

The Longitudinal Impact of Arrest, Criminal Conviction, and Incarceration on Smoking Classes

Connie Hassett-Walker  Norwich University, Northfield, VT, USA.

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ABSTRACT

BACKGROUND Previous research identifies three to six smoking classes over the life course. This study expands on earlier work about the impact of getting arrested in early adulthood on individuals' smoking classes, by including additional, more serious measures of justice system involvement (JSI), specifically criminal conviction and incarceration. Family processes were examined as secondary outcomes.

METHOD Data from seventeen waves (1997–2015) of the National Longitudinal Survey of Youth were analyzed via group-based trajectory modeling (GBTM), multinomial logistic regression, and latent transition analyses (LTA). Smoking behavior through age 36 is examined. Marital status, parenthood, juvenile smoking, juvenile arrest, and prior crime victimization experiences were also included in the models.

RESULTS Seven smoking classes were revealed: two low- or non-smoking classes; two decreasing classes; and three “problem” smoking (e.g., increasing, or chronic) classes. All JSI types increased the likelihood of being in a smoking class rather than a non-smoking class. Arrest and conviction had larger odds ratios than the most severe form of JSI—incarceration—with respect to respondents' likelihood of being in an increasing or chronic smoking class. Juvenile smoking was the most robust predictor of smoking in adulthood.

CONCLUSION Involvement with the justice system in all forms remains a negative health factor that increases smoking. While not typically a goal of criminal justice officials, attention should be paid to this unintended consequence of involvement with the justice system—increased smoking—given smoking's connection to serious illnesses such as cancer. As juvenile smoking is a strong risk factor for adult smoking, smoking prevention and cessation programs should start with youth; and be part of the offerings to individuals ensnared in the justice system at all levels.

KEYWORDS: Smoking classes, arrest, conviction, incarceration, transitions, life course

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CORRESPONDING AUTHOR: Connie Hassett-Walker, Criminology & Criminal Justice, Norwich University, 158 Harmon Dr, Ainsworth Hall 208, Northfield, VT 05602, USA. Email: chassett@norwich.edu

Introduction

Three to six different smoking classes have been identified through prior developmental and life course research.^{1,2,3} These classes can broadly be described as never-smokers or non-smokers, chronic or addicted smokers, and individuals who smoked for a period of time before trying to quit their cigarette use, either with or without success. Over the course of their lives, individuals differ in terms of when they start smoking, as well as whether they increase, fluctuate, decrease, or successfully quit cigarette use. Additionally, key events—such as a health scare, a victimization experience, or involvement with the criminal justice system—may cause an individual to transition⁴ from one smoking pathway to another.

This article builds on prior work⁵ and considers the impact of justice system involvement (JSI) in emerging adulthood, and family processes (marriage, parenthood) on individuals' smoking classes and transitions. Of particular interest is how JSI impacts change—for better (smoking decreases) or worse (smoking increases)—in individuals' smoking. Increasing smokers would include individuals that try and fail to quit smoking, as well as individuals whose smoking continues to climb over the years. Decreasing smokers would demonstrate a decline, either gradual or sharp, in their cigarette smoking.

Literature Review

Theoretical Reasons why JSI Could Increase, or Decrease, Individuals' Smoking

Prior research holds that involvement with the JSI can increase,⁶ decrease,^{7,8} or have no effect^{9,10} on substance use including cigarettes. Plausible explanations for why involvement with the justice system—from arrest to criminal conviction, to incarceration—might shift an individual's smoking patterns, for worse (more smoking) or for better (less smoking), include labeling theory, as well as the notion of the “teachable moment”. First, the criminological labeling theory¹¹ posits that individuals caught up in the justice system through arrest or more serious levels of JSI incur a label (e.g., “felon” or “criminal”) that will adversely affect them in the future in areas such as the inability to secure gainful employment.^{12,13,14,15} Depending on the extent of the involvement with the justice system, an arrested and subsequently convicted individual may find themselves under the supervision of the Department of Corrections (e.g., probation, incarceration in a facility). This would lump them in with other individuals with a similar label,¹¹ further solidifying the label and associated stigma. The individual may internalize their label and begin to see themselves as a bad or



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worthless person. Smoking can be a way to cope with negative emotions stemming (e.g., stress) from such situations.¹⁶ The labeled person may also be exposed to more individuals who smoke (and possibly use other substances), thus reinforcing the behavior. For instance, Lopes, Krohn, Lizotte et al.¹⁵ have examined the consequences of criminal sanctioning in earlier life on later adulthood outcomes, finding that arrest in early life was related to substance use, unemployment, and poverty.

Secondly, an alternative notion is that going through the justice system can provide a “teachable moment”,^{17,18,19,20} bringing about positive change for an individual, such as decreasing their smoking levels. Prior research has found support for the impact of surgery,²¹ a cancer diagnosis,²² hospital treatment for illness²³ and HIV treatment²⁴ as “teachable moments” to reduce individuals’ smoking.

Emerging Adulthood & Smoking

Most individuals start smoking during adolescence.²⁵ It is plausible that in time, smoking among younger people (e.g., teenagers) may shift with the 2019 passage of the Tobacco 21 law,²⁶ which raised the minimum age for purchasing tobacco products from 18 to 21 years. Beginning around 18 years of age,²⁷ emerging adulthood may be a period of increased risk for starting cigarette smoking.^{28,29} At age 18, young people can legally buy cigarettes and may be living on their own, away from parental supervision.^{30,31} Increases^{28,32} and fluctuations³³ in smoking have been recorded during this time. Yet changes in smoking behaviors among emerging and middle-aged adults have been under-examined.¹

There are also major life transitions occurring in emerging adulthood, such as getting married and/or becoming a parent, during a time when higher order reasoning is still in development.^{34,35,36} For women, moving out of her parents’ home, marriage and parenthood^{37,38} have been linked to decreased smoking as well as substance use.³⁹ Prior research⁴⁰ has found that marriage improves men’s behavior and life outcomes. To that end, the author expects that individuals who marry and/or have children^{41,42}—important family-related variables—will have a greater probability of shifting to less smoking.

The Present Study

The current paper is a continuation of an earlier study⁵ wherein arrest was the only JSI indicator. The present study expands on the earlier work by including additional, more serious measures of JSI, specifically criminal conviction and incarceration. Additionally, the longitudinal period is extended through age 36. Thirty six years of age was chosen because it was the oldest age longitudinally for which data were available, for which the sample size was not too small so as to render the models unstable. The following hypothesis was tested:

H1. Justice system involvement in emerging adulthood will be related to increased smoking during subsequent years.

The size of the transition to a higher smoking class will be greater, the more severe the type of JSI. That is, incarceration will be associated with greater transitions to more smoking than either arrest or conviction. Conviction will be associated with greater transitions to more smoking than arrest. It is also hypothesized that the JSI variables will remain significant even with the inclusion of other predictors (e.g., family process variables) in the models.

Methods

Seventeen waves of data from the National Longitudinal Survey of Youth (NLSY97) were analyzed. The NLSY97 is a nationally representative sample of individuals 12 to 18 years old when they were first interviewed in 1997. By the final survey wave—2015—in which questions about smoking behavior were asked, subjects ranged in age from 30 to 36 years of age. Respondents (n = 8984) have been interviewed annually since 1997, and the retention rate is over 80 percent since the start of the study. Approval from the author’s institutional review board (IRB) was sought prior to conducting any analyses. An exemption was approved since the NLSY97 data are de-identified and publicly available through the Bureau of Labor Statistics website¹.

Variables

Dependent variable: Smoking class. Respondents were asked in every survey wave, from 1997 through 2011, and then in 2013 and 2015, whether they had smoked since the date of their last interview (DLI). (Note: In 1997, the first year of the survey, they were asked the initial question, “Have you ever smoked a cigarette?” A question about smoking since DLI was not asked in either 2012 or 2014.) As subjects ranged in age from 12 to 18 in 1997 (and had a similar seven-year spread in ages in subsequent survey waves), the variable was recoded to reflect “Any smoking at ___ years old”. The dependent variable pertained to the years after emerging adulthood JSI; that is, from 22 years old through 36 years old. Hence, 15 new variables were created, which were subsequently used to create the dependent variable, smoking class. The data were then restructured from wide to long format, and the syntax was run in Stata statistical software (see Appendix A) to determine the right number of classes. A visual representation of the smoking classes (Figure 1) was created using the code “trajplot” in Stata.

The BIC scores for each possible configuration of smoking classes were recorded and compared in Excel (see Appendix A), for the different possibilities (e.g., 3-group linear, quadratic, cubic; 4-group linear, quadratic, cubic). The 7-group quadratic model, discussed shortly in the results section, was found to have the lowest BIC scores, with all significant parameter estimates.

Main Independent Variables: JSI in Emerging Adulthood

In every survey wave, respondents were asked about whether they had been arrested, convicted, or incarcerated since the date

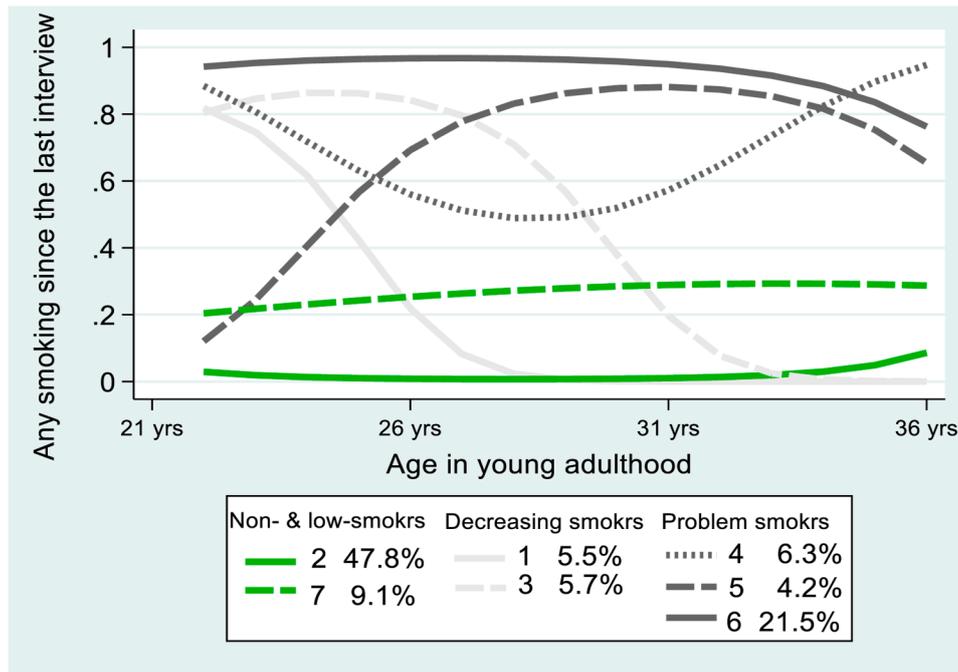


Figure 1. Any Smoking classes, ages 22 through 36. BIC = -368448.67 (N = 977 280) BIC = -368421.19 (N = 127 635).

of the last interview. Since the time period of interest was emerging adulthood, defined as ages 18 to 21, the three JSI variables from survey waves 1997 to 2006 were recoded to reflect, for example, arrest at 18, arrest at 19, arrest at 20, and arrest at 21. (The same recoding was performed separately for conviction and incarceration.) 1997 through 2006 were the survey waves that contained individuals ages 18, 19, 20, and 21. Ultimately the recoded-by-age JSI variables were additionally recoded into the three dichotomous independent variables: arrested_18to21 (yes/no), convicted_18to21 (yes/no), and incarcerated_18to21 (yes/no).

Key family process variables: Marital status and parenthood. In the raw NLSY97 data, a “collapsed marital status as of survey date” variable is included for 1997 through 2011, and then in 2013 and 2017. The response options are: 0/never married, 1/married, 2/separated, 3/divorced, and 4/widowed. Additionally during the same survey waves, respondents were asked about the number of children they had, both living at home and not living in the respondent’s household. These series of variables were recoded from “by survey year” to “by respondent age”, with age 22 as the “start” age (i.e., the first age after emerging adulthood). Both sets of variables were then recoded into fixed effects variables, to embody “marital status from 22 through 36 years old”; and “number of children from 22 through 36 years of age”.

Juvenile smoking, juvenile arrest. Juvenile smoking was included in the models, as smoking in adolescence has been shown to be related to adult smoking.⁴³ Any smoking from ages 12 through 17 was created as a dichotomous variable (yes/no), using the same recoding process as described for the dependent variable.

That is, responses to the question about any smoking since the date of the last interview, from survey wave 1997 through 2002, were recoded as smoking by age rather than smoking by year. The survey waves of 1997 through 2002 were the years that included respondents whose ages ranged from 12 through 17. Juvenile arrest from ages 12 to 17 was also included, created as a dichotomous variable using the same processes as described for juvenile smoking.

Trauma experience. A question about having been a victim of a crime in the past 5 years (yes/no) was asked in 2002 and again in 2007, as part of the NLSY97 series of health questions. Both variables were included in the models, as they present potential alternative causes of stress or other emotions that could contribute to increases in smoking.⁴⁴

Demographic covariates. Five demographic variables were included in the analyses: gender (male, female); race/ethnicity; poverty ratio in 1997; degree earned by 21 (ranging from none to Bachelor’s degree); and employment status by 21 (employed, not employed, not in labor force, in armed services).

Model Building & Analyses

To determine the effect of JSI and other variables on smoking classes, several analyses were performed. First, to determine the number of smoking classes, group-based trajectory modeling (GBTM) was conducted in Stata² version 16. Group-based trajectory modeling has been used by others^{45,46} studying behavior over the life course. As Stata does not have its own trajectory analysis function, the author used open-source code from Dr. Andrew Wheeler’s website³ to install a plug-in (net

install *traj*). First, the best-fitting model⁴⁷ (i.e., most parsimonious) was determined by comparing Bayesian Information Criteria scores across the different combinations of numbers of classes.⁴⁵ In addition to the BIC scores, the author considered which models did vs did not have significant parameter estimates. (See Appendix A). Ultimately, it was determined that the 7-class quadratic model was the best (i.e., lowest BIC scores and significant parameter estimates).

Once the optimal number of smoking classes was determined, multinomial logistic regression was performed. This is the appropriate modeling for nominal dependent variables resulting from GBTM.⁴⁸ In performing the GBTM, Stata creates a new variable, *traj group*, which was used as the smoking class dependent variable in the multinomial logistic regressions. Class 2 (non-smoking) was set as the reference category for the regressions.

To test the hypothesis assertion that more severe forms of JSI would be associated with more smoking, two analytic approaches were used. First, in addition to comparing the odds ratios for the JSI variables (arrest, conviction, incarceration) in the multinomial logistic regressions to their respective baselines (class 2), the odds ratios for the different JSI types were compared to each other by dividing the Exp (B) of the more severe JSI type by the Exp (B) of the less severe JSI type. In other words, the odds ratio for conviction was divided by the odds ratio for arrest; and the odds ratio for incarceration is divided by the odds ratio for conviction, and separately divided by the odds ratio for arrest. This was done for each of the “problem” smoking classes (to be discussed).

Additionally, latent transition analyses^{49,50} (LTA) were conducted of a dichotomous (yes/no) recoded version of the smoking variable at each age, to assess whether JSI type was related to transitions to a smoking class, in keeping with labeling theory (or conversely, related to a transition to a non-smoking class, in keeping with the notion of JSI serving as a teachable moment). Latent transition analyses is a semi-parametric finite mixture model used with large sample-size longitudinal data; and useful for analyzing changes in multiple categorical variables over time.⁵¹ Latent transition analyses can be considered a longitudinal extension of latent class analysis, with a time variable included. The LTA approach has been used in public health research, such as in determining the likelihood of smokers’ transitioning to a different smoking⁵² or substance use⁴⁹ status. Individuals are assigned to a latent class (also called state or status) at Time 1 using the latent status membership probabilities at Time 1. An assumption of LTA is that people can change their class membership over time. Thus, the goal of LTA is to assess the probability of an individual transitioning from one state, or class, to another as they move forward in time.

While predictors of latent status membership can be included in LTA,⁵³ incorporating other covariates in the LTA models proved to be unwieldy in terms of interpreting the output. The author thus chose to include additional variables in

the models via multinomial logistic regression. As it is not possible to perform LTA in Stata, LTA was performed using the software Latent Gold^{54,55} version 6.0, available from the company Statistical Innovations⁴. The NLSY97 data were restructured to long format prior to running all the analyses, and weights for all years, available from the BLS website⁵, were applied. The author checked for multicollinearity and skew in the variables; neither presented a problem.

Results

The Smoking Classes

In keeping with prior research on smoking pathways over the life course, the GBTM analyses produced 7 classes of smokers (see Figure 1). The 7-group quadratic model had the best fit (i.e., lowest BIC scores as well as significant parameter estimates; see Appendix A for Stata syntax, parameter estimates, comparative BIC scores). The seven classes of smoking can be described as the *non-smokers and low/occasional smokers* (classes 2 and 7, respectively; the classes in green in Figure 1); the *decreasing smokers* (class 1/immature later-quitting smokers and class 3/gradual decreasing smokers/eventual quitters; the classes in light gray in Figure 1); and the *problem smokers*, seen in Figure 1 in dark gray. *Problem smokers* consist of three classes: the *increasing smokers* (class 5); the *chronic smokers* (class 6); and the *unsuccessfully trying to quit chronic smokers* (class 4). Smoking class *traj group* is a nominal variable, and as such the number assigned to each class does not correspond with any particular order. In the subsequent multinomial logistic regression modeling, class 2/ non-smoking was used as the reference category.

Preliminary Analyses

To facilitate preliminary crosstab (Table 1) and correlation (Table 2) analyses, the smoking class dependent variable was recoded from a nominal to an ordinal variable, with low values indicating less severe smoking and higher values indicating more severe smoking. (Note: The ordinal form of the dependent variable was only used in the crosstab and correlation analyses. The nominal form of the dependent variable was used in the subsequent multinomial logistic regression modeling, as is the convention in this type of longitudinal analyses.) As seen above in Table 1, of the types of JSI, arrest had the highest percentage of respondents indicating “yes”. This makes sense, as some individuals that get arrested may have their charges subsequently dropped, or their case may be diverted out of the justice system (i.e., they are never convicted or incarcerated).

Correlation analyses was also performed, again using the ordinal form of the smoking class variable, to gauge the strength of the association between smoking class, JSI, and the other predictors. The results are shown in above in Table 2. All the JSI variables were positively and significantly, if modestly, related to smoking. Marital status and having children were

Table 1. Crosstab of recoded smoking classes (ordinal) by JSI.

SMOKING CLASS:	ARRESTED, 18 TO 21		CONVICTED, 18 TO 21		INCARCERATED, 18 TO 21	
	NO (N = 7123) ^a	YES (N = 1498)	NO (N = 8162)	YES (N = 822)	NO (N = 8692)	YES (N = 292)
0/non-smoking	91.5%	8.5%	96.1%	3.9%	99.0%	1.0%
1/immature later-quitting smokers	79.8%	20.2%	90.0%	10.0%	96.8%	3.2%
2/gradual decreasing, eventual quitters	72.9%	27.1%	85.6%	14.4%	95.4%	4.6%
3/low consistent smokers	82.1%	17.9%	89.9%	10.1%	96.8%	3.2%
4/increasing smokers	76.5%	23.5%	85.8%	14.2%	93.5%	6.5%
5/successfully trying to quit chronic smokers	71.9%	28.1%	83.5%	16.5%	93.6%	6.4%
6/chronic smokers	69.6%	30.4%	83.0%	17.0%	94.1%	5.9%

^aSample sizes listed are for the data in wide, pre-restructured format. Class percentages are as per analyses (crosstabs) of the unweighted data in long format and reflect the trajectory classes shown in Figure 1 and Table 3 (multinomial logistic regression).

Table 2. Correlations of recoded smoking classes (ordinal) with other predictors.

SMOKING CLASS	
Justice System Involvement (X1)	
Arrested, 18 to 21 (X1a)	.242**
Convicted, 18 to 21 (X1b)	.194**
Incarcerated, 18 to 21 (X1c)	.128**
Key Family Variables	
Marital status (X2)	-.004**
Children (X3)	-.023**
Demographic and Other Covariates	
Gender (1/male, 2/female)	-.074**
Race/ethnicity	.053**
Education	-.244**
Employment	-.042**
Poverty ratio	-.076**
Juvenile arrest	.206**
Juvenile smoking	.440**
Crime victim, 2002	.093**
Crime victim, 2007	.078**

**P ≤ .01

both negatively and significantly, but very weakly, related to smoking. Marital status cannot be neatly interpreted due to the nature of it being a fixed effect variable created for the respondents' multiple ages over the years. One interpretation might be

that moving further through the marital status stages (e.g., from non-married to married, to separated, to divorced) is correlated with lower smoking. It is also possible that a related third factor—aging—explains the marital status-smoking relationship, in that as individuals age, they often move through the different stages of life partnership. As individuals age, they also often develop new health problems and concerns, and to that end may have more incentive to try and quit, or reduce, their smoking.

Gender was weakly and negatively related to smoking, suggesting that males may smoke more than females. (For the gender value, males were coded as 1 and females were coded as 2). Education was modestly, negative, and significantly related to smoking, suggesting that earning a higher degree is correlated with lower smoking class membership. The strongest correlation was for juvenile smoking ($r = .44$), which was positively, significantly and moderately related to increasing smoking levels in adulthood.

Hypothesis Testing: JSI in emerging adulthood will be related to increased smoking during subsequent years; and the more severe the JSI type, the greater the smoking

The table below shows the multinomial logistic regression models for smoking class regressed on the three types of JSI, family process, juvenile behavior, and trauma experience predictors, and the demographic variables. The models were first run just including the JSI and family process variables (not shown in table format); and then run a second time adding in the additional predictors (seen below in Table 3). This two-step process was conducted to see how the odds ratios changed from the reduced model to the full regression models. Because the complete results for all 7 smoking classes, for the three different JSI types, are visually complicated, Table 3 only shows the models for smoking classes 4, 5, and 6—the “problem”

Table 3. Multinomial logistic regression, association between JSI and problem smoking classes^a.

SMOKING CLASS	ARRESTED			CONVICITED			INCARCERATED						
	STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)		
			LOWER BOUND	UPPER BOUND			LOWER BOUND	UPPER BOUND			LOWER BOUND	UPPER BOUND	
unsuccessfully trying to quit (4)	Intercept	.004			.004				.004				
	Arrested	.002	2.904**	2.894	2.914	.002	3.268**	3.255	3.281	.003	1.914**	1.901	1.927
	Marital status	.001	.965**	.964	.967	.001	.951**	.949	.953	.001	.932**	.931	.934
	Children	.001	.946**	.945	.947	.001	.947**	.946	.948	.001	.940**	.939	.941
	Juvenile arrest	.002	1.536**	1.531	1.541	.002	1.525**	1.520	1.530	.002	1.683**	1.677	1.689
	Juvenile smoking	.002	7.125**	7.102	7.147	.002	7.376**	7.353	7.400	.002	7.434**	7.411	7.458
	Crime victim, 2002	.002	1.235**	1.229	1.241	.002	1.305**	1.299	1.311	.002	1.360**	1.354	1.367
	Crime victim, 2007	.003	2.455**	2.442	2.469	.003	2.422**	2.409	2.436	.003	2.372**	2.359	2.385
	Gender	.002	.785**	.782	.787	.002	.746**	.744	.748	.001	.674**	.672	.676
	Race/ethnicity	.001	.972**	.971	.974	.001	.964**	.963	.965	.001	.977**	.976	.978
	Education	.001	.645**	.644	.646	.001	.629**	.628	.630	.001	.615**	.614	.616
	Poverty	.000	1.000**	1.000	1.000	.000	1.00**	1.000	1.000	.000	1.000**	1.000	1.000
	Employed	.001	1.113**	1.111	1.114	.001	1.12**	1.119	1.122	.001	1.109**	1.108	1.111
	Increasing (5)	Intercept	.004			.004				.004			
Arrested		.002	2.837**	2.826	2.848	.002	2.588**	2.576	2.600	.003	2.846**	2.826	2.865
Marital status		.001	1.122**	1.120	1.124	.001	1.098**	1.096	1.100	.001	1.091**	1.089	1.093
Children		.001	.967**	.966	.968	.001	.967**	.966	.968	.001	.962**	.961	.963
Juvenile arrest		.002	1.837**	1.830	1.844	.002	1.877**	1.870	1.884	.002	1.967**	1.960	1.974
Juvenile smoking		.002	2.862**	2.853	2.872	.002	2.974**	2.964	2.983	.002	2.976**	2.966	2.986
Crime victim, 2002		.003	.853**	.848	.858	.003	.908**	.903	.914	.003	.910**	.905	.915

(Continued)

Table 3. (Continued)

SMOKING CLASS	ARRESTED			CONVICTED			INCARCERATED					
	STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
			LOWER BOUND	UPPER BOUND			LOWER BOUND	UPPER BOUND			LOWER BOUND	UPPER BOUND
Crime victim, 2007	.003	3.103**	3.087	3.120	.003	3.031**	3.015	3.047	.003	3.007**	2.991	3.022
Gender	.002	.958**	.955	.961	.002	.888**	.885	.891	.002	.859**	.856	.862
Race/ethnicity	.001	.989**	.988	.991	.001	.982**	.981	.983	.001	.992**	.990	.993
Education	.001	.732**	.730	.733	.001	.711**	.709	.712	.001	.709**	.708	.710
Poverty	.000	1.000**	1.000	1.000	.000	1.000**	1.000	1.000	.000	1.000**	1.000	1.000
Employed	.001	1.176**	1.174	1.178	.001	1.179**	1.177	1.181	.001	1.159**	1.157	1.161
Intercept	.002				.002				.002			
Arrested	.001	2.691**	2.684	2.697	.001	2.827**	2.818	2.835	.003	1.919**	1.910	1.929
Marital status	.001	.965**	.964	.966	.001	.950**	.949	.951	.001	.934**	.933	.935
Children	.000	.925**	.925	.926	.000	.926**	.925	.927	.000	.920**	.920	.921
Juvenile arrest	.001	1.371**	1.368	1.374	.001	1.372**	1.368	1.375	.001	1.486**	1.483	1.489
Juvenile smoking	.001	9.316**	9.298	9.333	.001	9.635**	9.617	9.652	.001	9.700**	9.682	9.718
Crime victim, 2002	.002	1.112**	1.109	1.116	.002	1.168**	1.165	1.172	.002	1.207**	1.203	1.211
Crime victim, 2007	.002	2.256**	2.248	2.264	.002	2.223**	2.215	2.231	.002	2.179**	2.171	2.187
Gender	.001	.874**	.872	.875	.001	.828**	.826	.829	.001	.765**	.764	.767
Race/ethnicity	.000	1.163**	1.162	1.164	.000	1.156**	1.155	1.157	.000	1.169**	1.168	1.170
Education	.001	.562**	.562	.563	.001	.548**	.547	.549	.001	.539**	.538	.539
Poverty	.000	1.000**	1.000	1.000	.000	1.000**	1.000	1.000	.000	1.000**	1.000	1.000
Employed	.001	.974**	.973	.975	.001	.982**	.981	.983	.001	.972**	.971	.973

**P ≤ .001.

^aTo reduce the complexity of the multinomial logistic regression results presented, Table 3 presents the results of the “problem” smoking classes only (i.e., classes 4, 5, & 6). For the complete results for all 7 smoking classes, refer to Appendix B.

Table 4. Comparing regressions' odds ratios to each other.

	ARREST	CONVICTION	INCARCERATION
Class 4/unable to quit smokers, JSI Exp(B)	2.904	3.268	1.914
<i>Dividing more severe JSI by less severe JSI</i>	1.125 <i>Conviction/arrest</i>	.586 <i>Incarc./conviction</i>	.659 <i>Incarc./arrest</i>
Class 5/increasing smokers, JSI Exp(B)	2.837	2.588	2.846
<i>Dividing more severe JSI by less severe JSI</i>	.912 <i>Conviction/arrest</i>	1.099 <i>Incarc./conviction</i>	1.003 <i>Incarc./arrest</i>
Class 6/chronic smokers, JSI Exp(B)	2.691	2.827	1.919
<i>Dividing more severe JSI by less severe JSI</i>	1.051 <i>Conviction/arrest</i>	.679 <i>Incarc./conviction</i>	.713 <i>Incarc./arrest</i>

smoking classes. (The longer tables showing the complete models for all smoking classes, for the three different types of JSI, are shown in Appendix B.)

As seen in Table 3, all three types of JSI significantly predicted increased odds of being in a smoking class other than the reference class (class 2/non-smoking). The size of the odds ratios decreased from the JSI and family predictors model (not shown in table format) to the full model. However, arrest, conviction and incarceration in emerging adulthood all remained significant and increased the likelihood of respondents being in a smoking class, as opposed to the non-smoking class. Of the different types of JSI, arrest and conviction had generally larger odds ratios than the most severe type of JSI, incarceration, with respect to respondents' likelihood of being in the "problem smoking" classes (i.e., classes 4, 5 and 6)—counter to the predictions of the hypothesis. In the full models, arrest in emerging adulthood increased the odds of individuals being in class 4/unsuccessfully trying to quit smokers by 2.904; increased the odds of being in class 5/increasing smokers by 2.837; and increased the odds of being in class 6/chronic smokers by 2.691. Having been convicted in emerging adulthood increased the odds of individuals being in classes 4, 5 or 6 by 3.268, 2.588 and 2.827, respectively. By contrast, having been incarcerated increased the odds of being in classes 4, 5, or 6 by 1.914, 2.846, and 1.919, respectively. The confidence intervals for the Exp (B) statistics do not overlap for the arrest, conviction, and incarceration models. (The one exception to this is for class 5 smokers in the arrest and incarceration models.) This suggests that the difference in the JSI-type odds ratio sizes is generally statistically significant.

Across all types of JSI, both family variables—marital status and having children—generally reduced the odds slightly of being in one of the smoking classes as opposed to class 2/non-smoking, with a few exceptions, as expected. Both marital status and having children reduced the odds of being in the most problematic smoking class, class 6/chronic smoking. The inclusion of additional covariates in the models did not greatly change the odds ratios of either family variable. Female gender was related to a decreased likelihood of being in a smoking

class, as opposed to being in class 2/non-smoking. In other words, women were less likely to smoke than were men.

The consistently largest predictor of being in a "problem" smoking class rather than class 2/non-smoking was *juvenile smoking*. Odds ratios for juvenile smoking ranged from a low of 2.862 (arrest model, odds of being in class 5/increasing smokers) to a high of 9.700 (incarceration model, odds of being in class 6/chronic smokers). In all three JSI models, juvenile smoking increased the likelihood of individuals being in class 6/chronic smokers (as opposed to being in class 2/non-smoking) by over 800%. Additionally, having been a crime victim in 2007—when respondents would have been between 22 and 28 years of age—was consistently related to an increased odds of individuals being in a problem smoking class (classes 4, 5 or 6) rather than in class 2/non-smoking. Odds ratios for crime victimization reported in 2007 ranged from a low of 2.179 (incarceration model, odds of being in class 6/chronic smokers) to a high of 3.103 (arrest model, odds of being in class 5/increasing smokers).

As for the other covariates—race/ethnicity, education, poverty, and employment—education had the largest odds ratios regardless of JSI type. Increased education level at age 21 decreased the likelihood of an individual being in a smoking class (e.g., classes 4, 5, and 6), and increased the odds of the respondent being in class 2/non-smoking.

In addition to comparing the odds ratios for the JSI variables in Table 3 to their respective baselines (i.e., Exp [B] for arrest, conviction and incarceration in class 2), fully testing the hypothesis requires comparing the odds ratios to each other. This is shown above in Table 4. The table displays the original odds ratios seen in the multinomial logistic regressions for each JSI type for the problem smoking classes (classes 4, 5 and 6). Additionally, below each original odds ratio is the statistic resulting from dividing the odds ratio for the more severe JSI type by the odds ratio for the less severe JSI type.

The results seen in Table 4 show that counter to the predictions of the hypothesis, more severe forms of JSI are *not* always related to more problematic smoking. Holding other factors in the model constant, the odds of individuals who had been

Table 5. Transitions in smoking state based on JSI.

JSI in emerging adulthood	ARRESTED, 18 TO 21 YEARS OLD		CONVICTED, 18 TO 21 YEARS OLD		INCARCERATED, 18 TO 21 YEARS OLD	
	State 1/non-smoking	State 2/smoking	State 1/non-smoking	State 2/smoking	State 1/non-smoking	State 2/smoking
no (0)	.6131	.3869	.585	.415	.5633	.4367
yes (1)	.2772	.7228	.2508	.7492	.2075	.7925

convicted being in class 4 (unable to quit smokers) are 1.125 times more likely than if they had only been arrested. Another way to interpret this is that individuals that were convicted in early adulthood are 12% more likely to be in class 4 than if they had only been arrested. However, individuals who were incarcerated were 41% *less likely* to be in class 4 than if they had either been just convicted; and 34% *less likely* than if they had just been arrested. In terms of being in class 5 (increasing smokers), holding other factors constant, previously incarcerated individuals were slightly more likely to be in class 5 than if they had just been arrested or convicted. Previously incarcerated individuals were nearly 10% more likely to be in class 5 than if they had been previously convicted. The pattern seen for class 6 (chronic smokers) by JSI type is similar to the pattern seen for class 4 (unable to quit smokers). Previously convicted individuals were 5% more likely to be chronic smokers than if they had only been arrested. However, previously incarcerated individuals were less likely to be chronic smokers than if they had been only previously arrested (29% less likely) or only previously convicted (32% less likely).

It is worth noting that arrest and conviction are prerequisite experiences to being incarcerated. In other words, an individual would not end up behind bars without having been first arrested, and then convicted of a criminal offense. There may be individuals who were arrested-only (e.g., their charge may have been dismissed), as well as arrested-and-convicted-only but not ultimately incarcerated (e.g., the individual received a community sentence such as probation, and did not end up in jail or prison). Viewed this way, Table 4 suggests that incarceration is not necessarily worse for individuals in terms of ultimately being in a “problem smoking” class—counter to expectation. The experience of simply getting arrested—the initial point of entry into the justice system—seems to have an adverse impact on individuals in terms of their subsequent smoking behaviors.

Additional Testing of the Hypothesis: Assessing Transitions in Smoking Based on JSI via LTA

To further assess the impact of JSI on smoking, LTA was performed. The smoking variables used in the LTA were the dichotomous forms of the dependent variable, rather than the smoking class variable used in the multinomial logistic regression, as this facilitates interpretation of the output. As seen in Table 5, among those arrested during emerging adulthood,

27.72% are in state 1/non-smoking; and 72.28% are in state 2/smoking. (The Latent Gold software uses the terminology of “state” rather than “class” in conducting LTA). This is different from the non-arrested individuals, who are slightly more likely to be in state 1/non-smoking (61.31%) than state 2/smoking (38.69%). Similar percentages of formerly-convicted and formerly-incarcerated individuals are in state 2.

Transitions probabilities for *any smoking at age* ____ (yes or no) were then examined age by age, for ages 22 through 36 (see Table 6). The differences in transition probabilities over time are significant (see bottom of Table 6).

As seen in Table 6, JSI-involved individuals were more likely to transition from non-smoking to smoking (i.e., to move from state 1/non-smoking to state 2/smoking; see the bolded percentages). Taking age 25 as an example, 5.84% of formerly arrested individuals were likely to transition from non-smoking in the prior year (age 24) to smoking at age 25, compared to only 1.94% of non-formerly arrested individuals. The effects become more pronounced as the type of JSI becomes more severe. 7.15% of formerly convicted individuals were likely to transition from non-smoking to smoking from ages 24 to 25, compared to only 2.08% of non-convicted individuals. 13.41% of formerly incarcerated individuals were likely to transition from non-smoking to smoking from ages 24 to 25, compared to only 2.14% of non-incarcerated individuals. The results are similar at other ages, and suggest support for labeling theory or other factors (e.g., the stress of having past JSI).

As for JSI serving as a teachable moment that contributes to reduced smoking, the results in Table 6 do not support this. Looking again at age 25 for the *state 2/smoking-to-state 1/non-smoking* transitions, comparable (or lesser) percentages of previously-JSI involved individuals transitioned from smoking to non-smoking, as compared to non-JSI involved individuals. At age 25, for example, 5.23% of arrested individuals transitioned from smoking during the prior year to non-smoking at age 25, compared to 6.29% of non-arrested individuals. Similarly, 4.89% of convicted individuals at age 25 transitioned from smoking to non-smoking, compared to 6.15% of non-convicted individuals. 6.04% of incarcerated individuals transitioned from smoking to non-smoking, compared to 5.97% of non-incarcerated individuals. Involvement with the justice system did not lead to improvements in smoking behavior, as compared with individuals that were not justice system-involved in emerging adulthood.

Table 6. Smoking transitions at each age by JSI in emerging adulthood.

JSI INVOLVEMENT	INDEX1_ ANYSMOKING	STATE	ARRESTED AT 18-21 YRS OLD		CONVICTED AT 18-21 YRS OLD		INCARCERATED AT 18-21 YRS OLD	
			STATE		STATE		STATE	
			1/NON-SMOKING	2/ SMOKING	1/NON-SMOKING	2/ SMOKING	1/NON-SMOKING	2/ SMOKING
no (0)	Y3a_anysmoke22	1	.9887	.0113	.9898	.0102	.9912	.0088
no (0)	Y3a_anysmoke22	2	.0539	.9461	.053	.947	.0511	.9489
yes (1)	Y3a_anysmoke22	1	.9654	.0346	.9641	.0359	.9413	.0587
yes (1)	Y3a_anysmoke22	2	.0447	.9553	.042	.958	.0516	.9484
no (0)	Y3a_anysmoke23	1	.98	.02	.9784	.0216	.9773	.0227
no (0)	Y3a_anysmoke23	2	.0409	.9591	.0392	.9608	.0386	.9614
yes (1)	Y3a_anysmoke23	1	.94	.06	.9259	.0741	.8588	.1412
yes (1)	Y3a_anysmoke23	2	.0339	.9661	.031	.969	.0391	.9609
no (0)	Y3a_anysmoke24	1	.9798	.0202	.9789	.0211	.9779	.0221
no (0)	Y3a_anysmoke24	2	.0598	.9402	.0587	.9413	.0559	.9441
yes (1)	Y3a_anysmoke24	1	.9394	.0606	.9275	.0725	.8623	.1377
yes (1)	Y3a_anysmoke24	2	.0497	.9503	.0466	.9534	.0566	.9434
no (0)	Y3a_anysmoke25	1	.9806	.0194	.9792	.0208	.9786	.0214
no (0)	Y3a_anysmoke25	2	.0629	.9371	.0615	.9385	.0597	.9403
yes (1)	Y3a_anysmoke25	1	.9416	.0584	.9285	.0715	.8659	.1341
yes (1)	Y3a_anysmoke25	2	.0523	.9477	.0489	.9511	.0604	.9396
no (0)	Y3a_anysmoke26	1	.9886	.0114	.9881	.0119	.9879	.0121
no (0)	Y3a_anysmoke26	2	.0706	.9294	.0691	.9309	.0668	.9332
yes (1)	Y3a_anysmoke26	1	.9651	.0349	.9581	.0419	.9206	.0794
yes (1)	Y3a_anysmoke26	2	.0588	.9412	.055	.945	.0676	.9324
no (0)	Y3a_anysmoke27	1	.9885	.0115	.9882	.0118	.9877	.0123
no (0)	Y3a_anysmoke27	2	.0623	.9377	.0608	.9392	.0585	.9415
yes (1)	Y3a_anysmoke27	1	.9648	.0352	.9584	.0416	.9188	.0812
yes (1)	Y3a_anysmoke27	2	.0518	.9482	.0483	.9517	.0591	.9409
no (0)	Y3a_anysmoke28_new	1	.9925	.0075	.9919	.0081	.9916	.0084
no (0)	Y3a_anysmoke28_new	2	.0955	.9045	.0936	.9064	.0906	.9094
yes (1)	Y3a_anysmoke28_new	1	.9767	.0233	.9711	.0289	.9436	.0564
yes (1)	Y3a_anysmoke28_new	2	.0798	.9202	.0749	.9251	.0915	.9085
no (0)	Y3a_anysmoke29_new	1	.9887	.0113	.9885	.0115	.9882	.0118
no (0)	Y3a_anysmoke29_new	2	.0979	.9021	.0959	.9041	.0931	.9069
yes (1)	Y3a_anysmoke29_new	1	.9655	.0345	.9595	.0405	.9221	.0779
yes (1)	Y3a_anysmoke29_new	2	.0819	.9181	.0768	.9232	.0941	.9059
no (0)	Y3a_anysmoke30_new	1	.9905	.0095	.9898	.0102	.9901	.0099
no (0)	Y3a_anysmoke30_new	2	.0955	.9045	.0928	.9072	.0899	.9101

(Continued)

Table 6. (Continued)

JSI INVOLVEMENT	INDEX1_ANYSMOKING	STATE	ARRESTED AT 18-21 YRS OLD		CONVICTED AT 18-21 YRS OLD		INCARCERATED AT 18-21 YRS OLD	
			STATE		STATE		STATE	
			1/NON-SMOKING	2/SMOKING	1/NON-SMOKING	2/SMOKING	1/NON-SMOKING	2/SMOKING
yes (1)	Y3a_anysmoke30_new	1	.9709	.0291	.964	.036	.9338	.0662
yes (1)	Y3a_anysmoke30_new	2	.0799	.9201	.0743	.9257	.0908	.9092
no (0)	Y3a_anysmoke31_new	1	.9918	.0082	.9913	.0087	.9908	.0092
no (0)	Y3a_anysmoke31_new	2	.1108	.8892	.1091	.8909	.1048	.8952
yes (1)	Y3a_anysmoke31_new	1	.9748	.0252	.9693	.0307	.9385	.0615
yes (1)	Y3a_anysmoke31_new	2	.0929	.9071	.0876	.9124	.1059	.8941
no (0)	Y3a_anysmoke32_new	1	.9903	.0097	.99	.01	.9885	.0115
no (0)	Y3a_anysmoke32_new	2	.1409	.8591	.1379	.8621	.1332	.8668
yes (1)	Y3a_anysmoke32_new	1	.9701	.0299	.9648	.0352	.924	.076
yes (1)	Y3a_anysmoke32_new	2	.1187	.8813	.1114	.8886	.1346	.8654
no (0)	Y3a_anysmoke33	1	.9921	.0079	.9922	.0078	.9921	.0079
no (0)	Y3a_anysmoke33	2	.0439	.9561	.0428	.9572	.0418	.9582
yes (1)	Y3a_anysmoke33	1	.9755	.0245	.9723	.0277	.9464	.0536
yes (1)	Y3a_anysmoke33	2	.0364	.9636	.0339	.9661	.0423	.9577
no (0)	Y3a_anysmoke34	1	.9889	.0111	.9878	.0122	.9868	.0132
no (0)	Y3a_anysmoke34	2	.1624	.8376	.1606	.8394	.1552	.8448
yes (1)	Y3a_anysmoke34	1	.966	.034	.9571	.0429	.9134	.0866
yes (1)	Y3a_anysmoke34	2	.1375	.8625	.1305	.8695	.1567	.8433
no (0)	Y3a_anysmoke35	1	.9929	.0071	.9909	.0091	.9918	.0082
no (0)	Y3a_anysmoke35	2	.0511	.9489	.0486	.9514	.0477	.9523
yes (1)	Y3a_anysmoke35	1	.9782	.0218	.968	.032	.945	.055
yes (1)	Y3a_anysmoke35	2	.0424	.9576	.0385	.9615	.0482	.9518
no (0)	Y3a_anysmoke36	1	1	0	1	0	1	0
no (0)	Y3a_anysmoke36	2	.7298	.2702	.7333	.2667	.7196	.2804
yes (1)	Y3a_anysmoke36	1	1	0	1	0	1	0
yes (1)	Y3a_anysmoke36	2	.6894	.3106	.6831	.3169	.7219	.2781

Arrested: Z-value = 935.6491, $P \leq .001$; Convicted: Z-value = 708.7135, $P \leq .001$; Incarcerated: Z-value = 407.1113, $P \leq .001$.

Discussion

This study is a continuation of a previous study⁵ that examined the impact of emerging adulthood arrest on smoking transitions through age 30. The present article improves on the prior work by operationalizing JSI beyond just arrest to include more serious levels of involvement (criminal conviction and incarceration). It also examined classes and transitions in smoking over a longer time period (i.e., through age 36). This study also considered the additional impact of two key family processes—marital

status and parenthood—on smoking transitions for JSI-involved vs non-involved individuals. Socio-demographic variables (i.e., race/ethnicity, employment, poverty, and education) were also included in the models.

All types of JSI increased the likelihood of being in a smoking class rather than being in the non-smoking reference class. This is reflected in both the multinomial logistic regression and the LTA. The JSI indicators remained significant even with other predictors included in the regression models.

It did not necessarily bear out, as was hypothesized, that the more serious forms of JSI were related to more “problem smoking” classes. Rather than incarceration being notably more detrimental for individuals in terms of contributing to future problem smoking, arrest—the *start* of any JSI process—is seen to adversely contribute to individuals’ future smoking pathways. Conviction, the next step in the JSI process, *sometimes* had a more adverse impact on individuals’ smoking behavior than arrest did; and other times not. As for why incarceration was not more damaging to individuals in terms of creating longer-term, addictive-type smoking, it may be due to cigarettes being harder to acquire in a correctional facility that has a smoke-free policy, for example. By contrast, individuals that are only arrested, or arrested and convicted but sentenced to some type of community corrections such as probation, may find themselves living at home but forced to regularly visit a probation office, for example. This experience of “doing time on the outside” could function like an ongoing reminder of their JSI status, and contribute to a smoking habit (e.g., using cigarettes as a way to cope with the stress and/or bad feelings stemming from having a “criminal” label).

More serious forms of JSI were related to larger effects on transitions from non-smoking to smoking, as observed in the LTA models. Of the different types of JSI in the multinomial logistic regression models, arrest and conviction had generally larger odds ratios than the most severe form of JSI, incarceration, particularly with respect to respondents’ likelihood of being in the “problem smoking” classes (i.e., classes 4, 5, and 6). In the LTA models, JSI-involved individuals were more likely to transition from non-smoking to smoking, than from smoking to non-smoking. The LTA results provided more support for labeling theory than the idea of JSI as a teachable moment leading to less smoking.

Across all types of JSI, both family variables—marital status and having children—generally reduced the odds slightly of being in one of the smoking classes—including the most serious smoking class, class 6/chronic smoking—as opposed to class 2/non-smoking. Juvenile smoking was by far the most robust predictor of smoking in adulthood, in keeping with prior research²⁵ that most people who start smoking begin in adolescence. Prior crime victimization was also related to increased smoking.

The results also present an opportunity to address disparities in JSI and smoking as relate to socio-demographic factors. While race, education, poverty and employment all significantly predicted smoking as opposed to non-smoking, education had a notable impact on reduced smoking regardless of JSI type. This finding suggests that increased educational opportunities may help offset some of the negative consequences (e.g., stigma) that can follow an individual in the years following their involvement with the justice system and contribute to their smoking. While criminal justice professionals typically view educational opportunities for JSI individuals as a positive thing, education is generally seen as contributing to future

employment and less recidivism. The ability to earn a degree is not usually framed in the context of reducing JSI individuals’ smoking or improving their health. Educational opportunities may help lessen the detrimental impact of other factors such as poverty, thereby reducing disparities in individuals’ post-JSI smoking. This is an area for future inquiry.

All studies have limitations, and this present effort is no exception. The NLSY97 data are based on self-report and thus subject to response bias (e.g., social desirability, recall)^{56,57}. That said, self-reported substance use is generally found to have acceptable levels of validity and reliability⁵⁸. An advantage of self-report data is that subjects’ behavior is less likely to be underestimated than when using official sources of data⁵⁹. Additionally for the NLSY97, so as to minimize social desirability bias, reports of sensitive behaviors were obtained via audio computer-assisted self-interviewing.

The investigator initially performed the GBTM analyses without the weights applied. This resulted in a cleaner image than the one featured in Figure 1 (i.e., fewer smoking classes). However, as the multinomial logistic regression and LTA needed to be run with the weights on, for the sake of consistency the GBTM was redone with weighting.

Limitations aside, the present study contributes to the literature on how involvement with the criminal justice system impacts subsequent smoking behavior over the life course. A value of this study is that it is interdisciplinary in nature, drawing on both public health and criminal justice research. While smoking behavior is not typically considered within the purview of policing, court, and correctional officials, attention should be paid to this unintended consequence of JSI: more smoking, which contributes to increased risk for smoking-related illnesses (e.g., cancer), and worse health generally. Smoking prevention and cessation programs should be part of the offerings to individuals caught up in the justice system at varying levels, along with other types of programming such as employment assistance, recidivism prevention and substance abuse cessation more broadly.

The policy implications are also the importance of targeting juvenile smoking, including but not limited to youth who get arrested, convicted and incarcerated. Involvement with the justice system, in all its manifestations, is a negative health factor that increases smoking. Reducing JSI individuals’ smoking should be among the areas of concern for the justice system, in addition to the standard goal of reduced recidivism.

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ORCID iD

Connie Hassett-Walker  <https://orcid.org/0000-0002-7518-8840>

NOTES

1. <https://www.nlsinfo.org/investigator/pages/search>
2. <https://www.stata.com/company/>
3. <https://www.andrew.cmu.edu/user/bjones/traj>
4. <https://www.statisticalinnovations.com/latent-gold-6-0/>
5. <https://www.nlsinfo.org/weights/nlsy97>

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Appendix A: Smoking trajectory Stata syntax, 7-group quadratic model

Stata Syntax

```
traj, model (logit) var(Y3a_anysmoke22 Y3a_anysmoke23 Y3a_anysmoke24 Y3a_anysmoke25 Y3a_anysmoke26 Y3a_anysmoke27 Y3a_anysmoke28_new Y3a_anysmoke29_new Y3a_anysmoke30_new
```

```
Y3a_anysmoke31_new Y3a_anysmoke32_new Y3a_anysmoke33 Y3a_anysmoke34 Y3a_anysmoke35 Y3a_anysmoke36) indep (t_1-t_15) order (2 2 2 2 2 2) trajplot,xtitle("Age in young adulthood")ytitle("Any Smoking")
Maximum Likelihood Estimates
Model: Logistic (logit)
```

GROUP	PARAMETER	STANDARD ESTIMATE	T FOR H0: ERROR	PARAMETER=0	PROB > T
1	Intercept	1.75072	.09615	18.209	.0000
	Linear	-.15644	.05580	-2.803	.0051
	Quadratic	-.08955	.00812	-11.023	.0000
2	Intercept	-2.99061	.04577	-65.338	.0000
	Linear	-.55896	.02020	-27.675	.0000
	Quadratic	.04005	.00144	27.826	.0000
3	Intercept	.96800	.10286	9.411	.0000
	Linear	.52023	.05359	9.708	.0000
	Quadratic	-.07579	.00528	-14.353	.0000
4	Intercept	2.73582	.09853	27.768	.0000
	Linear	.75356	.03715	-20.282	.0000
	Quadratic	.05091	.00306	16.622	.0000
5	Intercept	-2.94027	.13439	-21.878	.0000
	Linear	1.00608	.03951	25.461	.0000
	Quadratic	-.05117	.00260	-19.687	.0000
6	Intercept	2.50960	.04654	53.924	.0000
	Linear	.30469	.01642	18.551	.0000
	Quadratic	-.02628	.00112	-23.418	.0000
7	Intercept	-1.45012	.07144	-20.298	.0000
	Linear	.09303	.02143	4.341	.0000
	Quadratic	-.00380	.00147	-2.592	.0095
Group membership					
1	(%)	5.50629	0.11406	48.276	.0000
2	(%)	47.77569	.21136	226.043	.0000
3	(%)	5.66225	.23719	23.872	.0000
4	(%)	6.30753	.25764	24.482	.0000
5	(%)	4.21938	.14381	29.340	.0000
6	(%)	21.45354	.17172	124.931	.0000
7	(%)	9.07533	.18461	49.160	.0000

Comparative BIC Scores.

ANY SMOKING	LARGE N	SMALL N	LARGE N	SMALL N	LARGE N	SMALL N
# of groups	Linear		Quadratic		Cubic	
3	380 971	380 963	379 043	379 032	378 837	378 823
4	378 526	378 515	373 244	373 229	372 555	372 535
5	372 861	372 847	370 815	370 796	370 064	370 040
6	369 935	369 918	369 321	369 298	parameters n.s.	parameters n.s.
7	369 611	369 590	368 448	368 421	parameters n.s.	parameters n.s.

Color coding key: Green, bold = lowest BIC scores; Yellow = low BIC scores, significant parameter estimates; Yellow, struck-through score = low BIC scores, insignificant parameter estimates.

Appendix B: Complete Multinomial Logistic Regression Models, Smoking Classes 1-7

Table B1. Multinomial logistic regression, association between arrest and smoking class (complete).

SMOKING CLASS		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
				LOWER BOUND	UPPER BOUND
immature later-quitting smokers (1)	Intercept	.004			
	Arrested	.002	1.782**	1.775	1.789
	Marital status	.001	1.059**	1.057	1.061
	Children	.001	.943**	.942	.944
	Juvenile arrest	.002	1.463**	1.457	1.468
	Juvenile smoking	.002	4.827**	4.812	4.842
	Crime victim, 2002	.004	.344**	.341	.347
	Crime victim, 2007	.004	1.406**	1.396	1.416
	Gender	.002	.704**	.702	.706
	Race/ethnicity	.001	1.023**	1.022	1.024
	Education	.001	.821**	.819	.822
	Poverty	.000	1.000**	1.000	1.000
Employed	.001	1.109**	1.107	1.111	
gradual decreasing smokers eventual quitters (3)	Intercept	.004			
	Arrested	.002	3.061**	3.051	3.072
	Marital status	.001	1.069**	1.068	1.071
	Children	.001	.989**	.988	.990
	Juvenile arrest	.002	.808**	.805	.811
	Juvenile smoking	.002	10.782**	10.746	10.818
	Crime victim, 2002	.003	.942**	.937	.947
	Crime victim, 2007	.003	3.455**	3.437	3.472
	Gender	.002	.797**	.795	.800
	Race/ethnicity	.001	1.158**	1.156	1.159
	Education	.001	.611**	.610	.612
	Poverty	.000	1.000**	1.000	1.000
Employed	.001	1.095**	1.093	1.097	

(Continued)

Table B1. (Continued)

SMOKING CLASS		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
				LOWER BOUND	UPPER BOUND
unsuccessfully trying to quit smokers (4)	Intercept	.004			
	Arrested	.002	2.904**	2.894	2.914
	Marital status	.001	.965**	.964	.967
	Children	.001	.946**	.945	.947
	Juvenile arrest	.002	1.536**	1.531	1.541
	Juvenile smoking	.002	7.125**	7.102	7.147
	Crime victim, 2002	.002	1.235**	1.229	1.241
	Crime victim, 2007	.003	2.455**	2.442	2.469
	Gender	.002	.785**	.782	.787
	Race/ethnicity	.001	.972**	.971	.974
	Education	.001	.645**	.644	.646
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	1.113**	1.111	1.114
increasing smokers (5)	Intercept	.004			
	Arrested	.002	2.837**	2.826	2.848
	Marital status	.001	1.122**	1.120	1.124
	Children	.001	.967**	.966	.968
	Juvenile arrest	.002	1.837**	1.830	1.844
	Juvenile smoking	.002	2.862**	2.853	2.872
	Crime victim, 2002	.003	.853**	.848	.858
	Crime victim, 2007	.003	3.103**	3.087	3.120
	Gender	.002	.958**	.955	.961
	Race/ethnicity	.001	.989**	.988	.991
	Education	.001	.732**	.730	.733
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	1.176**	1.174	1.178
chronic smokers (6)	Intercept	.002			
	Arrested	.001	2.691**	2.684	2.697
	Marital status	.001	.965**	.964	.966
	Children	.000	.925**	.925	.926
	Juvenile arrest	.001	1.371**	1.368	1.374
	Juvenile smoking	.001	9.316**	9.298	9.333
	Crime victim, 2002	.002	1.112**	1.109	1.116
	Crime victim, 2007	.002	2.256**	2.248	2.264
	Gender	.001	.874**	.872	.875
	Race/ethnicity	.000	1.163**	1.162	1.164
	Education	.001	.562**	.562	.563
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	.974**	.973	.975

(Continued)

Table B1. (Continued)

SMOKING CLASS		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
				LOWER BOUND	UPPER BOUND
consistent, occasional smokers (7)	Intercept	.004			
	Arrested	.002	1.664**	1.658	1.671
	Marital status	.001	.973**	.972	.975
	Children	.001	.927**	.926	.928
	Juvenile arrest	.002	.758**	.755	.761
	Juvenile smoking	.001	3.540**	3.530	3.550
	Crime victim, 2002	.003	1.078**	1.073	1.084
	Crime victim, 2007	.004	.865**	.859	.871
	Gender	.001	.748**	.746	.750
	Race/ethnicity	.001	.956**	.955	.957
	Education	.001	.855**	.853	.856
	Poverty	.000	.999**	.999	.999
	Employed	.001	1.078**	1.076	1.079

**P ≤ .001.

Table B2. Multinomial logistic regression, association between conviction and smoking class (complete).

SMOKING CLASS		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
				LOWER BOUND	STD. ERROR
immature later-quitting smokers (1)	Intercept	.004			
	Convicted	.002	1.795**	1.786	1.804
	Marital status	.001	1.049**	1.047	1.050
	Children	.001	.945**	.944	.946
	Juvenile arrest	.002	1.475**	1.469	1.480
	Juvenile smoking	.002	4.893**	4.878	4.908
	Crime victim, 2002	.004	.352**	.349	.355
	Crime victim, 2007	.004	1.370**	1.361	1.380
	Gender	.002	.685**	.683	.687
	Race/ethnicity	.001	1.018**	1.016	1.019
	Education	.001	.813**	.812	.815
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	1.109**	1.107	1.110
gradual decreasing smokers, eventual quitters (3)	Intercept	.004			
	Convicted	.002	3.692**	3.677	3.707
	Marital status	.001	1.055**	1.054	1.057

(Continued)

Table B2. (Continued)

SMOKING CLASS	STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)		
			LOWER BOUND	STD. ERROR	
	Children	.001	.991**	.990	.992
	Juvenile arrest	.002	.796**	.793	.799
	Juvenile smoking	.002	11.170**	11.133	11.208
	Crime victim, 2002	.003	.975**	.970	.980
	Crime victim, 2007	.003	3.421**	3.404	3.438
	Juvenile arrest	.002	.796**	.764	.769
	Race/ethnicity	.001	1.150**	1.148	1.151
	Education	.001	.597**	.596	.598
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	1.105**	1.103	1.107
unsuccessfully trying to quit smokers (4)	Intercept	.004			
	Convicted	.002	3.268**	3.255	3.281
	Marital status	.001	.951**	.949	.953
	Children	.001	.947**	.946	.948
	Juvenile arrest	.002	1.525**	1.520	1.530
	Juvenile smoking	.002	7.376**	7.353	7.400
	Crime victim, 2002	.002	1.305**	1.299	1.311
	Crime victim, 2007	.003	2.422**	2.409	2.436
	Gender	.002	.746**	.744	.748
	Race/ethnicity	.001	.964**	.963	.965
	Education	.001	.629**	.628	.630
	Poverty	.000	1.000**	1.000	1.000
Employed	.001	1.120**	1.119	1.122	
increasing smokers (5)	Intercept	.004			
	Convicted	.002	2.588**	2.576	2.600
	Marital status	.001	1.098**	1.096	1.100
	Children	.001	.967**	.966	.968
	Juvenile arrest	.002	1.877**	1.870	1.884
	Juvenile smoking	.002	2.974**	2.964	2.983
	Crime victim, 2002	.003	.908**	.903	.914
	Crime victim, 2007	.003	3.031**	3.015	3.047
	Gender	.002	.888**	.885	.891
	Race/ethnicity	.001	.982**	.981	.983
	Education	.001	.711**	.709	.712
	Poverty	.000	1.000**	1.000	1.000
Employed	.001	1.179**	1.177	1.181	

(Continued)

Table B2. (Continued)

SMOKING CLASS		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
				LOWER BOUND	STD. ERROR
chronic smokers (6)	Intercept	.002			
	Convicted	.001	2.827**	2.818	2.835
	Marital status	.001	.950**	.949	.951
	Children	.000	.926**	.925	.927
	Juvenile arrest	.001	1.372**	1.368	1.375
	Juvenile smoking	.001	9.635**	9.617	9.652
	Crime victim, 2002	.002	1.168**	1.165	1.172
	Crime victim, 2007	.002	2.223**	2.215	2.231
	Gender	.001	.828**	.826	.829
	Race/ethnicity	.000	1.156**	1.155	1.157
	Education	.001	.548**	.547	.549
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	.982**	.981	.983
consistent, occasional smokers (7)	Intercept	.003			
	Convicted	.002	1.816**	1.807	1.824
	Marital status	.001	.967**	.965	.968
	Children	.001	.929**	.928	.930
	Juvenile arrest	.002	.758**	.755	.761
	Juvenile smoking	.001	3.580**	3.570	3.590
	Crime victim, 2002	.003	1.091**	1.085	1.096
	Crime victim, 2007	.004	.853**	.847	.859
	Gender	.001	.735**	.733	.737
	Race/ethnicity	.001	.951**	.950	.952
	Education	.001	.851**	.849	.852
	Poverty	.000	.999**	.999	.999
	Employed	.001	1.077**	1.076	1.079

**P ≤ .001

Table B3. Multinomial logistic regression, association between incarceration and smoking class (complete).

SMOKING CLASS		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
				LOWER BOUND	STD. ERROR
Immature later-quitting smokers (1)	Intercept	.004			
	Incarcerated	.005	1.092**	1.082	1.102
	Marital status	.001	1.040**	1.038	1.041
	Children	.001	.942**	.941	.943

(Continued)

Table B3. (Continued)

SMOKING CLASS		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
				LOWER BOUND	STD. ERROR
	Juvenile arrest	.002	1.556**	1.550	1.561
	Juvenile smoking	.002	4.928**	4.913	4.944
	Crime victim, 2002	.004	.364**	.361	.368
	Crime victim, 2007	.004	1.357**	1.348	1.367
	Gender	.002	.652**	.650	.654
	Race/ethnicity	.001	1.021**	1.020	1.022
	Education	.001	.802**	.800	.803
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	1.108**	1.106	1.109
gradual decreasing smokers, eventual quitters (3)	Intercept	.004			
	Incarcerated	.003	2.575**	2.558	2.592
	Marital status	.001	1.034**	1.032	1.035
	Children	.001	.984**	.983	.985
	Juvenile arrest	.002	.878**	.874	.881
	Juvenile smoking	.002	11.301**	11.263	11.338
	Crime victim, 2002	.003	1.014**	1.009	1.019
	Crime victim, 2007	.003	3.357**	3.340	3.374
	Gender	.001	.697**	.695	.699
	Race/ethnicity	.001	1.167**	1.165	1.168
	Education	.001	.584**	.583	.585
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	1.087**	1.085	1.089
unsuccessfully trying to quit smokers (4)	Intercept	.004			
	Incarcerated	.003	1.914**	1.901	1.927
	Marital status	.001	.932**	.931	.934
	Children	.001	.940**	.939	.941
	Juvenile arrest	.002	1.683**	1.677	1.689
	Juvenile smoking	.002	7.434**	7.411	7.458
	Crime victim, 2002	.002	1.360**	1.354	1.367
	Crime victim, 2007	.003	2.372**	2.359	2.385
	Gender	.001	.674**	.672	.676
	Race/ethnicity	.001	.977**	.976	.978
	Education	.001	.615**	.614	.616
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	1.109**	1.108	1.111

(Continued)

Table B3. (Continued)

SMOKING CLASS		STD. ERROR	EXP(B)	95% CONFIDENCE INTERVAL FOR EXP(B)	
				LOWER BOUND	STD. ERROR
increasing smokers (5)	Intercept	.004			
	Incarcerated	.003	2.846**	2.826	2.865
	Marital status	.001	1.091**	1.089	1.093
	Children	.001	.962**	.961	.963
	Juvenile arrest	.002	1.967**	1.960	1.974
	Juvenile smoking	.002	2.976**	2.966	2.986
	Crime victim, 2002	.003	.910**	.905	.915
	Crime victim, 2007	.003	3.007**	2.991	3.022
	Gender	.002	.859**	.856	.862
	Race/ethnicity	.001	.992**	.990	.993
	Education	.001	.709**	.708	.710
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	1.159**	1.157	1.161
chronic smokers (6)	Intercept	.002			
	Incarcerated	.003	1.919**	1.910	1.929
	Marital status	.001	.934**	.933	.935
	Children	.000	.920**	.920	.921
	Juvenile arrest	.001	1.486**	1.483	1.489
	Juvenile smoking	.001	9.700**	9.682	9.718
	Crime victim, 2002	.002	1.207**	1.203	1.211
	Crime victim, 2007	.002	2.179**	2.171	2.187
	Gender	.001	.765**	.764	.767
	Race/ethnicity	.000	1.169**	1.168	1.170
	Education	.001	.539**	.538	.539
	Poverty	.000	1.000**	1.000	1.000
	Employed	.001	.972**	.971	.973
consistent, occasional smokers (7)	Intercept	.003			
	Incarcerated	.004	1.872**	1.859	1.885
	Marital status	.001	.961**	.960	.963
	Children	.001	.926**	.925	.927
	Juvenile arrest	.002	.782**	.779	.785
	Juvenile smoking	.001	3.587**	3.577	3.597
	Crime victim, 2002	.003	1.103**	1.098	1.109
	Crime victim, 2007	.004	.848**	.842	.854
	Gender	.001	.718**	.716	.720
	Race/ethnicity	.001	.954**	.953	.955
	Education	.001	.848**	.847	.849
	Poverty	.000	.999**	.999	.999
	Employed	.001	1.070**	1.069	1.072

** $P \leq .001$.