Intelligence 41 (2013) 277–288

Contents lists available at SciVerse ScienceDirect

Intelligence

journal homepage:

Intelligence is associated with criminal justice processing: Arrest through incarceration ☆

Kevin M. Beaver [a,b,*], Joseph A. Schwartz [a], Joseph L. Nedelec [c], Eric J. Connolly [a], Brian B. Boutwell [d], J.C. Barnes [e]

[a] College of Criminology and Criminal Justice, Florida State University, Tallahassee, FL 32306-1127, USA
[b] Center for Social and Humanities Research, King Abdulaziz University, Jeddah, Saudi Arabia
[c] Division of Criminal Justice, University of Cincinnati, Cincinnati, OH 45221-0389, USA
[d] College of Criminal Justice, Sam Houston State University, Huntsville, TX 77341-2296, USA
[e] School of Economic, Political, and Policy Sciences, University of Texas at Dallas, Richardson, TX 75080, USA

ARTICLE INFO

Article history:
Received 24 February 2012
Received in revised form 7 May 2013
Accepted 7 May 2013
Available online xxxx

Keywords:
Health
Arrest
Criminal justice
Incarceration

ABSTRACT

Findings flowing from empirical research consistently indicate that IQ is associated with criminal involvement, with persons of relatively lower IQ being more likely to engage in various types of crime when compared with persons of relatively higher IQ. As with all research, however, there are a number of limitations with the existing literature that may bias the IQ–crime connection in unknown ways. Specifically, previous research has generally analyzed sub-samples drawn from non-nationally representative samples, has relied on a narrow range of criminal justice measures, has not fully examined whether the IQ–crime link is observed across demographic subgroups, and has not always ruled out the effects of potential confounds. The current study is designed to overcome the most serious of these limitations and offer new evidence of the link between IQ and criminal involvement. Analysis of data drawn from the National Longitudinal Study of Adolescent Health (Add Health) provides strong evidence indicating that IQ and crime are linked even after addressing various shortcomings of previous research. Limitations of the study are discussed and directions for future research are offered.

1. Introduction

Criminal behavior is a relatively common occurrence in the US with crime rates hovering around 3345 per 100,000 persons during the past 5 years or so (Federal Bureau of Investigation, 2010). Even though crime has been on a downward trend recently, rates of crime in the US far exceed those of virtually every other industrialized country. Annually, nearly 20 out of every 1000 US citizens are victims of some type of crime and nearly 5 out of every 1000 are victims of a serious violent physical offense (Bureau of Justice Statistics, 2011). Besides the physical and emotional trauma that can result from criminal victimizations, there is also a tremendous financial toll that is shouldered by taxpayers. A recent analysis revealed, for instance, that each murder can cost the US approximately $17.25 million with some estimates reaching $24 million per murder (DeLisi et al., 2010). While murder has the highest associated costs, other violent crimes such as rape/sexual assault ($240,776 per offense), aggravated assault ($107,020 per offense), and robbery ($42,310 per offense) also have

☆ This research uses data from Add Health, a program project designed by J.Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 (addhealth@unc.edu). No direct support was received from grant P01-HD31921 for this analysis.

* Corresponding author at: College of Criminology and Criminal Justice, Florida State University, 634 West Call Street, Tallahassee, FL 32306-1127, USA. Tel.: +1 850 644 9180; fax: +1 850 644 9614.
E-mail address: kbeaver@fsu.edu (K.M. Beaver).

0160-2896/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.intell.2013.05.001

extremely high per offense costs (McCollister, French, & Fang, 2010). Overall, studies suggest that the annual cost of all crime in the United States likely exceeds $1 trillion (Anderson, 1999). Given the serious implications that result from crimes—especially serious violent crimes—there has been a significant amount of research devoted to developing prevention and intervention programs that can reduce criminal involvement. Much of this effort has been by etiological research that attempts to uncover the causes of crime. Although a wide range of criminogenic factors have been identified that span multiple levels of measurement (Beaver & Wright, 2011), individual-level factors have emerged as some of the strongest and most consistent predictors of crime and other types of antisocial behaviors (Denno, 1990; Farrington, 1997; Herrenkohl et al., 2000).

Of all the individual-level factors that have been shown to be associated with crime, IQ has surfaced as one of the more commonsensical and often cited factors (Neisser et al., 1996). All else equal, persons who score relatively low on IQ tests are significantly more likely to have been arrested for an official crime, to self-report involvement in criminal behavior, and to also hold and endorse pro-criminal attitudes and values when compared with persons who score relatively higher on IQ tests (Gabrielli & Mednick, 1980; Hirschi & Hindelang, 1977; Lynam, Moffitt, & Stouthamer-Loeber, 1993; McNulty, Bellair, & Watts, 2013; Moffitt, Caspi, Silva, & Stouthamer-Loeber, 1995; Moffitt, Gabrielli, Mednick, & Schulsinger, 1981). These associations are generally considered robust as they have been detected across a wealth of heterogeneous samples, using different measures of IQ, employing various methodological approaches, and analyzing the association with unique units of analysis (Diamond, Morris, & Barnes, 2012; Fergusson, Horwood, & Ridder, 2005; Levine, 2011; Moffitt & Silva, 1988). There are, however, a number of limitations with the existing literature that must be addressed in order to establish more convincingly that IQ is a criminogenic risk factor. Below, we identify and briefly discuss five of the more pressing shortcomings with the existing literature examining the IQ–crime nexus.

First, most of the samples that have been analyzed to test for the association between IQ and crime consist of prison inmates, psychiatric patients, sex offenders, or other non-nationally representative groups of people (Diamond et al., 2012; Guay, Ouimet, & Proulx, 2005; Hanson, Scott, & Steffy, 1995; Holland, Beckett, & Levi, 1981; Holland & Holt, 1975). The main exception to this rule, however, is the National Longitudinal Survey of Youth (NLSY) which consists of a nationally representative sample of males and females (McNulty et al., 2013). These data were analyzed by Herrnstein and Murray (1994) who detected a significant inverse association between IQ scores and criminal involvement (but see Cullen, Gendreau, Jarjoura, & Wright, 1997). Importantly, the NLSY79 data are somewhat outdated and the findings that were generated with this sample may not necessarily generalize to youth who were raised in the 1990s or 2000s. Without evidence generated from contemporary, nationally representative samples, it is difficult to establish whether IQ is (or remains) associated with criminal involvement in the general population during current times.

Second, the measurement of criminal involvement in most studies frequently relies on either official measures of arrest and conviction or self-reports that measure the frequency with which the respondent engaged in criminal behavior. While both types of measurement strategies have been shown to be relatively valid and reliable (Brame, Fagan, Piquero, Schubert, & Steinberg, 2004; Krohn, Lizotte, Phillips, Thornberry, & Bell, 2011; Thornberry & Krohn, 2000), they are also both host to a number of limitations. For example, official crime reports only capture those crimes that led to the arrest and conviction of the criminal. Given that most crimes go undetected or unsolved by law enforcement (Booth, Johnson, & Choldin, 1977; Hindelang, Hirschi, & Weis, 1981; O'Brien, Shichor, & Decker, 1980), it is possible that IQ is associated with detection of criminal behaviors, but not the actual etiology of crime (Fischer et al., 1996; Herrnstein & Murray, 1994; but see Moffitt & Silva, 1988). Self-report surveys, in contrast, are host to reporting bias whereby subjects either intentionally or unintentionally misstate the number of crimes that they have committed over the examined time period (Krohn et al., 2011; Morris & Slocum, 2010). If IQ scores are systematically linked to reporting bias, then studies that use self-reports to measure the frequency of criminal involvement may produce biased results. An alternative to these two approaches is to use self-reports to measure contact with the criminal justice system. With this type of measurement, subjects are asked to report on whether they had been arrested, convicted, and/or incarcerated for any type of crime. By using this approach, it is possible to try to isolate the effects of IQ on being processed through the criminal justice system; an event that is unlikely to be misremembered or forgotten. Herrnstein and Murray (1994) used this measurement strategy, but their research is one of the key exceptions to the general rule of using either self-reports or official data. As a result, the IQ–crime association may be affected in unknown ways because of the measurement strategies that are typically used. More research using alternative measures of criminal involvement is needed to address this possibility.

The third main limitation with the existing literature is the failure to examine thoroughly whether the IQ–crime link is observed across race/gender subcategories. Both IQ and criminal involvement are known to vary significantly across races and between males and females (Bell, Willson, Wilman, Dave, & Silverstone, 2006; Federal Bureau of Investigation, 2003; Halpern & LaMay, 2000; Lauritsen, Heimer, & Lynch, 2009; Lynn, 2010; Rushton & Jensen, 2010). In respect to race, African Americans, for example, have IQ scores that are, on average, about 1 standard deviation below the IQ scores of Caucasians (Gottfredson, 2004; Rowe, 1994). At the same time, although African Americans make-up only about 13.6% of the population, they account for approximately 38% of inmates housed in federal and state prisons (Rastogi, Johnson, Hoeffel, & Drewery, 2011; Sabol, West, & Cooper, 2009). With respect to gender, empirical evidence has revealed that males and females differ in IQ scores, and that these differences emerge primarily in relation to verbal IQ scores and spatial IQ scores, with females scoring higher on the former and males scoring higher on the latter (Hyde & Linn, 1988; Voyer, Voyer, & Bryden, 1995). There are also tremendous differences in arrest rates between males and females, where male arrest rates are approximately 15 times higher than female arrest rates (Sabol et al., 2009). This male–female difference in arrest is most pronounced for serious violent offenses. What is interesting is that even though IQ and crime stratify by race and gender, there has been a paucity of research that examines the race/gender subcategories to determine whether the IQ–crime

nexus is observed across them. Typically, race and gender are either held constant through statistical controls or by analyzing African Americans and Caucasians separately (and frequently only males are included in these analyses). Whether IQ is associated with criminal involvement across differing combinations of race/gender (i.e., African-American males, African-American females, Caucasian males and Caucasian females) or not remains undetermined at this point.

Fourth, existing research generally fails to isolate the effects of IQ on crime from the effects of other higher-order cognitive processes, especially executive functions. There is now a well established knowledge base indicating that executive functions, such as self-regulation, are among the strongest and most consistent predictors of criminal behaviors (Oglive, Stewart, Chan, & Shum, 2011). Moreover, variation in executive functions has also been found to be inextricably tied to variation in IQ scores (Ardila, Pineda, & Rosselli, 2000; Oglive et al., 2011). The major problem, however, is that most studies estimating the association between IQ and crime fail to account for executive functions, making it quite possible that IQ scores are simply proxy measures for other higher-order cognitive processes. Given that studies have generally failed to isolate the effects of IQ from the effects of executive functions, it is difficult to determine the true effect that IQ has on criminal behavior independent of the effects of executive functions that are linked to antisocial behaviors, such as self-regulation and self-control.

Fifth, virtually nothing is known about whether IQ is associated with being processed through the criminal justice system. The criminal justice system employs a highly selective gating process, wherein suspects must be arrested, then prosecuted, then convicted, and finally sentenced. At each stage of the gating process, various factors have been found to be associated with increased (or decreased) odds of being funneled through the system. Some of these factors are directly related to the nature of the crime, such as the seriousness of the crime (Reitz, 2011). Other factors, which have no direct application to the crime, have also been found to be associated with being processed through the criminal justice system. These factors are largely referred to as "extra-legal" factors and include attributes such as race, gender, and age (Beaver, DeLisi, Mears, & Stewart, 2009). The possibility exists that IQ may be an extra-legal factor and, as a result, part of the IQ effect on crime may have more to do with the suspect's IQ than their actual criminal behavior. To date, however, no study has fully examined this possibility, leaving virtually nothing known about the possibility that IQ acts as an extra-legal factor.

Taken together, these limitations evident in the existing literature make it difficult to provide an unbiased estimate of the true nature of the association between IQ and criminal involvement. While most studies are not host to all of these limitations, to our knowledge no study has attempted to address all of them simultaneously. The current study is designed to deal with all of the limitations described above to provide a more accurate estimation of the effect that IQ has on criminal behavior.

2. Methods

2.1. Data

Data for this study were drawn from the National Longitudinal Study of Adolescent Health (Add Health; Harris, 2009). Detailed information about the data, including the sampling design, has been published previously (Harris, Halpern, Smolen, & Haberstick, 2006; Harris et al., 2003; Resnick et al., 1997). Briefly, the Add Health is a nationally representative and prospective sample of American youths. Subjects have been assessed at four different time points. The first wave of data was collected in 1994–1995 when approximately 90,000 adolescents completed a self-report survey at school. Follow-up surveys were administered to a subsample of 20,745 respondents to collect more detailed information when the respondents were between the ages of 12 and 21. Nearly one-and-a-half years later, when the respondents were 13 to 22 years of age, the second round of interviews were completed with 14,738 youths. Then, in 2001–2002 when the respondents were young adults (ages ranged from 18 to 28), the third wave of data was collected from 15,197 participants. Finally, the fourth wave of interviews was conducted in 2007–2008 when the 15,701 respondents were 24–32 years old. In total, 80% of all wave 1 respondents who were eligible for inclusion in the sample at wave 4 were successfully re-interviewed. Overall, the data span about thirteen years of adolescent and adulthood development (Harris et al., 2003).

3. Measures

3.1. Intelligence (IQ)

IQ was assessed in the current study by using scores from the Peabody Vocabulary Test (PVT). The PVT is an abbreviated version of the Peabody Picture Vocabulary Test — Revised (PPVT), a standardized assessment designed to measure variation in verbal skills and receptive vocabulary. The PVT has been used previously as a measure of IQ (Beaver & Wright, 2011; Rowe, Jacobson, & Van den Oord, 1999). The PVT was administered to respondents during wave 1 interviews and again during wave 3 interviews. The wave-to-wave correlations between the two measures were relatively large and statistically significant for both males ($r = .571$, $p < .001$) and females ($r = .598$, $p < .001$). To help reduce attenuation due to measurement error and to create a more reliable and valid measure of IQ, the two PVT scores were summed together and averaged to create a composite IQ score. Table 1 presents the descriptive statistics for the measure of IQ for males and females by race.

3.2. Criminal justice processing

During wave 4 interviews, participants were asked questions about their contact with the criminal justice system. From these items, three different measures of criminal justice processing were employed in the current study. First, subjects were asked whether they had ever been arrested (0 = no, 1 = yes). Second, subjects were asked whether they had ever spent time in a jail, prison, juvenile detention center, or other correctional facility (0 = no, 1 = yes). Third, we combined these two items to create a measure that indicates whether the respondent had been incarcerated if they had been arrested (0 = no, 1 = yes). This latter measure is used as a way of examining whether IQ can differentiate between arrestees who were incarcerated and arrestees who were not incarcerated. Importantly, all participants who had not been arrested were

Table 1
Descriptive statistics for intelligence and the criminal justice outcome measures for males and females by race.

	Males				Females			
	Black		White		Black		White	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Intelligence	92.81	15.30	104.01	11.70	92.39	15.16	102.66	12.22
Arrest								
Yes	(742)	(50.0)	(1886)	(39.7)	(430)	(21.4)	(837)	(16.0)
No	(743)	(50.0)	(2868)	(60.3)	(1581)	(62.8)	(4407)	(84.0)
Incarcerated								
Yes	(467)	(30.4)	(1050)	(21.9)	(198)	(7.9)	(390)	(7.4)
No	(1069)	(69.6)	(3734)	(78.1)	(1818)	(90.2)	(4865)	(92.6)
Incarcerated if arrested								
Yes	(467)	(63.5)	(1050)	(55.8)	(228)	(53.5)	(390)	(46.8)
No	(269)	(36.5)	(833)	(44.2)	(198)	(46.5)	(444)	(53.0)

coded as missing for the last variable, thus allowing for an estimation of the IQ–incarceration association *only* for those who had been arrested. Table 1 contains the descriptive statistics for the criminal justice processing measures for males and females.

3.3. Control variables

Four control variables/scales were included in the analyses. First, age was a continuous variable measured in years. Second, race was a dichotomous dummy variable (0 = Black, 1 = White); respondents who were a race other than Caucasian or African American were removed from the final analytical sample. Third, a low self-control scale was included in the statistical equations. This scale, which has been used previously (Beaver, DeLisi, Vaughn, & Wright, 2010; Mears, Cochran, & Beaver, in press), was created from wave 1 data, includes a total of twenty-three items, and was used as a measure of executive functioning (Beaver, Wright, & DeLisi, 2007).[1] Fourth, a lifetime delinquency scale was created by using self-reported data about involvement in acts of violent and serious delinquency at all four waves of data collection. Because 30.8% of cases were missing information for the low self-control scale and 58.2% were missing information on the delinquency scale, missing values for these two scales were imputed with the mean in order to preserve sample sizes for the multivariate analyses. Additional analyses using different imputation algorithms, such as full-information-maximum-likelihood (FIML), produced the same pattern of results when estimated using AMOS. Omitting these scales from the analyses also failed to significantly affect the association between IQ and the criminal justice processing outcome measures, indicating that the imputation procedure did not influence the substantive findings.

[1] We realize that this measure of self-control does not capture all of the variation that exists with executive functioning. However, we follow the lead of a large body of criminological research revealing that measures of self-control represent some of the strongest and most consistent predictors of criminal involvement (Pratt & Cullen, 2000) and that these measures should be viewed as measures of executive functioning (Beaver et al., 2007). Nonetheless, we caution against viewing this scale as explaining all of the variation in the criminal justice outcome measures that is attributable to executive functioning.

4. Plan of analysis

The analysis for this study was conducted in a series of steps. First, the association between IQ scores and the probability of being arrested, the probability of being incarcerated, and the probability of being incarcerated if arrested was examined by estimating multivariate binary logistic regression models. All of the statistical models included covariates for the requisite control variables/scales described previously. To facilitate interpretation of the effect sizes, the predicted probabilities of being arrested, of being incarcerated, and of being incarcerated if arrested were plotted against IQ scores. Second, given that there are significant male–female differences in criminal involvement all of the models were estimated separately for males and females.[2] Third, because both contact with the criminal justice system and IQ scores have been shown to differ significantly between Caucasians and African Americans, additional analyses were estimated to examine whether any association between IQ and contact with the criminal justice system was detected within racial categories.

5. Results

The analysis for this study began by estimating the association between IQ scores and the probabilities of being arrested, incarcerated, and incarcerated if arrested for males. The findings are presented in Fig. 1, and the parameter estimates are included in the legend of the figure. The results revealed a statistically significant negative association between

[2] An alternative to estimating the models separately by race/gender would have been to estimate the models with a multiplicative interaction term. However, when estimating non-linear models such as logistic regression, the coefficient estimate for a multiplicative interaction term can be misleading and requires additional calculation to achieve an interpretable value. Ai and Norton (2003, p. 124) summarize the problem succinctly: "…the interaction effect is conditional on the independent variables, unlike the interaction effect in linear models…the interaction effect may have different signs for different values of covariates. Therefore, the sign of [the interaction effect] does not necessarily indicate the sign of the interaction effect." There are various approaches to circumvent or account for these estimation difficulties. One approach—the one we follow—is to estimate split-sample models and assess individual covariates independently across subsamples.

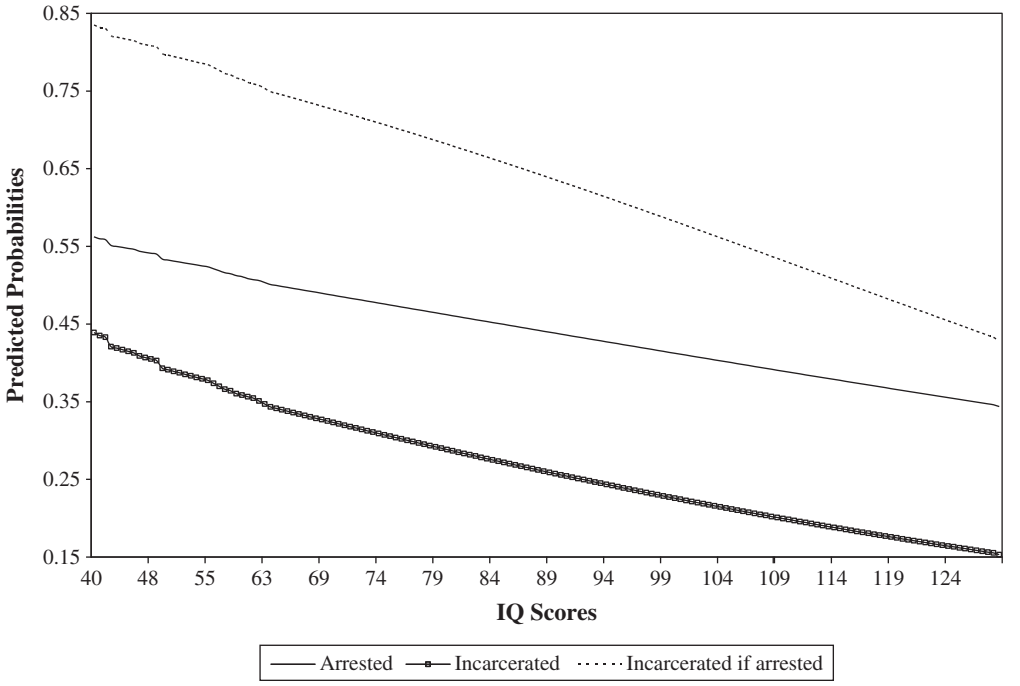

Fig. 1. Predicted probabilities of arrest and incarceration for males as a function of IQ scores. Notes: Coefficients for arrested (N = 4603): IQ: OR = .990, 95% CI for OR = .985–.995, $p < .05$; Age: OR = .999, 95% CI for OR = .965–1.035, $p > .05$; Race: OR = .783, 95% CI for OR = .672–.913, $p < .05$; Low self-control: OR = 1.031, 95% CI for OR = 1.023–1.040, $p < .05$; Lifetime delinquency: OR = 1.112, 95% CI for OR = 1.092–1.132, $p < .05$. Coefficients for incarcerated (N = 4653): IQ: OR = .984, 95% CI for OR = .978–.989, $p < .05$; Age: OR = 1.007, 95% CI for OR = .967–1.050, $p > .05$; Race: OR = .796, 95% CI for OR = .670–.946, $p < .05$; Low self-control: OR = 1.031, 95% CI for OR = 1.022–1.041, $p < .05$; Lifetime delinquency: OR = 1.083, 95% CI for OR = 1.067–1.100, $p < .05$. Coefficients for incarcerated if arrested (N = 1872): IQ: OR = .979, 95% CI for OR = .971–.987, $p < .05$; Age: OR = 1.013, 95% CI for OR = .960–1.069, $p > .05$; Race: OR = .887, 95% CI for OR = .702–1.121, $p > .05$; Low self-control: OR = 1.014, 95% CI for OR = 1.002–1.027, $p < .05$: Lifetime delinquency: OR = 1.045, 95% CI for OR = 1.023–1.067, $p < .05$. Predicted probabilities were estimated with all other covariates set to their means.

IQ scores and the probability of being arrested even after correcting for the effects of age, low self-control and lifetime delinquency. Importantly, the coefficients for race, low self-control, and lifetime delinquency were also statistically significant. Very similar results were garnered when examining the link between IQ and the odds of being incarcerated. Once again, IQ scores significantly predicted the odds of being incarcerated even after adjusting for the statistically significant effects of race, low self-control, and lifetime delinquency (age was included as a covariate, but it was not statistically significant). Last, the effects of IQ on the odds of being incarcerated if arrested were estimated. The binary logistic regression equation indicated a statistically significant association between IQ scores and the odds of being incarcerated if arrested as well as significant associations between the odds of being incarcerated and low self-control and lifetime delinquency.

To facilitate the interpretation of the ORs for IQ, the predicted probabilities of being arrested, incarcerated, and incarcerated if arrested were plotted across IQ scores for males. As can be seen in Fig. 1, the odds of all three criminal justice outcomes decrease significantly as IQ scores increase. To put these findings in perspective, the probability of being arrested for respondents with the lowest IQ scores was .562, while the probability of being arrested for respondents with the highest IQ scores was .344. These effects are even more pronounced when examining incarceration, where the odds of being incarcerated for respondents with the lowest IQ scores was .439, while the odds of being incarcerated for respondents with the highest IQ scores was .153. Similarly, the odds of being incarcerated if arrested for respondents with the lowest IQ scores was .835, while the odds of being incarcerated if arrested for respondents with the highest IQ scores was .427.

Next, binary logistic regression models were estimated to examine whether the association between IQ and criminal justice outcomes was observed for Black males, the results of which are included in the legend of Fig. 2. Consistent with the results that were generated for all males, IQ was related to the odds of being arrested and so was lifetime delinquency. The model employing incarceration as the outcome measure revealed a similar pattern of findings, wherein IQ was a statistically significant predictor of the odds of being incarcerated irrespective of age, low self-control, and lifetime delinquency. Once again, the association between lifetime delinquency and incarceration was statistically significant. Last, IQ was found to be predictive of the odds of being incarcerated if arrested after including covariates for age, low self-control, and lifetime delinquency.

The predicted probabilities of being arrested, incarcerated, and incarcerated if arrested are plotted for Black males in Fig. 2. Across all three criminal justice outcome measures, the predicted probabilities decrease as IQ scores increase. For example, the predicted probabilities of being arrested, incarcerated, and incarcerated if arrested were .628, .433, and .778, respectively, for Black males who have the lowest IQs. For Black males with

the highest IQs, the predicted probabilities of arrest, incarceration, and incarceration if arrested were .396, .217, and .536, respectively.

The results thus far indicate a relatively consistent association between IQ scores and the odds of arrest and incarceration for all males and for Black males. The three logistic regression models presented in Fig. 3 examine the link between IQ and criminal justice outcomes for White males. First, IQ maintained a negative and statistically significant effect with the odds of being arrested and so too did low self-control and lifetime delinquency. Second, IQ, low self-control, and lifetime delinquency were related to the odds of being incarcerated. Third, and consistent with the previous models, IQ, low self-control, and lifetime delinquency all had statistically significant and negative effects on the odds of being incarcerated if arrested.

The predicted probabilities of being arrested, incarcerated, and incarcerated if arrested for White males are plotted against IQ scores in Fig. 3. As can be seen, there is a negative association between IQ scores and the criminal justice outcomes, indicating that as IQ scores increase the odds of being arrested or incarcerated decrease. To illustrate, White males with the lowest IQ scores had predicted probabilities of .536, .461, and .870 for being arrested, incarcerated, and incarcerated if arrested, respectively. In contrast, the predicted probabilities for White males with the highest IQ scores were .332, .136, and .399 for being arrested, incarcerated, and incarcerated if arrested.

The previous analyses revealed that IQ is related to the probability of being arrested and incarcerated for males, for Black males, and for White males. The following analyses examine the potential association between IQ and criminal justice outcomes for females, Black females, and White females. Fig. 4 presents the results generated from the full sample of females. Consistent with the results for males, the results of the binary logistic regression models revealed a statistically significant and negative association between IQ scores and the probability of being arrested once the effects of age, race, low self-control, and lifetime delinquency had been removed. It is important to point out that the effects of low self-control and lifetime delinquency were also significantly associated with the probability of being arrested. A similar pattern of results emerged when examining the link between IQ scores and the odds of being incarcerated. Specifically, IQ, low self-control, and lifetime delinquency were significantly associated with the probability of being incarcerated for females even after adjusting for the effects of age and race. Moreover, a significant association between IQ scores and the probability of being incarcerated if arrested was also detected. The only other covariate to reach statistical significance in this model was lifetime delinquency.

The predicted probabilities of being arrested, incarcerated, and incarcerated if arrested for females were plotted against IQ scores in Fig. 4. These line graphs demonstrate that IQ scores and the criminal justice outcome measures are inversely related, where the probabilities of being arrested and incarcerated decrease as IQ scores increase. For example, females with the lowest IQ scores had a predicted probability of being

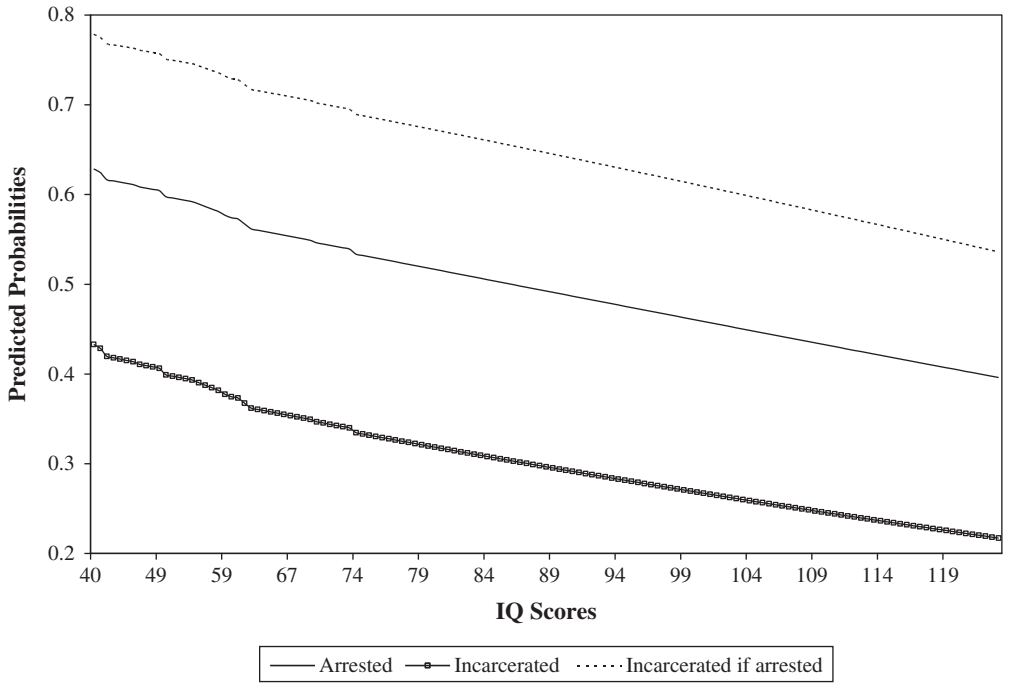

Fig. 2. Predicted probabilities of arrest and incarceration for Black males as a function of IQ scores. Notes: Coefficients for arrested (N = 1041): IQ: OR = .989, 95% CI for OR = .980–.997, $p < .05$; Age: OR = 1.045, 95% CI for OR = .974–1.123, $p > .05$; Low self-control: OR = 1.005, 95% CI for OR = .987–1.023, $p > .05$, Lifetime delinquency: OR = 1.101, 95% CI for OR = 1.066–1.137, $p < .05$. Coefficients for incarcerated (N = 1070): IQ: OR = .988, 95% CI for OR = .979–.997, $p < .05$; Age: OR = 1.022, 95% CI for OR = .946–1.104, $p > .05$; Low self-control: OR = 1.003, 95% CI for OR = .984–1.023, $p > .05$; Lifetime delinquency: OR = 1.075, 95% CI for OR = 1.047–1.103, $p < .05$. Coefficients for incarcerated if arrested (N = 491): IQ: OR = .987, 95% CI for OR = .974–.999, $p < .05$; Age: OR = .975, 95% CI for OR = .880–1.081, $p > .05$; Low self-control: OR = .998, 95% CI for OR = .973–1.025, $p > .05$; Lifetime delinquency: OR = 1.041, 95% CI for OR = 1.004–1.079, $p < .05$. Predicted probabilities were estimated with all other covariates set to their means.

arrested of .360, a predicted probability of being incarcerated of .223, and a predicted probability of being incarcerated if arrested of .675. In contrast, females with the highest IQ scores had a predicted probability of being arrested of .108, a predicted probability of being incarcerated of .040, and a predicted probability of being incarcerated if arrested of .362.

In order to determine whether the link between IQ scores and criminal justice outcomes is observed for both Black and White females, the previous analyses were re-estimated separately for Black females and White females. These analyses begin with the results for Black females and the results are presented in Fig. 5. As can be seen, the results indicate a statistically significant association between IQ scores and the odds of being arrested after adjusting for the statistically significant effects of low self-control, and lifetime delinquency. Age was also included as a covariate, but was not significantly related to the odds of being arrested. A statistically significant association between IQ scores and the probability of being incarcerated was also detected and once again low self-control and lifetime delinquency emerged as statistically significant. For the models examining the odds of being incarcerated if arrested, there was not a statistically significant association between IQ scores and the probability of being incarcerated if arrested, but there was a statistically significant association between lifetime delinquency and the odds of being incarcerated if arrested.

Fig. 5 portrays the predicted probabilities of being arrested, incarcerated, and incarcerated if arrested across the full range of IQ scores for Black females. Keep in mind that the link between IQ scores and the odds of being incarcerated if arrested was not statistically significant ($p = .093$). This figure reveals a negative association between IQ scores and the predicted probabilities for all three of the criminal justice outcome measures. To illustrate, for Black females with the lowest IQ scores, the predicted probability of being arrested was .392, the predicted probability of being incarcerated was .237, and the predicted probability of being incarcerated if arrested was .684. For Black females with the highest IQ scores, the predicted probability of being arrested was .120, the predicted probability of being incarcerated was .237, and the predicted probability of being incarcerated if arrested was .307.

The last series of statistical models, which are presented in Fig. 6, examine the association between IQ scores and criminal justice outcomes for White females. Consistent with all of the previous results, the binary logistic regression models indicated a statistically significant and inverse association between IQ scores and the odds of being arrested. Low self-control and lifetime delinquency were also related to the odds of being arrested. The results of the logistic regression models using the incarcerated variable revealed the same pattern of findings, where IQ scores and the probability of being incarcerated were inversely related, while low self-control and lifetime delinquency were positively related to the odds of incarceration. Last, and in line with the results for Black females, there was not a significant association between IQ scores and the probability of being incarcerated if

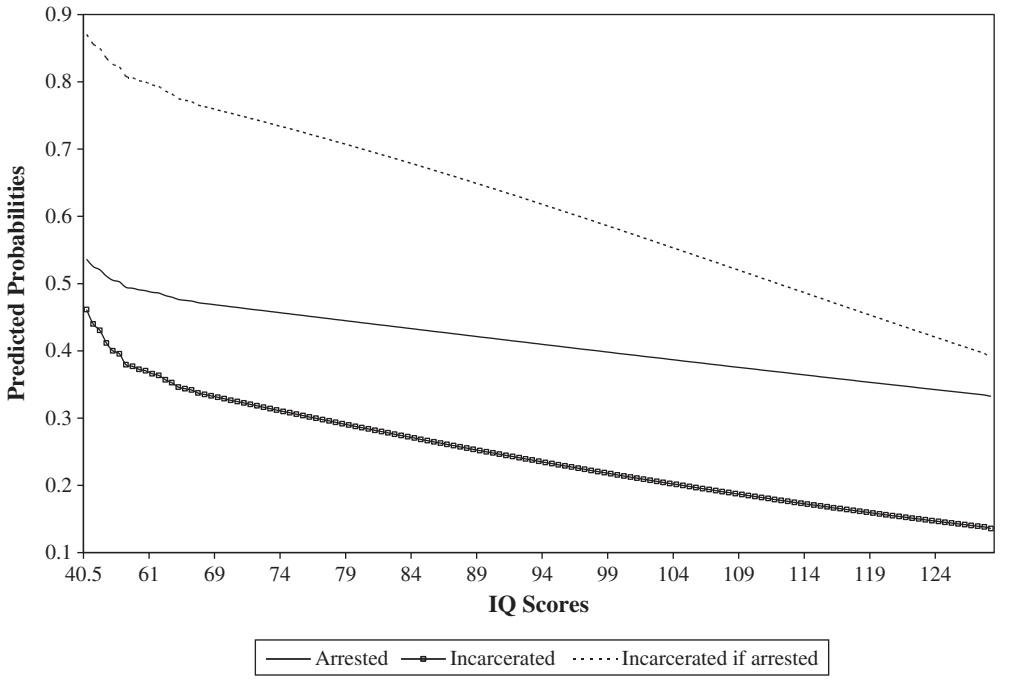

Fig. 3. Predicted probabilities of arrest and incarceration for White males as a function of IQ scores. Notes: Coefficients for arrested (N = 3562): IQ: OR = .990, 95% CI for OR = .984–.997, $p < .05$; Age: OR = .986, 95% CI for OR = .947–1.027, $p > .05$; Low self-control: OR = 1.038, 95% CI for OR = 1.028–1.047, $p < .05$; Lifetime delinquency: OR = 1.117, 95% CI for OR = 1.094–1.141, $p < .05$. Coefficients for incarcerated (N = 3583): IQ: OR = .981, 95% CI for OR = .974–.988, $p < .05$; Age: OR = 1.004, 95% CI for OR = .956–1.053, $p > .05$; Low self-control: OR = 1.040, 95% CI for OR = 1.029–1.051, $p < .05$; Lifetime delinquency: OR = 1.088, 95% CI for OR = 1.067–1.108, $p < .05$. Coefficients for incarcerated if arrested (N = 1381): IQ: OR = .974, 95% CI for OR = .963–.984, $p < .05$; Age: OR = 1.028, 95% CI for OR = .965–1.096, $p > .05$; Low self-control: OR = 1.019, 95% CI for OR = 1.005–1.034, $p < .05$; Lifetime delinquency: OR 1.048, 95% CI for OR = 1.021–1.075, $p < .05$. Predicted probabilities were estimated with all other covariates set to their means.

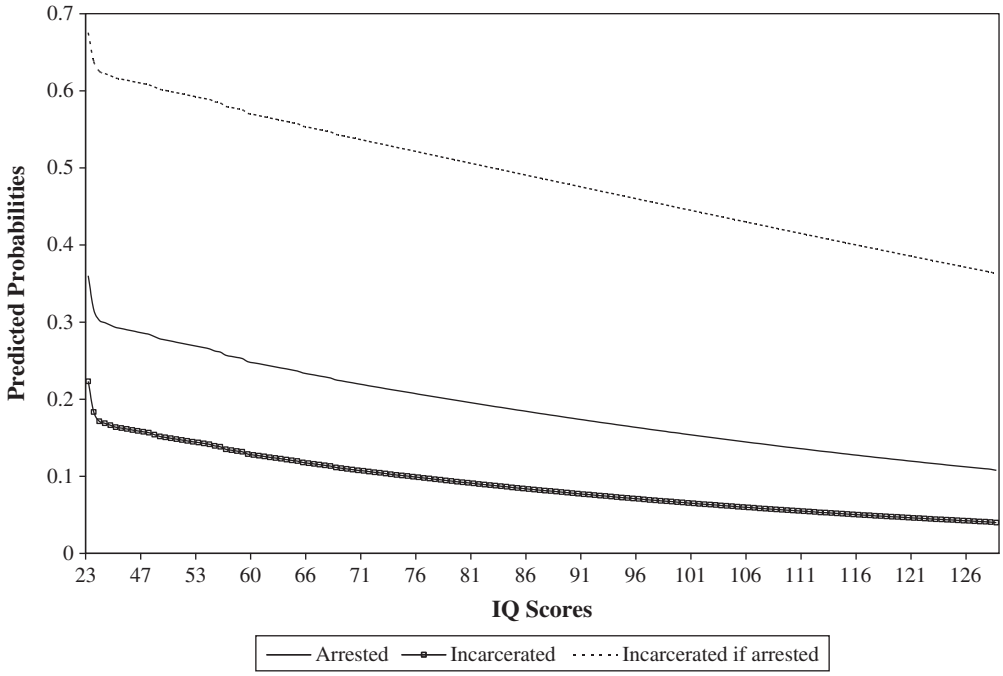

Fig. 4. Predicted probabilities of arrest and incarceration for females as a function of IQ scores. Notes: Coefficients for arrested (N = 5710): IQ: OR = .986, 95% CI for OR = .980–.991, $p < .05$; Age: OR = .988, 95% CI for OR = .948–1.030, $p > .05$; Race: OR = .896, 95% CI for OR = .758–1.060, $p > .05$; Low self-control: OR = 1.032, 95% CI for OR = 1.022–1.043, $p < .05$; Lifetime delinquency: OR = 1.160, 95% CI for OR = 1.131–1.190, $p < .05$. Coefficients for incarcerated (N = 5724): IQ: OR = .982, 95% CI for OR = .975–.989, $p < .05$; Age: OR = 1.021, 95% CI for OR = .962–1.083, $p > .05$; Race: OR = 1.048, 95% CI for OR = .827–1.329, $p > .05$; Low self-control: OR = 1.035, 95% CI for OR = 1.021–1.048, $p < .05$; Lifetime delinquency: OR = 1.155, 95% CI for OR = 1.124–1.187, $p < .05$. Coefficients for incarcerated if arrested (N = 945): IQ: OR = .988, 95% CI for OR = .977–.999, $p < .05$; Age: OR = 1.063, 95% CI for OR = .983–1.149, $p > .05$; Race: OR = 1.331, 95% CI for OR = .977–1.813, $p > .05$; Low self-control: OR = 1.010, 95% CI for OR = .993–1.027, $p > .05$; Lifetime delinquency: OR = 1.077, 95% CI for OR = 1.037–1.119, $p < .05$. Predicted probabilities were estimated with all other covariates set to their means.

arrested, but there was an association between lifetime delinquency and the odds of being incarcerated if arrested.

Fig. 6 plots the predicted probabilities of being arrested, being incarcerated, and being incarcerated if arrested across IQ scores for White females. Remember that the association between IQ scores and the probability of being incarcerated if arrested was not statistically significant ($p = .151$). A pattern similar to those reported with the other samples emerged, where as IQ scores increase, the probability of being arrested and incarcerated decrease. In particular, White females with the lowest IQ scores had a predicted probability of being arrested of .304, had a predicted probability of being incarcerated of .177, and had a predicted probability of being incarcerated if arrested of .627. White females with the highest IQ scores, in contrast, had a predicted probability of being arrested of .104, had predicted probability of being incarcerated of .004, and had a predicted probability of being incarcerated if arrested of .390.[3]

[3] We also recalculated all of the statistical models by removing outliers that fell at the lowest end of the IQ measure to check the robustness of the results. The pattern of statistical significance remained identical, but in general the effect sizes increased for the models employing male subjects. As a result, we report the findings generated on the full sample of respondents (without excluding outliers), but are confident that the findings are not being driven by outliers on the IQ measure.

6. Discussion

There is a widespread belief that IQ is associated with criminal involvement and the existing empirical evidence seems to support that prevailing view (Walsh, 2011). As was discussed previously, however, there are a number of limitations with studies testing the IQ–crime association and thus perhaps the association is not nearly as strong or robust as is typically assumed. The current study was designed to correct for the key limitations in the extant literature and to examine whether IQ and crime were associated after these shortcomings were addressed. Data from the Add Health study were analyzed and the results are summarized in relation to the five key shortcomings of the existing literature.

First, unlike much of the previous research examining the IQ–crime link (Fergusson et al., 2005; Guay et al., 2005; Hanson et al., 1995; Holland & Holt, 1975; Holland et al., 1981; for an important exception see Herrnstein & Murray, 1994), the current study employed a nationally representative sample of American adolescents. Given that the association was still statistically significant, these findings tend to suggest that the IQ–crime association is generalizable to both clinical/incarcerated and community samples of adolescents and adults. Second, much of the existing literature measures crime either through self-reports or through official crime measures. The current study employed a somewhat different approach and relied on self-reports of being officially processed through the criminal

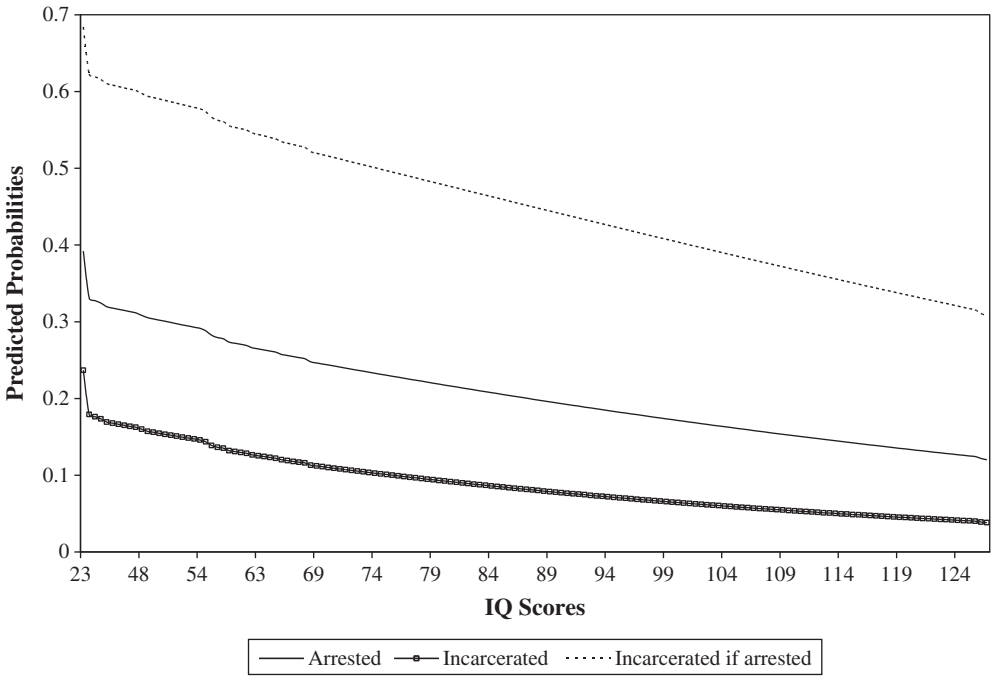

Fig. 5. Predicted probabilities of arrest and incarceration for Black females as a function of IQ scores. Notes: Coefficients for arrested (N = 1540): IQ: OR = .985, 95% CI for OR = .977–.994, $p < .05$; Age: OR = .984, 95% CI for OR = .912–1.062, $p > .05$; Low self-control: OR = 1.024, 95% CI for OR = 1.005–1.043, $p < .05$; Lifetime delinquency: OR = 1.171, 95% CI for OR = 1.123–1.220, $p < .05$. Coefficients for incarcerated (N = 1546): IQ: OR = .981, 95% CI for OR = .969–.993, $p < .05$; Age: OR = 1.009, 95% CI for OR = .906–1.124, $p > .05$; Low self-control: OR = 1.034, 95% CI for OR = 1.008–1.061, $p < .05$; Lifetime delinquency: OR = 1.165, 95% CI for OR = 1.116–1.215, $p < .05$. Coefficients for incarcerated if arrested (N = 304): IQ: OR = .985, 95% CI for OR = .968–1.003, $p > .05$; Age: OR = 1.064, 95% CI for OR = .921–1.230, $p > .05$; Low self-control: OR = 1.019, 95% CI for OR = .985–1.054, $p > .05$; Lifetime delinquency: OR = 1.080, 95% CI for OR = 1.020–1.143, $p < .05$. Predicted probabilities were estimated with all other covariates set to their means; the association between IQ and incarceration if arrested is not significant.

justice system. Despite this somewhat different measurement strategy (but see Herrnstein & Murray, 1994), the findings consistently revealed that IQ scores were related to criminal involvement. Third, relatively little literature has examined the IQ–crime association across various race/gender categories. We examined whether the criminogenic effect of IQ was confined to just one race/gender category or was applicable to all of the subgroups. The results revealed that IQ increased the probability of criminal involvement for most of the race/gender subgroups. The key exceptions were for the equations estimating the effect of IQ on incarceration (if arrested) for Black females and White females, where IQ was unrelated to the probability of being incarcerated. Fourth, unlike prior research that typically fails to control for executive functions, the current study revealed that IQ was associated with criminal involvement even after controlling for the effects of self-control. Fifth, relatively little research has explored the role of IQ on the probability of being processed through the criminal justice system. Fortunately, the Add Health data allowed us to explore the link between IQ and being arrested, being incarcerated, and being incarcerated if arrested. Across all of these outcome measures, the effect of IQ tended to remain a relatively strong and consistent predictor of criminal involvement/criminal justice processing.

Taken together, the results revealed a robust association between IQ and multiple measures of crime even after taking into account the limitations that plague prior research.[4] When combined with previous literature, there is good reason to believe that IQ is related to criminal involvement regardless of the sample analyzed, the measurement of crime, and the inclusion of controls for potentially confounding factors, such as executive functions. There is likely not another individual-level variable that is so consistently associated with crime and other forms of antisocial behaviors than IQ. When viewed in this light, these findings, along with those of the existing literature, tend to suggest that the criminogenic effects of IQ are not a methodological artifact and that research examining the etiology of crime and antisocial behaviors is likely misspecified if a measure of IQ is not included in the statistical models.

Although these findings clearly underscore a link between IQ and crime, the results of the current study provide very little

[4] It is important to point out that the association between IQ and incarcerated if arrested for females was not as robust as the other associations. Indeed, the association between IQ and incarcerated if arrested was not statistically significant for Black females or for White females, but it was significant in the full sample of females. This pattern of findings suggests that part of the reason for the null association is the result of a lack of statistical power. Future research, however, is needed to more fully explore this possibility and the potential reasons for why IQ and incarceration (if arrested) is not nearly as strong as the associations between IQ and the other criminal justice outcome measures.

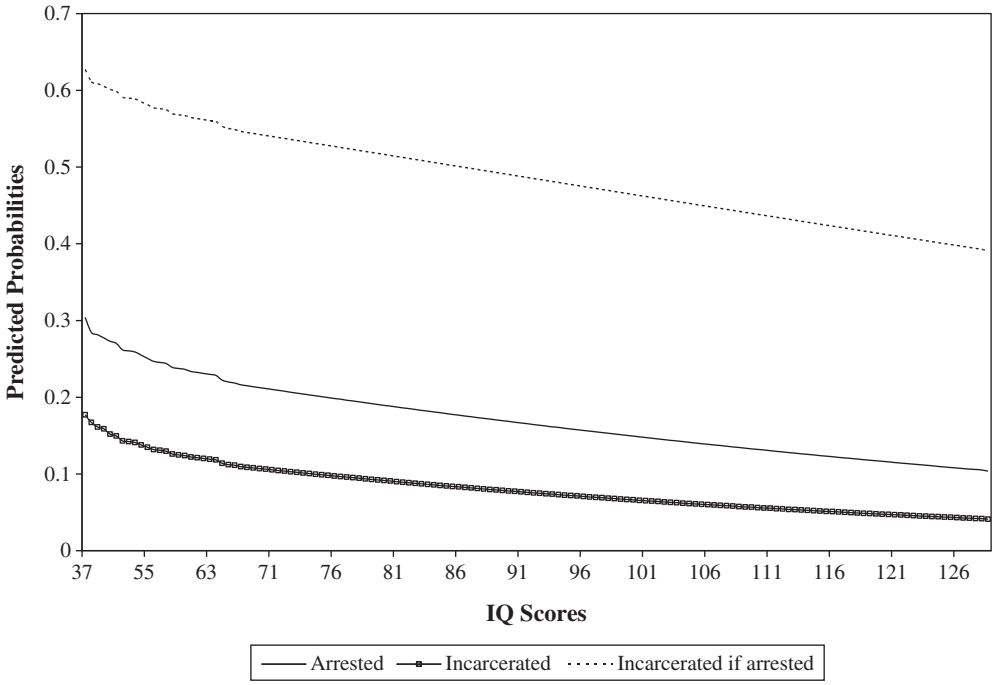

Fig. 6. Predicted probabilities of arrest and incarceration for White females as a function of IQ scores. Notes: Coefficients for arrested (N = 4170): IQ: OR = .986, 95% CI for OR = .979–.993, $p < .05$; Age: OR = .990, 95% CI for OR = .941–1.041, $p > .05$; Low self-control: OR = 1.035, 95% CI for OR = 1.024–1.047, $p < .05$; Lifetime delinquency: OR = 1.154, 95% CI for OR = 1.116–1.192, $p < .05$. Coefficients for incarcerated (N = 4178): IQ: OR = .983, 95% CI for OR = .973–.992, $p < .05$: Age: OR = 1.024, 95% CI for OR = .954–1.099, $p > .05$; Low self-control: OR = 1.035, 95% CI for OR = 1.020–1.051, $p < .05$; Lifetime delinquency: OR = 1.149, 95% CI for OR = 1.108–1.191, $p < .05$. Coefficients for incarcerated if arrested (N = 641): IQ: OR = .990, 95% CI for OR = .976–1.004, $p > .05$; Age: OR = 1.063, 95% CI for OR = .969–1.167, $p > .05$; Low self-control: OR = 1.007, 95% CI for OR = .987–1.027, $p > .05$; Lifetime delinquency: OR = 1.073, 95% CI for OR = 1.019–1.130, $p < .05$. Predicted probabilities were estimated with all other covariates set to their means; the association between IQ and incarceration if arrested is not significant.

detail about the processes that are at play that ultimately account for the IQ–crime linkage. However, it is important to note that the findings are consistent with explanations that focus on detection and demeanor. Recall that all of the statistical models included a control for lifetime self-reported delinquency. Thus, the effects of IQ on being processed through the criminal justice system are above and beyond the effects that IQ has on crime and delinquency in general. While IQ may be a causal factor in producing crime and delinquency, the fact that IQ has effects on criminal justice processing variables after the effects of self-reported delinquency are removed tends to suggest that IQ may have effects that are the result of differential detection (Feldman, 1977; Hirschi & Hindelang, 1977). In this case, criminals with lower IQ are more likely to be detected by the criminal justice system for any number of different reasons. In addition, IQ may also act as an "extra-legal" variable or IQ may also be related to demeanor, wherein criminals with lower IQ are likely to act in ways that are ultimately responsible for them being processed through the criminal justice system. Unfortunately, the current study was unable to test these different mechanisms, but future research would benefit greatly from exploring the potential explanations for why IQ is associated with criminal justice processing.

Although the findings reported here add additional empirical evidence to the IQ–crime link, there are a number of limitations that need to be addressed by future researchers. First, IQ was assessed only with measures of verbal abilities. It would be interesting to determine whether these findings would have been detected with other measures of IQ, such as spatial IQ. We were unable to explore this possibility because the Add Health data did not include any additional measures of IQ during the first three waves of data collection. Second, the measures of criminal involvement were based on self-reports, not on official crime measures. As a result, it is possible that IQ is related in some systematic way to the admission of being processed through the criminal justice system as opposed to actually being processed through the criminal justice system. While this is possible, previous research has already revealed that IQ is related to official crime measures, so it is unlikely that the entire IQ effect is confounded by truthfulness in responding to questions about criminal justice processing (Walsh, 2003). Third, the Add Health data only span through early adulthood, which leaves open the possibility that the effects reported here may change in some significant way had the data been available throughout the entire life course. Importantly, most criminal offenders who are processed through the criminal justice system typically have their first contact with the criminal justice system in adolescence or early adulthood (Gottfredson & Hirschi, 1990). As a result, it is unlikely that these findings would change appreciably by extending the timeframe to middle- or late-adulthood. Nonetheless, it would be interesting for future researchers to explore this possibility more closely. Fourth, we were unable to establish temporal ordering between IQ and the criminal justice outcome measures given that IQ was

measured from wave 1 and wave 3 data and the criminal justice outcome measures were assessed over the entire life course. This might not be as salient of an issue when dealing with IQ and antisocial behaviors because both phenotypes have been shown to be relatively stable from childhood through adulthood and there is no empirical evidence indicating that being processed through the criminal justice system would affect IQ. Until these limitations are fully addressed, the true nature of the association between IQ and crime will remain somewhat obscured. If the results of the current study are any indication, however, the IQ–crime association will remain relatively large and consistent even when these and other limitations are addressed in future research.

References

Ai, C., & Norton, E. C. (2003). Interaction terms in logit and probit models. *Economics Letters*, *80*, 123–129.

Anderson, D. A. (1999). The aggregate burden of crime. *Journal of Law and Economics*, *42*, 611–642.

Ardila, A., Pineda, D., & Rosselli, M. (2000). Correlation between intelligence test scores and executive function measures. *Archives of Clinical Neuropsychology*, *15*, 31–36.

Beaver, K. M., DeLisi, M., Mears, D. P., & Stewart, E. A. (2009). Low self-control and contact with the criminal justice system in a nationally representative sample of males. *Justice Quarterly*, *26*, 695–715.

Beaver, K. M., DeLisi, M., Vaughn, M. G., & Wright, J. P. (2010). The intersection of genes and neuropsychological deficits in the prediction of adolescent delinquency and low self-control. *International Journal of Offender Therapy and Comparative Criminology*, *54*, 22–42.

Beaver, K. M., & Wright, J. P. (2011). The association between county-level IQ and county-level crime rates. *Intelligence*, *39*, 22–26.

Beaver, K. M., Wright, J. P., & DeLisi, M. (2007). Self-control as an executive function: Reformulating Gottfredson and Hirschi's parental socialization thesis. *Criminal Justice and Behavior*, *34*, 1345–1361.

Bell, E. C., Willson, M. C., Wilman, A. H., Dave, S., & Silverstone, P. H. (2006). Males and females differ in brain activation during cognitive tasks. *NeuroImage*, *30*, 529–538.

Booth, A., Johnson, D. R., & Choldin, H. M. (1977). Correlates of city crime rates: Victimization surveys versus official statistics. *Social Problems*, *25*, 187–197.

Brame, R., Fagan, J., Piquero, A. R., Schubert, C. A., & Steinberg, L. (2004). Criminal careers of serious delinquents in two cities. *Youth Violence and Juvenile Justice*, *2*, 256–272.

Bureau of Justice Statistics (2011). *Criminal victimization, 2010 (NCJ 235508)*. (Washington, DC: Jennifer L. Truman. Retrieved February 17, 2012 from http://www.bjs.gov/content/pub/pdf/cv10.pdf).

Cullen, F. T., Gendreau, P., Jarjoura, G. R., & Wright, J. P. (1997). Crime and the bell curve. Lessons from intelligent criminology. *Crime and Delinquency*, *43*, 387–411.

DeLisi, M., Kosloski, A. E., Sween, M., Hachmeister, E., Moore, M., & Drury, A. J. (2010). Murder by numbers: Monetary costs imposed by a sample of homicide offenders. *Journal of Forensic Psychiatry and Psychology*, *21*, 501–513.

Denno, D. W. (1990). *Biology and violence: From birth to adulthood.* Cambridge, UK: Cambridge University Press.

Diamond, B., Morris, R. G., & Barnes, J. C. (2012). Individual and group IQ predict inmate violence. *Intelligence*, *40*, 115–122.

Farrington, D. P. (1997). Early prediction of violent and non-violent youth offending. *European Journal on Criminal Policy and Research*, *5*, 51–66.

Federal Bureau of Investigation (2003). *Age-specific arrest rates and race-specific arrest rates for selected offenses 1993–2001.* Washington, DC: U.S. Department of Justice.

Federal Bureau of Investigation (2010). *Crime in the United States, 2010.* Washington, DC: U.S. Department of Justice.

Feldman, M. P. (1977). *Criminal behavior: A psychological analysis.* New York: Wiley.

Fergusson, D. M., Horwood, J., & Ridder, E. M. (2005). Show me the child at seven II: Childhood intelligence and later outcomes in adolescence and young adulthood. *Journal of Child Psychology and Psychiatry*, *46*, 850–858.

Fischer, C. S., Hout, M., Jankowski, M. S., Lucas, S. R., Swindler, A., & Voss, K. (1996). *Inequality by design: Cracking the bell curve myth.* Princeton, NJ: Princeton University Press.

Gabrielli, W. F., & Mednick, S. A. (1980). Sinistrality and delinquency. *Journal of Abnormal Psychology*, *89*, 654–661.

Gottfredson, L. S. (2004). Intelligence: Is it the epidemiologists' elusive "fundamental cause" of social class inequalities in health? *Journal of Personality and Social Psychology*, *86*, 174–199.

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime.* Stanford, CA: Stanford University Press.

Guay, J. P., Ouimet, M., & Proulx, J. (2005). On intelligence and crime: A comparison of incarcerated sex offenders and serious non-sexual violent criminals. *International Journal of Law and Psychiatry*, *28*, 405–417.

Halpern, D. F., & LaMay, M. L. (2000). The smarter sex: A critical review of sex differences in intelligence. *Educational Psychology Review*, *12*, 229–246.

Hanson, K. R., Scott, H., & Steffy, R. A. (1995). A comparison of child molesters and nonsexual criminals: Risk predictors and long-term recidivism. *Journal of Research in Crime and Delinquency*, *32*, 325–337.

Harris, K. M. (2009). *The National Longitudinal Study of Adolescent Health (Add Health), waves I & II, 1994–1996; wave III, 2001–2002; wave IV, 2007–2009 [machine-readable data file and documentation].* Chapel Hill, NC: Carolina Population Center, University of North Carolina at Chapel Hill.

Harris, K. M., Florey, F., Tabor, J., Bearman, P. S., Jones, J., & Udry, R. J. (2003). The National Longitudinal Study of Adolescent Health: Research design [www document]. URL: http://www.cpc.unc.edu/projects/addhealth/design

Harris, K. M., Halpern, C. T., Smolen, A., & Haberstick, B. C. (2006). The National Longitudinal Study of Adolescent Health (Add Health) twin data. *Twin Research and Human Genetics*, *9*, 988–997.

Herrenkohl, T. L., Maguin, E., Hill, K. G., Hawkins, J. D., Abbott, R. D., & Catalano, R. F. (2000). Developmental risk factors for youth violence. *Journal of Adolescent Health*, *26*, 176–186.

Herrnstein, R. J., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life.* New York, NY: Free Press.

Hindelang, M. J., Hirschi, T., & Weis, J. G. (1981). *Measuring delinquency.* Beverly Hills, CA: Sage.

Hirschi, T., & Hindelang, M. J. (1977). Intelligence and delinquency: A revisionist review. *American Sociological Review*, *48*, 571–587.

Holland, T. R., Beckett, G. E., & Levi, M. (1981). Intelligence, personality, and criminal violence: A multivariate analysis. *Journal of Consulting and Clinical Psychology*, *49*, 106–111.

Holland, T. R., & Holt, N. (1975). Prisoner intellectual and personality correlates of offense severity and recidivism. *Journal of Clinical Psychology*, *31*, 667–672.

Hyde, J. S., & Linn, M. C. (1988). Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin*, *104*, 53–69.

Krohn, M. D., Lizotte, A. J., Phillips, M. D., Thornberry, T. P., & Bell, K. A. (2011). Explaining systematic bias in self-reported measures: Factors that affect the under- and over-reporting of self-reported arrests. *Justice Quarterly*, http://dx.doi.org/10.1080/07418825.2011.60622.

Lauritsen, J. L., Heimer, K., & Lynch, J. P. (2009). Trends in the gender gap in violent offending: New evidence from the National Crime Victimization Survey. *Criminology*, *47*, 361–399.

Levine, S. (2011). Elaboration on the association between IQ and parental SES with subsequent crime. *Personality and Individual Differences*, *50*, 1233–1237.

Lynam, D. R., Moffitt, T. E., & Stouthamer-Loeber, M. (1993). Explaining the relation between IQ and delinquency: Class, race, test motivation, school failure, or self control? *Journal of Abnormal Psychology*, *102*, 187–196.

Lynn, R. (2010). Consistency of race differences in intelligence over millennia: A comment on Wicherts, Borsboom and Dolan. *Personality and Individual Differences*, *48*, 100–101.

McCollister, K. E., French, M. T., & Fang, H. (2010). The cost of crime to society: New crime-specific estimates for policy and program evaluation. *Drug and Alcohol Dependence*, *108*, 98–109.

McNulty, T. L., Bellair, P. E., & Watts, S. J. (2013). Neighborhood disadvantage and verbal ability as explanations of the Black–White difference in adolescent violence: Toward and integrated model. *Crime and Delinquency*, *59*, 140–160.

Mears, D. P., Cochran, J. C., & Beaver, K. M. (in press). Self-control theory and non-linear effects on offending. *Journal of Quantitative Criminology* (in press).

Moffitt, T. E., Caspi, A., Silva, P. A., & Stouthamer-Loeber, M. (1995). Individual differences in personality and intelligence are linked to crime: Cross-context evidence from nations, neighborhoods, genders, races, and age-cohorts. In J. Hagan (Ed.), *Current perspectives on aging and the life cycle. Delinquency and disrepute in the life course: Contextual and dynamic analyses.* (pp. 1–34). Greenwich, CT: JAI Press.

Moffitt, T. E., Gabrielli, W. F., Mednick, S. A., & Schulsinger, F. (1981). Socioeconomic status, IQ, and delinquency. *Journal of Abnormal Psychology*, *90*, 152–156.

Moffitt, T. E., & Silva, P. A. (1988). IQ and delinquency: A direct test of the differential detection hypothesis. *Journal of Abnormal Psychology*, *97*, 330–333.

Morris, N. A., & Slocum, L. A. (2010). The validity of self-reported prevalence, frequency, and timing of arrest: An evaluation of data collected using a life event calendar. *Journal of Research in Crime and Delinquency*, *47*, 210–240.

Neisser, U., Boodoo, G., Bouchard, T. J., Boykin, A. W., Brody, N., Ceci, S. J., et al. (1996). Intelligence: Known and unknowns. *American Psychologist*, *51*, 77–101.

O'Brien, R. M., Shichor, D., & Decker, D. L. (1980). An empirical comparison of the validity of UCR and NCS crime rates. *The Sociological Quarterly*, *21*, 391–401.

Oglive, J. M., Stewart, A. L., Chan, R. C. K., & Shum, D. K. (2011). Neuropsychological measures of executive function and antisocial behavior: A meta-analysis. *Criminology*, *49*, 1063–1107.

Pratt, T. C., & Cullen, F. T. (2000). The empirical status of Gottfredson and Hirschi's general theory of crime: A meta-analysis. *Criminology*, *38*, 931–964.

Rastogi, S., Johnson, T. D., Hoeffel, E. M., & Drewery, M. P., Jr. (2011). *The Black population: 2010.* : U.S. Census Bureau.

Reitz, K. R. (2011). Sentencing. In J. Q. Wilson, & J. Petersilia (Eds.), *Crime and public policy* (pp. 467–498). New York, NY: Oxford University Press.

Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., Jones, J., et al. (1997). Protecting adolescents from harm: Findings from the National Longitudinal Study of Adolescent Health. *Journal of the American Medical Association*, *278*, 823–832.

Rowe, D. C. (1994). *The limits of family influence.* New York, NY: Guilford Press.

Rowe, D. C., Jacobson, K. C., & Van den Oord, E. J. C. G. (1999). Genetic and environmental influences on vocabulary IQ: Parental education level as moderator. *Child Development*, *70*, 1151–1162.

Rushton, J. P., & Jensen, A. R. (2010). The rise and fall of the Flynn Effect as a reason to expect a narrowing of the Black–White IQ gap. *Intelligence*, *38*, 213–219.

Sabol, W. J., West, H. C., & Cooper, M. (2009). *Prisoners in 2008.* Washington, DC: Bureau of Justice Statistics.

Thornberry, T. P., & Krohn, M. D. (2000). The self-report method for measuring delinquency and crime. *Criminal Justice*, *4*, 33–83.

Voyer, D., Voyer, S., & Bryden, M. P. (1995). Magnitude of sex differences in spatial abilities: A meta-analysis and consideration of critical variables. *Psychological Bulletin*, *117*, 250–270.

Walsh, A. (2003). Intelligence and antisocial behavior. In A. Walsh, & L. Ellis (Eds.), *Biosocial criminology: Challenging environmentalism's supremacy* (pp. 105–124). New York, NY: Nova Science Publishers.

Walsh, A. (2011). *Social class and crime: A biosocial approach.* New York, NY: Routledge.