | 0.862** | 0.083 | 0.497** | 0.033 | 0.779** | 0.038 |
| 3-Cycles | -0.865** | 0.156 | -0.444** | 0.065 | -0.693** | 0.081 |
| Grade alter | 0.119 | 0.115 | 0.292 | 0.207 | -0.007 | 0.068 |
| Grade ego | -0.323** | 0.124 | -0.241 | 0.208 | -0.129 | 0.072 |
| Same grade | 1.554** | 0.120 | 1.976** | 0.181 | 1.181** | 0.062 |
| Gender alter | -0.081 | 0.059 | -0.079 | 0.054 | -0.033 | 0.038 |
| Gender ego | 0.078 | 0.072 | 0.009 | 0.050 | -0.074 | 0.042 |
| Same gender | 0.567** | 0.061 | 0.431** | 0.049 | 0.430** | 0.037 |
| Hispanic alter | -0.122 | 0.091 | -0.027 | 0.045 | -0.181** | 0.053 |
| Hispanic ego | -0.139 | 0.110 | 0.012 | 0.052 | -0.129* | 0.058 |
| Same Hispanic | 0.147 | 0.085 | 0.212** | 0.041 | 0.304** | 0.046 |
| CHOICE alter | 0.034 | 0.123 | 0.056 | 0.068 | - | - |
| CHOICE ego | 0.458** | 0.125 | 0.225** | 0.070 | - | - |
| Same CHOICE | 0.292* | 0.116 | 0.189** | 0.063 | - | - |
| Academics alter | 0.072 | 0.048 | 0.038 | 0.046 | 0.048 | 0.033 |
| Academics sq. alter | -0.103 | 0.076 | -0.107 | 0.062 | 0.032 | 0.047 |
| Academics ego | 0.086 | 0.048 | 0.071 | 0.040 | 0.051 | 0.033 |
| Academics similarity | 0.177 | 0.101 | 0.239** | 0.075 | 0.276** | 0.069 |
| Smoker alter | 0.180 | 0.204 | - | - | -0.116 | 0.122 |
| Smoker ego | -0.862* | 0.425 | - | - | -0.377** | 0.142 |
| Same smoker | -0.400** | 0.081 | -0.173* | 0.075 | -0.269** | 0.063 |

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| Parameter | CHOICE 1 | | CHOICE 2 | | Non-CHOICE | |
|--|-----------------|--------------|----------|-------|------------|---------|
| | Estimate | S.E. | Estimate | S.E. | Estimate | S.E. |
| <i>Effects predicting smoking initiation</i> | | | | | | |
| Rate smoking initiation | 0.228 | 0.052 | 0.205 | 0.047 | 0.157 | 0.126 |
| Alters' CHOICE participation | n.s. | - | 1.207 | 6.775 | n.s. | - |
| Alters' current smoking status | 73.746** | 0.382 | n.s. | - | -26.289 | 133.575 |
| Effect from CHOICE | n.s. | - | n.s. | - | n.s. | - |
| Smoking behavior of parents | n.s. | - | n.s. | - | n.s. | - |
| Hispanic ethnicity | n.s. | - | n.s. | - | n.s. | - |

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