INCARCERATION AND POST-RELEASE HEALTH BEHAVIOR

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Abstract

This study investigates the link between incarceration and health behavior among a sample of young adults from the National Longitudinal Study of Adolescent Health (N=12,784). Incarceration is associated with a higher expected rate of fast food consumption and a higher likelihood of cigarette smoking. These associations operate through a combination of financial, social, and psychological mechanisms. Given the role of health behavior in predicting future health outcomes, poor health behavior may be a salient force driving health and mortality risk among the formerly incarcerated population.

Many unfavorable health outcomes, such as obesity and hypertension, result in part from poor health behavior. In fact, poor diet, tobacco use, and physical inactivity have been identified as the leading causes of death in the United States (Mokdad et al., 2004; 2005). Every year approximately 700,000 inmates are released from prison and millions more are released from jail (Carson and Sabol, 2012; Beck, 2006). Research increasingly suggests that time behind bars exacerbates physical and mental health (Schnittker and John, 2007; Massoglia, 2008; Schnittker et al., 2012; Turney, Wildeman, and Schnittker, 2012), but the role of health behavior in this nexus has garnered little attention

Unhealthy habits are more prevalent among socioeconomically disadvantaged members of the population and it is estimated that differences in these behaviors account for about 25 percent of socioeconomic disparities in health (Pampel, Krueger, and Denny, 2010). Incarceration is also rampant in the lives of the "poor, poorly educated, mentally ill, and socially estranged," and some scholars argue that incarceration disparities could be widening health inequalities (Wildeman and Muller, 2012: 12). Considering the potentially lethal consequences of poor health behavior and given striking disparities in both incarceration and health, any impact of incarceration on health behavior has potentially far-reaching implications for health inequality.

This study builds on prior research by examining the association between incarceration and health behavior among young adults using the National Longitudinal Study of Adolescent Health (Add Health). Young ex-inmates (ages 24-32) constitute an important group because the majority of individuals who experience incarceration will first enter the correctional facility during this stage of their lives, which is referred to as "emerging adulthood." As implied by the term, this age tends to be characterized by growing autonomy, marriage, stable employment, and

for many, a time when "many directions remain possible" (Arnett, 2000: 469). This is also a crucial stage for health behavior, which tends to stabilize around this time (Harris, 2010). However, while many young adults may be exploring new directions, young ex-inmates are confronting limited ones as they transition from prison rather than from college (Western, 2006; Comfort, 2012). The stressors confronted by individuals who pass through correctional facilities are likely to worsen health behavior.

As scholars note, selection into incarceration makes it difficult to isolate outcomes from pre-existing conditions. To address this issue, former inmates are compared to respondents who have been convicted of crimes, but who have not been incarcerated using what is referred to here as a "strategic comparison group" regression. This group should be more comparable to former inmates than all never-incarcerated respondents. Also, both groups have convictions, helping to isolate the influence of incarceration from conviction. Available mediators are also employed to elucidate why incarceration may impact health behavior, including subjective social standing, perceived stress, and financial difficulties. In short, this study advances prior research by (1) investigating the link between incarceration and health behavior among young adults and (2) explicating the mechanisms potentially linking incarceration to such behaviors.

BACKGROUND

An expansive body of literature considers the collateral consequences of incarceration, including effects on employment, family life, and civic engagement. More recently, research suggests that incarceration increases the risk of several physical and mental health ailments, such as hypertension (Massoglia, 2008a), sexually transmitted diseases (Massoglia, 2008a; Hammett et al., 2002), disabling conditions (Greifinger, 2007; Schnittker and John, 2007), major

depression (Schnittker et al., 2012; Turney, Wildeman, and Schnittker 2012), and anxiety (Massoglia, 2008a). In addition to increasing the risk of poor health, incarceration may also negatively impact health *behavior*. Poor diet, cigarette smoking, and sedentary behavior are associated with many of the commonly cited consequences of incarceration, such as increased financial strain, social isolation, and heightened stress (Krueger and Chang, 2008; Umberson et al., 2010; Pampel et al., 2010). While some of these outcomes present more tangible threats to health behavior by constricting financial resources, time behind bars and subsequent reintegration hurdles also present more impalpable or nuanced threats to health behavior. For example, ex-inmates may feel that their identities are beyond their control, leading to increased stress and fatalism, both of which are associated with unhealthy behavior. In this study, incarceration is theorized to worsen health behavior through a myriad of processes, including financial hardship, social isolation, and diminished psychological wellbeing.

Incarceration and Financial Hardship

Former inmates confront numerous barriers to financial stability, including difficulties obtaining loans, housing, and employment (see Tonry and Petersilia, 2000 for an overview). With respect to employment in particular, employers are reluctant to hire ex-felons due to the stigma of a criminal record (Pager, 2003) and/or due to a hiatus from the labor market (Western, et al., 2001). Financial wellbeing can worsen health behavior by impacting the "means and motives" associated with maintaining a healthy lifestyle (Pampel et al., 2010: 14). For example, nutritious foods are typically more costly than less healthy options (Pampel et al., 2010) and fruits and vegetables sold in relatively poor neighborhoods are on average 15-20 percent more expensive than in wealthier neighborhoods (Emmons, 2000). Low-SES individuals also tend to

live in neighborhoods with fewer opportunities for healthy behavior due to limited access to health-related facilities, stores, and spaces (Emmons, 2000; Powell et al., 2007).

With respect to motives, financial strife acts as a stressor in its own right, but living in economically precarious situations is accompanied by chronic stressors as well (Pampel et al., 2010). Residents of disadvantaged neighborhoods are exposed to neighborhood decay, noise pollution, and violence. Van Lenthe and Mackenbach (2006) find that individuals living in relatively disadvantaged areas are more likely to smoke in part because of increased exposure to such neighborhood stressors. Residents of low-income neighborhoods are also less likely to walk for leisure due to lower levels of neighborhood attractiveness and safety concerns (Pampel et al, 2010). Low-SES individuals are also more likely to be fatalistic and deprioritize long-term consequences, both of which are associated with poor health behavior (Niederdeppe and Levy, 2007; Pampel et al., 2010; Adams and White, 2009).

Incarceration and Social Ties

While behind bars inmates are displaced from family and friends. Maintaining contact with outside ties can be difficult, as can maintaining the quality of such relationships (Christian, 2005; Comfort, 2008; Clear, 2007). Once released, former inmates continue to be isolated due to others fearing the "contagion of stigma" or due to the strain of being separated from loved ones (Massoglia et al., 2011). Studies suggest that incarceration is especially damaging with respect to marital bonds, increasing the risk of divorce and decreasing the likelihood of marriage (Western et al., 2004).

Social ties are integral components to a healthy lifestyle. People offer instrumental support for health needs, such as buying groceries or providing transportation to medical

appointments (Berkman et al., 2000). They can also be helpful in terms of finding employment (Granovetter, 1973; Yakubovich, 2005). In addition, family and friends can offer emotional support by providing "love and caring, sympathy and understanding and/or esteem or value" (Thoits, 1995, cited in Berkman et al., 2000: 848). Research suggests that this type of support acts as a stress buffer, preventing or reducing stress-driven unhealthy behaviors (Kamarck et al., 1990; Steptoe et al., 1990). In addition to providing a source of support, social ties can influence health behavior via control processes (Thoits, 2011). For example, a romantic partner can monitor health behaviors and marriage restructures a person's life in ways that foster healthy habits (Umberson et al., 2010).

Incarceration and Psychological Wellbeing

Stress. Drawing on the tenants of *stress process theory* (Pearlin, 1989), the experience of incarceration is likely to expose individuals to a number of stressors. More specifically, the effects of incarceration can be likened to Pearlin's concept of *stress proliferation*, which distinguishes between primary and secondary stressors (Pearlin et al., 1997). The primary stressors of incarceration include the loss of liberty and control, isolation, the need to make behavioral adjustments, and fear of other inmates (Sykes, 1958; Massoglia, 2008a). The stressors of prison life may also be *magnified* by the social isolation of inmates, since family and friends who otherwise provide emotional support during times of strain are absent (see Comfort, 2008; Zamble and Porporino, 1988; Braman, 2004). Drawing on Elliot and Eisdorfer's (1982) taxonomy of stressors, it is also useful to conceptualize such primary stressors as a *stressful event sequence.* According to Elliot and Eisdorfer (1982), a stressful event sequence entails a focal event, such as being incarcerated, which then gives rise to a series of related obstacles. A

stressful event sequence is also distinguished by having a foreseeable endpoint for individuals. Inmates may perceive their release as an endpoint, given ethnographic work showing that inmates tend to be optimistic about their release and changes they want to make in their lives (Zamble and Porporino, 1988; Phillips and Lindsay, 2011).

Once outside, secondary stressors of incarceration may compound primary stressors, especially given that such obstacles are not fully anticipated (Phillips and Lindsay, 2011). Secondary stressors include difficulties securing identification, finding a place to live, and finding a source of income. Former inmates can also find themselves prohibited from political participation, without parental rights, and still struggling for social acceptance. Also, and unlike primary stressors, the secondary stressors of imprisonment may resist adaptation and have no foreseeable endpoint (Bronsteen et al., 2009). To that end, the secondary stressors of incarceration can also be conceptualized as *chronic stressors*. In contrast to a stressful event sequence, Elliot and Eisdorfer (1982) argue that chronic stressors have no foreseeable endpoint and "pervade a person's life, forcing him or her to restructure his or her identity or social roles" (cited in Segerstrom and Miller, 2004: 2).

Three recent studies suggest that incarceration has profound effects on major depression, a well-established correlate of perceived stress (Roxburgh, 2011; Schnittker et al., 2012; Turney et al., 2012). In Turney and colleagues' (2012) study in particular, the authors surmise that incarceration is a source of stress proliferation. They find that both current and recent incarceration increases the likelihood of depression among fathers, and that this effect is explained by a combination of economic and relational difficulties experienced both during and after incarceration (see p.477).

Stigma and Social Standing. For many scholars, the tribulations of former inmates can be traced to stigma. From this perspective, spending time in a correctional facility stains an individual's identity, ostracizing him or her from others. Indeed, interview-based studies find that ex-felons believe their criminal past serves as a "scarlet letter, leaving them permanently marked or 'branded'" (Uggen et a1., 2004: 280; see also, Maruna, 2001). Stigma may worsen health behavior by lowering an individual's perceived standing relative to others. Former inmates are likely to "suffer from the stress of a diminished status" and "have little power over their social identity" (Schnittker and John, 2007: 118). Indeed, a recent study suggests that incarceration is associated with decreased subjective status, even after considering the social and economic consequences of imprisonment (Schnittker and Bacak, 2013).

Subjective standing is a stronger and more consistent predictor of health than objective measures of socioeconomic status (Sakurai et al., 2010; Adler et al., 2000; Demakakos et al., 2008). According to Marmot (2004), subjective social status is such a crucial predictor of morbidity and mortality because people at relatively higher positions are able to exercise more control and autonomy over life circumstances. To Marmot, these are basic human needs that are met more adequately at each progressive rung up the ladder.

Being stigmatized is a potential stressor for former inmates, but they may also react to any perceived discrimination by adopting fatalistic mentalities and feelings of low self-worth. Consistent with symbolic interactionist theory, individuals develop a sense of self in reference to others (Mead, 1934; Goffman, 1963; Link and Phelan, 2001). If ex-inmates experience "felt stigma," they may develop negative attitudes about themselves that are consistent with how they believe others see them (see also Green et al., 2005). Diminished feelings of self-worth and self-efficacy can lead to poor health behavior by leading to depression, and relatedly, by leading

individuals to give less priority to their futures (Strecher et al., 1986; McGee and Williams, 2000; Kearney and O'Sullivan, 2003).

Taken together, research suggests that incarceration has profound effects on social, economic, and psychological wellbeing. Incarceration is hypothesized to worsen diet, exercise, and smoking through a combination of these mechanisms. However, certain mediating factors may be more consequential than others depending on the behavior. For instance, socioeconomic disparities in obesity are less pronounced than disparities in smoking and exercise (Pampel et al., 2010). In addition, married people weigh more and exercise less than unmarried individuals (Grzywacz and Marks, 2001), but the transition to marriage is associated with a reduction in smoking (Bachman et al., 2001).[1] Although the strength and relevance of social and economic measures may differ across behaviors, each is linked with mental wellbeing. Any increase in perceived isolation, perceived discrimination, stress, diminished social standing, and fatalism should contribute to each behavior. Figure 1 illustrates the process by which incarceration is predicted to worsen health behavior.

"Figure 1 about here."

DATA AND METHODS

Sample

This research draws on a sample of young adults from the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a nationally representative survey of adolescents who were enrolled in grades 7-12 during the 1993-1994 academic year. Following an initial in-school survey of 90,000 students, approximately 20,000 participants were randomly selected for in-home interviews at wave I. Three subsequent follow-up interviews have been conducted since

wave I, the most recent of which was administered in 2007 and 2008 when the respondents were 24-32 years old.

Measures

Health Behavior. Three measures of health behavior at wave IV are employed in this study: *fast food consumption, physical activity*, and *cigarette smoking*. *Fast food consumption* is measured as the number of times in the past seven days a respondent consumed fast food. Fast food is defined as food from restaurants such as "McDonalds, Burger King, Wendy's, Arby's, Pizza Hut, Taco Bell, or Kentucky Fried Chicken or a local fast food restaurant." Despite some improvements in the nutritional quality of fast food options, fast food consumption is still associated with an increased risk of obesity (Fowles et al., 2011) and a recent study finds that from 1997/1998 to 2009/2010, the average Healthy Eating Index score across eight popular fast food restaurants increased only slightly from 45 to 48 (out of 100). In addition, none of the restaurants "achieved or approximated optimum scores" for fruit, dark green and orange vegetables, legumes, whole grains, or sodium (Hearst et al., 2013: 592). *Physical activity* is measured as the number of days a respondent engaged in any physical activity during the seven days prior to the interview. This variable includes a wide range of activities, such as walking, running, playing golf, and skateboarding (see Table 1 for the complete list of items). Responses to seven items were summed, such that the final index ranges from 1-49. Although these activities are distinct in a number of ways, the goal of this study is not to ascertain the differences between individuals with regard to *types* of leisure activity. Rather, the goal is to assess the association between incarceration and level of activity. Finally, *cigarette smoking* is

measured as a dichotomous variable indicating whether or not an individual smoked at least one cigarette *per day* in the past thirty days.

Contact with the Criminal Justice System. Four dichotomous indicators of exposure to the criminal justice system are employed: *incarcerated and convicted; incarcerated and not convicted; arrested only;* and *no contact*, where *convicted-only* respondents comprise the reference category. These measures were generated using the following survey items: (1) *Have you ever been arrested?,* (2) *Have you ever been convicted of or pled guilty to any charges other than a minor traffic violation?,* and (3) *Have you ever spent time in a jail, prison, juvenile detention center, or other correctional facility"* [2] Each of these categories is mutually exclusive. *Arrested only* respondents have been arrested, but not convicted of crimes or incarcerated, while *convicted only* respondents have been arrested and convicted, but not incarcerated.

As indicated, a portion of respondents indicated spending time behind bars, but were never convicted of anything more serious than a minor traffic violation. Nearly 70 percent of these respondents spent less than one month in jail and the most frequent arrest charge was "other" (50 percent). Respondents only report specifically about arrests pertaining to assault, theft, rape, robbery, drugs, fraud, and alcohol. Possible infractions included in the "other" category may include probation violations, disturbing the peace, destruction of property, illegal gun possession, trespassing, or more serious offenses such as domestic violence and child molestation. While most respondents in this category were likely arrested for minor infractions, a smaller portion is likely comprised of respondents who awaited trial for more serious charges and were never convicted. Although this group of individuals is not the group of interest, being arrested and incarcerated – *but not convicted* is a potentially interesting category of exposure to

the criminal justice system that is under-explored. Arguably, spending even a short time in jail could expose individuals to stressors and could jeopardize any current employment.

Controls. Analyses control for demographic and socioeconomic characteristics of respondents, including age, race, sex, parental education, respondent education, and prior neighborhood disadvantage. Each variable is measured at wave I, except for respondent education, which is measured as whether or not the respondent had graduated high school by wave IV. Measures also include prior depression, future orientation, and fatalistic mentality. Analyses control on prior delinquency, which is measured by summing weighted responses to questions about participation in fighting, theft, robbery, and destruction of property. Respondents were asked how many times they had engaged in each offense during the prior 12 months, and indicated the frequency as 1-2 (1), 3-4 (2), or 5 or more times(3). Each response was multiplied by a corresponding severity score culled from recent work by Ramchad and colleagues (2009). The weighted items were then summed for each respondent. Since this item was asked of respondents during their adolescent and teenage years, models also adjust for more recent indicators of criminal involvement. Variables are included to indicate whether a respondent had ever been arrested for a violent crime as an adult and whether they had been arrested as an adult more than once, which are available at wave IV. Finally, models control for prior smoking, diet, and physical activity at wave I.[3]

Mediators. The second aim of this study is to elucidate any mechanisms linking incarceration to risky health behavior. All measures are constructed from wave IV survey items. Economic wellbeing is captured using employment status and whether a respondent experienced financial difficulties in the last year, including not being able to pay bills on time, not having enough money to pay them, and having services shut off in the household due to payment

delinquency. Social integration is measured using three variables: *married*, *perceived isolation*, and *number of friends*. Importantly, these variables capture friendship ties as well as marital ties and are both objective and subjective. A series of variables also capture variation in psychological wellbeing, including *fatalistic mentality*, *perceived stress*, and *perceived discrimination* and *social standing*. Social standing is measured using a survey item in which respondents were asked to look at a picture of a 10-step ladder. They were instructed to think of people at step 10 as having the "most money and education, and the most respected jobs." At step 1, on the other hand, are people who have the "least money, education, and least respected jobs or no jobs at all." Respondents indicated where they stand relative to other people in the U.S. by choosing a step on the ladder. This measure is especially advantageous since many scholars discuss the potentially stigmatizing effects of incarceration, but few have been able to gauge it using available data (Schnittker and Bacak, 2013).

"Table 1 about here."

Analytic Strategy

Isolating the consequences of incarceration is difficult considering that many "outcomes," such as unemployment, also typically precede incarceration (Wakefield and Uggen, 2010). Massoglia and Warner (2011) note that identifying a strategic group with which to compare former inmates is a promising approach to isolate the effects of incarceration. While it is possible to control for the influence of variables that may bias the association, some variables of interest may be missing or measured imprecisely. For example, prior research indicates that self-control is an important determinant of health and criminal behavior, but the proper measurement of this characteristic is subject of much debate (Piquero, 2008). Finding an

appropriate comparison group can help account for (although not completely eliminate) unobserved heterogeneity.

Using a strategic comparison group is also useful for identifying the possible mechanisms driving any association. For example, Massoglia and colleagues (2011) compare individuals who have been incarcerated to deployed military personnel and find that incarceration has a similar effect on divorce as deployment, leading them to conclude that separation, rather than stigma, may be the key mechanism. Similarly, Apel and Sweeten (2010) compare the employment outcomes of first-time offenders sentenced to incarceration to those who were convicted, but not incarcerated. They find that incarceration leads to a detachment from the labor market that is less likely among respondents who had been convicted, but not incarcerated.[4]

In this study, the health behavior of convicted ex-inmates is compared to respondents who have been convicted of crimes, *but not incarcerated*. As Apel and Sweeten (2010) note, convicts who have not been incarcerated are especially meaningful as comparison cases because they are "closest to the incarceration decision," whereas arrestees are at the initial stage of the criminal justice funneling process (p.454). Former inmates should be similar to "convicted-only" respondents on a number of dimensions that may not be fully observed in the data.[5] If the associations between being a convicted former inmate and health behaviors are significant when comparing this group to individuals who have been "convicted only," this would suggest that the behavioral consequences of incarceration outstretch those of conviction. Of course, this finding would not rule out the potential role of stigma, but it may suggest that any stigma experienced by ex-inmates outstretches that of convicted-only individuals.

The first model of each analysis compares incarcerated and convicted respondents to all never-incarcerated respondents by regressing health behavior on *Incarcerated and Convicted*. In

the second model, the reference category is changed in an important way. *Incarcerated and Not Convicted, No Contact* and *Arrested Only* are included, which changes the reference category from all never-incarcerated respondents to those who have been arrested and convicted, but not incarcerated ("convicted-only"). In model 3 of each analysis controls are included to "fill in the gaps" with observable data, while models 4-5 test the contribution of various mediators. For parsimony's sake, control variables are not shown. Negative binomial regressions are employed for fast food consumption and physical activity and logistic regression is used to model the relationship between incarceration and cigarette smoking.

RESULTS

Table 2 presents descriptive statistics for all variables used. The Add Health design incorporates oversampling of certain demographic groups, such as racial/ethnic minorities. To adjust for survey design, survey weights are employed in all analyses using the SVY command available in Stata. Approximately 8 percent of the sample reported having been convicted and incarcerated by wave IV. Ten percent reported being arrested only, 6 percent reported being arrested and jailed, but not convicted, and 72 percent reported no contact. The remaining 3-4 percent of respondents has been "convicted-only."

"Table 2 about here."

Fast Food Consumption

Estimates of fast food consumption regressed on incarceration are shown in Table 3. Log-odds are displayed, which can be exponentiated to yield the incident rate ratio, or the estimated rate for respondents who have been incarcerated relative to the reference category. As expected, former incarceration exhibits a positive and significant association with fast food consumption.

Former inmates with a conviction are expected to eat fast food at a rate that is approximately 1.6 times greater than never-incarcerated respondents (see model 1). In model 2, the reference category is changed to "convicted-only." Changing the reference reduces the strength of the association only slightly by 6 percent. The association is further reduced by 27 percent in model 3 after controlling for background characteristics of respondents. All else equal, being incarcerated and convicted is associated with a fast food consumption rate that is 1.38 times higher than respondents who have been arrested and convicted, but not incarcerated.

"Table 3 about here."

The main effect of incarceration is significant after adjusting for potential mediators (see models 4-5). In model 4, estimates are adjusted for the influence of employment, financial difficulties, marital status, and number of friends. Being employed and experiencing financial difficulties are both positively related to fast food consumption. Although this may seem counterintuitive at first blush, employed individuals may eat fast food at a higher rate due to limited lunch breaks, while unemployed individuals may have more opportunities for leisurely or home-prepared meals. In model 5, perceived discrimination and perceived stress emerge as significant predictors of poor diet.

Reductions in the main coefficient are modest across models. A series of mediation tests indicates that perceived stress and financial difficulties are significant mediators of the association, but these variables each account for only two percent the total effect (see Preacher and Hayes, 2008).[6] It is possible that former inmates eat poorly due to variables beyond the scope of available measures, such as neighborhood characteristics. Fast food restaurants are more concentrated in low-income neighborhoods and higher concentrations are associated with higher

resident BMIs (Inagami et al., 2009). Massoglia and colleagues (2013) also find that, at least among white ex-inmates, incarceration is associated with decreased neighborhood attainment.

Cigarette Smoking

Estimates of the association between incarceration and smoking suggest that former inmates are more likely to smoke than convicted-only respondents (see Table 4). Once again, the magnitude of the effect is diminished after changing the reference category. According to model 2, 51 percent of ex-inmates with convictions are expected to be every-day smokers, compared to 33 percent of respondents who have been convicted of crimes, but not incarcerated. Approximately 39 percent of "incarcerated, not convicted" respondents and 33 percent of "arrested only" respondents are predicted to smoke. The predicted probability of smoking among all criminally-involved respondents is significantly higher than the "no contact" group (.18).

The difference between "incarcerated and convicted" respondents and all other respondents who have had contact with the criminal justice system is especially noteworthy. Approximately one in two individuals who have been convicted and incarcerated are predicted to smoke, compared to one out of every three respondents who have been arrested-only, convicted-only, or incarcerated-not convicted. This is more troubling in light of the fact that many states have banned smoking in correctional facilities. By 2010, twenty-five states had banned tobacco use (see Seaman, 2010). It is not possible to discern the geographic locations of incarcerations using these data, but it seems likely that any benefits of smoking bans would begin to surface in this sample of ex-inmates, who were interviewed between 2007-2008.

"Table 4 about here.

The association is robust after controlling for pertinent background characteristics, although the coefficient is reduced somewhat (see model 3). After including the first slate of mediators in model 4, the association is attenuated by about 13.5 percent, suggesting that economic and integration measures may be significant mediators of this relationship. Unemployed respondents are more likely to smoke, as are individuals who are experiencing financial strife. Unlike fast food consumption models, marriage and number of friends are significantly and negatively associated with smoking risk. This is consistent with prior literature, which suggests that marriage is more effective at curbing smoking than at influencing activity, diet, and obesity. In model 5, the main effect is reduced by another 17 percent after including psychological and attitudinal measures. Individuals who perceive themselves as discriminated against and individuals with a relatively diminished sense of their social standing are more likely to smoke.

Additional mediation tests indicate that marriage, social standing, financial difficulties, perceived stress, and perceived discrimination all partially mediate the incarceration-smoking link. Together, these variables account for roughly 25 percent of the total effect on smoking. Social standing emerged as the most salient mediator, accounting for 9 percent of the total effect, while financial difficulties accounted for another 7.5 percent.

Physical Activity

Counter to predictions, analyses indicate that being a former inmate does not lead to increased sedentariness (see Table 5). There is no evidence of a link between incarceration and leisure activity, even when comparing the full sample of former inmates to never-incarcerated respondents. As described, this variable includes an array of activities, including everything from

running and lifting weights to hunting, yard work, and bowling. Therefore, supplemental analyses were carried out in which each item was assessed separately. Each item combines a few activities into a single indicator (e.g. *Playing football, soccer, basketball, lacrosse, rugby, field hockey, or ice hockey*), but there is arguably greater similarity within each item than across items. Even separately, incarceration was not significantly associated with any of the seven items. This includes "lifting," which may have been a common activity for ex-inmates while they were behind bars. However, as suggested by prior studies, any health benefits of incarceration may not endure beyond release (Schnittker and John, 2007).

"Table 5 about here."

CONCLUSION

This study finds that incarceration is associated with a higher rate of fast food consumption and a higher likelihood of smoking. The most salient mediators of these associations are financial strife, social standing, and perceived stress. Using convicted-only respondents as comparison cases offers some leverage with respect to theoretical interpretation as well, since these outcomes cannot be attributed to conviction. However, this does not mean that *stigma* should be discounted, or that conviction is irrelevant in this context. As discussed, lower subjective status and higher levels of perceived stress could result in part from an increase in "felt stigma" among ex-inmates. Individuals with both incarceration *and* conviction histories may boast relatively stigmatizing records compared to convicted-only individuals. For example, a sex offense may be more stigmatizing than a drug possession. Stigma may also be cumulative, such that greater contact with the criminal justice system is accompanied by progressively unfavorable stains on one's identity (see also Schnittker and Bacak, 2013).

To be sure, convicted-only respondents are not a flawless comparison group. Rather, it is argued that convicted-only individuals make a better comparison group than all never-incarcerated respondents because they should be more *similar* on unobservables.[7] Thus, although this strategy helps account for unobserved heterogeneity, it certainly does not eliminate it. Also, and as noted, this strategy is useful in terms of interpretation. Many formal barriers, such as voting restrictions, loan disqualification, and the "box" on job applications, apply to *conviction*. This study finds that incarceration influences health behavior above and beyond having a "conviction." As noted, however, these findings may highlight important differences in *types* of convictions across these two groups. Research should further examine the complexity and context of criminal justice contact.[8]

The effects of conviction and incarceration may differ in important ways and there is substantial variation within these types of contact (see also Schnittker and Bacak, 2013). Restrictions are often conviction-specific and offenses differ with respect to social and cultural meaning. For example, sex offenders constitute a unique category of offenders in terms of societal reaction and in terms of formal barriers to reintegration. Within incarceration, there is variation in terms of facility type, facility characteristics, duration, and geographic location. The inability to capture these contextual factors is a common limitation in this area of work (Massoglia, 2008a; Schnittker and John, 2007; Schnittker and Bacak, 2013; Turney et al., 2013), although there are potentially meaningful differences to be explored.

The relatively unhealthy habits of ex-inmates in the Add Health sample will likely translate to higher rates of chronic illness and premature mortality in the future. While the social, financial, and psychological consequences of incarceration certainly constitute threats to ex-inmates' health above and beyond that of leading to poor health behavior, health behavior

modification and education may constitute a fruitful area for intervention efforts. Michie and colleagues (2009) note there is "clear evidence" that such programs are less successful among disadvantaged groups, but in a review of recent research they find evidence that such programs can be effective. Specifically, they find that "providing information, facilitating goal setting, and prompting barrier identification," may be most helpful for low-income groups (p.613).

Finally, the same individuals and communities that are hard-hit by incarceration are also hard-hit by health epidemics, and recent studies suggest that differential exposure to incarceration may contribute to health disparities (Massoglia, 2008b; Johnson and Raphael, 2009; Wildeman, 2012). Given the potentially lethal consequences of poor diet and smoking, and given striking disparities in both incarceration and health, addressing the link between incarceration and poor health behavior could be instrumental in reducing health inequality more generally.

NOTES

[1] Diet, smoking, and exercise differ in important ways. As Pampel and colleagues (2010) note, "smoking requires action to purchase cigarettes, whereas lack of exercise involves inaction; quitting smoking often produces unpleasant symptoms of withdrawal and increases weight, whereas starting to exercise often increases feelings of well-being and reduces weight" (p.3). In addition, preparing nutritious meals and exercising involve time investments, while smoking does not. Eating unhealthy is arguably more socially accepted, while smoking is less accepted. Although it is not an explicit aim of this study, Pampel and colleagues (2010) also note the need for more research comparing health behaviors and their determinants (p.14). Thus, the results of this study also contribute to the understanding of the predictors of different health behaviors more generally.

[2] 120 respondents indicated exposure to the criminal justice system prior to age 18 only. These respondents were considered "arrested only." For one, juvenile facilities may be a qualitatively different experience than adult facilities. Second, many juvenile offenders may not bear the stain of a criminal record if such records have been expunged. To ensure that the classification of these cases does not alter the results, sensitivity analyses were conducted in which these observations were considered "missing." Results did not differ substantively (results available upon request).

[3] Rather than prior fast food consumption at wave I, prior consumption of fruit and vegetables is employed as a control. Fast food consumption is not available at this wave, however, fruit and vegetable consumption does predict lower levels of fast food consumption by wave IV and studies find that people who eat higher quantities of fast food tend to eat lower quantities of

healthier foods (Fowles et al., 2011; Moore et al., 2009; Sebastian, Wilkinson, and Goldman, 2009.

[4]The results of these studies do not rule out stigma altogether. In Apel and Sweeten's (2010) study, for example, the stigma of incarceration and conviction could be greater than that of conviction only, and individuals with an incarceration record might have a conviction that is more stigmatizing.

[5] A vast body of research investigates the collateral consequences of incarceration, but many studies do not or cannot isolate the "incarceration effect" from the "conviction effect." Official barriers to reintegration, such as civil and employment limitations, apply to conviction rather than incarceration history. Certainly, the experience of incarceration exposes offenders to added and/or distinct stressors. However, comparing the outcomes of the formerly incarcerated to never-incarcerated may capture the effects of conviction, rather than conviction *and* incarceration, or incarceration alone.

[6] The product of coefficients method is used to compute the indirect effect. For each mechanism tested, two coefficients are produced: the coefficient for the IV when the MV is regressed on the IV as well as controls (a), and the coefficient for the MV when the DV is regressed on the MV, IV, and controls (b). To obtain the indirect effect of each mediator, the product of coefficients (a*b) is calculated using the *nlcom* (nonlinear combination) command available in Stata, which also computes standard errors for estimates. Significance is determined using the $p<.05$ level, two-tailed test. To calculate the proportion of the total effect that is attenuated by each mediator, the indirect effect is divided by the total effect (indirect + direct effect of incarceration).

[7] The associations were also examined using propensity score methods. Each convicted ex-inmate was paired with a respondent who had never been incarcerated, but who had a similar

propensity to experience this event using 1:1 and 3:1 nearest neighbor matching with a .01 caliper. Consistent with main analyses, propensity score models indicate that ex-inmates with a conviction are expected to eat more fast food and are more likely to smoke than their matched counterparts (results available upon request).

[8] The main models were also carried out using "No Contact" as the reference group (see Appendix A). In Table A1, associations are shown for each outcome while adjusting for controls. In smoking and fast food models, the effect of being "Incarcerated and Convicted" was significantly stronger than the effect sizes for other categories. Notably, none of the effects for other categories of contact were significantly different from each other though. Once again, these results suggest that incarceration constitutes a particularly harmful experience for respondents.

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TABLES AND FIGURES

Figure 1. Theoretical Relationships between Incarceration and Health Behavior

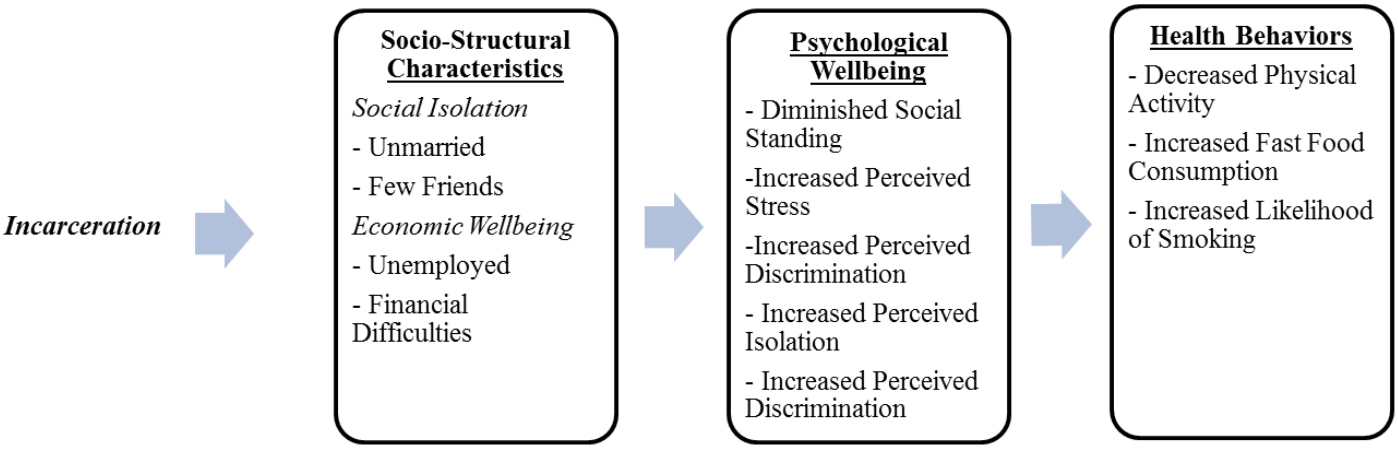

Table 1. Descriptions of Variables Used in the Analysis

Variable	Description
Dependent Variables	
Fast Food Consumption	Number of days during the past week the respondent ate fast food
Physical Activity	An index created by summing the number of times during the past week a respondent engaged in any of the following activities (α=.58): - *Bicycling, skateboarding, dancing hiking, hunting or doing yard work* - *Rollerblading, roller skating, downhill skiing, snowboarding, playing racquet sports, or doing aerobics* - *Playing football, soccer, basketball, lacrosse, rugby, field hockey, or ice hockey* - *Running, wrestling, swimming, cross-country skiing, cycle racing, or martial arts* - *Playing golf, fishing, bowling, playing softball or baseball* - *Walking for exercise* - *Participating in gymnastics, weight lifting, or strength training*
Cigarette Smoking	Respondent smoked at least one cigarette per day in the last 30 days (yes=1)
Independent Variables	
Incarcerated, Convicted	Respondent was convicted, incarcerated and released prior to wave IV (*yes*=1)
Incarcerated, Not Convicted	Respondent was incarcerated, but not convicted, prior to wave IV (*yes*=1)
Arrested-only	Respondent was arrested prior to wave IV, but never convicted or incarcerated (*yes*=1)
No Contact	Respondent has never been arrested, convicted, or incarcerated (*yes*=1)
Convicted-only	Respondent has been arrested and convicted, but never incarcerated (*yes*=1)
Control Variables	
Age	Respondent's age in years at wave IV
Black	Respondent is Black (*yes*=1)
Hispanic	Respondent is Hispanic (*yes*=1)
Other Race	Respondent is other race (*yes*=1)
Male	Respondent is male (*yes*=1)
High School Education	Respondent graduated from high school or obtained a GED equivalent by w4 (*yes*=1)
Parent Education	Highest educational attainment of either parent (0=*no high school,* 5=*postgraduate education*)
Neighborhood Disadvantage-W1	Scale combining the proportion of respondent's census tract at w1 on welfare, living at or below poverty, unemployed, and proportion of female headed households (α=.95)
Future Orientation-W1	The degree to which respondent agreed with the following statement: *When making a decision, I go with my gut feeling and don't think much about the consequences of each alternative*
Fatalistic Mentality-W1	Scale reflecting the respondent's perceived likelihood that s/he will live to be 35 (reverse coded)
Depression-W1	Scale combining responses on 11 items, where respondents were asked on a scale of 0-3 how often they experienced each of the following during the past week (α=.80): - *Being bothered by things that don't usually bother them* - *Not feeling like eating, appetite was poor* - *Could not shake off the blues, even with the help of family and friends* - *Feeling like they were just as good as other people (reverse coded)* - *Felt depressed* - *Felt too tired to do things*

	- *Felt hopeful (reverse coded)* - *Felt like a failure* - *Enjoyed life (reverse coded)* - *Felt sad* - *Felt life was not worth living*
Diet-W1	Number of times respondent ate fruits or vegetables in past 24 hours.
Cigarette Smoking-W1	Respondent smoked cigarettes within the past 30 days (*yes*=1)
Physical Activity – W1	An index created by summing the number of times during the past week a respondent engaged in any of the following activities(α=.42): - *Rollerblading, roller-skating, skate-boarding, or bicycling* - *Play an active sport, such as baseball, softball, basketball, soccer, swimming, or football* - *Exercise, such as jogging, walking, karate, jumping rope, gymnastics, or dancing.*
Delinquency-W1	A weighted scale ranging from 0 to 19.2 indicated the level of delinquency at wave I based on involvement in vandalism, shoplifting, other theft, burglary, fighting, selling drugs, and robbery (α=.79).
Violent Arrestee	Respondent has been arrested for a violent offense after the age of 18(*yes*=1)
Repeat Arrestee	Respondent has been arrested more than once (*yes*=1)
Mediators	
Mental Health and Attitudes	
Fatalistic Mentality	The degree to which a respondent agreed with the following statement (reverse coded): *I'm always optimistic about my future*
Perceived Stress	Scale constructed from responses to 4 items, indicating how often in the past 30 days respondents (α=.79) - *felt unable to control the important things in life* - *felt confident in the ability to handle personal problems (reverse coded)* - *felt that things were going their way (reverse coded)* - *felt that difficulties were piling too high to overcome*
Perceived Discrimination	How often a respondent feels he or she is treated with less respect or courtesy than other people (*0=never, 3=often*)
Social Integration	
Perceived Isolation	How often a respondent feels isolated from others (0=*never*, 3=*often*)
Number of Friends	The number of "close friends" a respondent reported.
Married	Respondent is married (*yes*=1)
Social Standing	Scale indicating where respondents perceive their social standing relative to others in the U.S., where 10=*high* and 1=*low*.
Socioeconomic Status	
Employed	Respondent is employed (*yes*=1)
Financial Difficulties	Respondent indicated he or she, or the household, experienced one of the following in the prior year (*yes*=1): - *not having enough money to pay the full mortgage or rent payment* - *not having enough money to pay the phone bill* - *not having enough money to pay the energy bill* - *the gas or electric being turned off due to outstanding bills* - *being worried about food running out*

Table 2. Descriptive Statistics for Add Health Sample

Variable	Mean	S.D.	Minimum	Maximum
Dependent Variables				
Cigarette Smoking	.217	.412	0	1
Physical Activity	6.257	5.668	0	49
Fast Food Consumption	2.323	2.808	0	55
Independent Variables				
Incarcerated, Convicted	.08	.277	0	1
Incarcerated, Not Convicted	.062	.241	0	1
No Contact	.719	.449	0	1
Arrested Only	.100	.300	0	1
Controls				
Age	28.986	1.753	24.279	34.694
Male	.468	.498	0	1
Black	.223	.416	0	1
Hispanic	.09	.285	0	1
Other	.161	.368	0	1
High School Graduate	.92	.271	0	1
Parent Education	2.411	1.686	0	5
Neighborhood Disadvantage-W1	-.002	.928	-1.241	7.972
Future Orientation –W1	3.06	1.119	1	5
Fatalistic Mentality-W1	1.618	0.844	1	5
Cigarette Smoking – W1	.259	.438	0	1
Depression – W1	6.976	4.819	0	33
Physical Activity – W1	3.493	0	9	2.231
Diet – W1	2.12	1.251	0	4
Delinquency – W1	.847	1.88	0	19.2
Violent Arrestee	.016	.127	0	1
Repeat Arrestee	.135	.016	0	1
Mediators				
Employed	.82	.384	0	1
Married	.419	.493	0	1
Number of Friends	3.113	.999	1	5
Financial Difficulties	.237	.425	0	1
Perceived Isolation	.978	.939	0	3
Perceived Discrimination	.958	.792	0	3
Social Standing	4.988	1.673	1	10
Perceived Stress	4.823	2.93	0	16
Fatalistic Mentality	.083	.276	0	1

Table 3. Negative Binomial Regression of Fast Food Consumption on Incarceration and other Covariates

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Incarcerated, Convicted	.471**	.441**	.323**	.311**	.288**
	(.054)	(.082)	(.075)	(.074)	(.075)
Incarcerated, Not Convicted		.233	.126	.125	.104
		(.085)	(.084)	(.084)	(.083)
No Contact		-.071	.045	.064	.057
		(.065)	(.068)	(.067)	(.068)
Arrested Only		.064	.083	.096	.082
		(.075)	(.073)	(.072)	(.072)
Employed				.197**	.210**
				(.043)	(.043)
Financial Difficulties				.198**	.150**
				(.033)	(.033)
Married				-.006	.006
				(.033)	(.033)
Number of Friends				-.007	-.000
				(.014)	(.014)
Perceived Isolation					-.025
					(.019)
Perceived Discrimination					.047*
					(.018)
Social Standing					-.017
					(.009)
Perceived Stress					.017**
					(.005)
Fatalistic Mentality					-.070
					(.040)
Constant	.789**	.816**	.987*	.781*	.703
	(.028)	(.062)	(.338)	(.356)	(.358)
N	12,880	12,880	12,880	12,880	12,880
Log Likelihood	-26,125.3	26,082.4	25,694.4	25,647.3	25,614.9

*p<.05, **p<.01

-Models 3-5 are adjusted for background characteristics of respondents, including prior diet at wave I.

Table 4. Logistic Regression of Cigarette Smoking on Incarceration and other Covariates

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Incarcerated, Convicted	1.286**	.720**	.605**	.533*	.442
	(.114)	(.164)	(.187)	(.191)	(.195)
Incarcerated, Not Convicted		.253	.211	.163	.074
		(.177)	(.198)	(.204)	(.206)
No Contact		-.795**	-.508**	-.413	-.432
		(.141)	(.154)	(.158)	(.160)
Arrested Only		.009	.147	.201	.142
		(.155)	(.166)	(.173)	(.174)
Employed				-.366**	-.295**
				(.089)	(.093)
Financial Difficulties				.567**	.394**
				(.073)	(.075)
Married				-.469**	-.402**
				(.066)	(.068)
Number of Friends				-.096**	-.063*
				(.031)	(.031)
Perceived Isolation					-.066
					(.046)
Perceived Discrimination					.124*
					(.042)
Social Standing					-.149**
					(.021)
Perceived Stress					.026
					(.014)
Fatalistic Mentality					-.064
					(.099)
Constant	-1.263**	-.698**	3.486**	3.342**	3.508**
	(.055)	(.141)	(.613)	(.630)	(.639)
N	12,784	12,784	12,784	12,784	12,784
Log Likelihood	-6,458	-6,345.6	-5,623.3	-5,471.7	-5,386

*p<.05, **p<.01

-Models 3-5 estimates are adjusted for background characteristics of respondents, including prior smoking at wave I.

Table 5. Negative Binomial Regression of Physical Activity on Incarceration and other Covariates

Variable	Model 1	Model 2	Model 3
Incarcerated, Convicted	-.010	-.108	-.069
	(.049)	(.084)	(.086)
Incarcerated, Not Convicted		-.042	-.013
		(.086)	(.082)
No Contact		-.092	-.015
		(.066)	(.072)
Arrested Only		-.009	.021
		(.076)	(.079)
Constant	1.738**	1.639**	.654*
	(.018)	(.068)	(.238)
N	12,895	12,895	12,895
Log Likelihood	-34,403.2	-34,397.4	-34,146.4

*p<.05, **p<.01

-Model 3 estimates are adjusted for background characteristics of respondents, including prior activity at wave I.

Appendix A

Table A1. Associations between Incarceration and Health Behavior using "No Contact" as Reference Category

	Fast Food	Cigarette Smoking	Physical Activity
Incarcerated, Convicted	.277**	1.118**	-.054
	(.058)	(.154)	(.071)
Incarcerated, Not Convicted	.080	.715**	.002
	(.058)	(.145)	(.061)
Convicted Only	-.046	.510**	.016
	(.069)	(.155)	(.072)
Arrested Only	.037	.656**	.037
	(.045)	(.089)	(.040)
Constant	1.033**	2.995**	.639**
	(.330)	(.593)	(.238)
N	12,880	12,784	12,895
Log Likelihood	-25,694.4	-5,623.3	-34,146.8

*p<.05, **p<.01
-Models are adjusted for controls