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# The association between county-level IQ and county-level crime rates

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ABSTRACT

An impressive body of research has revealed that individual-level IQ scores are negatively associated with criminal and delinquent involvement. Recently, this line of research has been extended to show that state-level IQ scores are associated with state-level crime rates. The current study uses this literature as a springboard to examine the potential association between county-level IQ and county-level crime rates. Analysis of data drawn from the National Longitudinal Study of Adolescent Health revealed statistically significant and negative associations between county-level IQ and the property crime rate, the burglary rate, the larceny rate, the motor vehicle theft rate, the violent crime rate, the robbery rate, and the aggravated assault rate. Additional analyses revealed that these associations were not confounded by a measure of concentrated disadvantage that captures the effects of race, poverty, and other social disadvantages of the county. We discuss the implications of the results and note the limitations of the study.



## 1. Introduction

One of the most consistent findings to emerge from criminological research is that rates of crime and violence vary significantly across macro-level units (Reiss & Tonry, 1986). Studies have revealed, for instance, that variation in crime rates exists across countries, states, counties, neighborhoods, and even census tracts (Land, McCall, & Cohen, 1990; Messner & Rosenfeld, 1994). In light of these macro-level differences in crime rates, there has been a considerable amount of theoretical and empirical research attempting to identify the various factors that might be able to explain such differences (Messner & Rosenfeld, 1994). With few exceptions, most of the research has identified macro-level differences in socio-environmental factors as the key causes of differences in crime rates (Pratt & Cullen, 2005; Sampson, Raudenbush, & Earls, 1997). To illustrate, variation in relative deprivation, absolute deprivation, residential mobility, unemployment rates, and informal social control, among other socio-environmental factors have all been tied to variation in crime rates across macro-level units (Pratt & Cullen, 2005). The explicit assumption with this line of reasoning is that crime rates are characteristics of some aggregate-level of analysis (e.g., states or counties) and thus cannot be explained by characteristics at lower levels of aggregation.

The possibility that factors other than socio-environmental ones can explain variation in phenomena occurring at the macro-level was brought to the forefront by Lynn and Vanhanen (2002). In their book, *IQ and the Wealth of Nations*, Lynn and Vanhanen explored why wealth varies so drastically across countries. Through a litany of statistical analyses, they reported that variation in the wealth of a country was explained, in large part, by the average IQ of citizens in the country. Follow-up analyses revealed that variation in country-level IQ was linked with a range of other country-level inequalities, such as literacy rates, per capita income, educational levels, and life expectancy (Lynn & Vanhanen, 2006). More recent analyses have begun to build on Lynn and Vanhanen's work by examining whether average IQ at levels of aggregation other than the country (e.g., state) are able to explain differences in various macro-level rates, such as economic conditions, health outcomes, and governmental effectiveness (Kanazawa, 2006; McDaniel, 2006). Of particular

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interest are the three studies that have examined the association between the average level of IQ and crime rates at the state-level of analysis.

In the first study, McDaniel (2006) estimated state IQ by using scores from the National Assessment of Educational Progress standardized tests that were completed for students in grades 4 through 8 for all fifty states. State-level violent crime rates were garnered from the Bureau of Justice Statistics and averaged across the years 2002–2004. The results of the bivariate analysis revealed a statistically significant and inverse relationship between average state IQ and violent crime rates ($r = -.58$, $p < .05$). A second study using the same IQ measure as McDaniel (2006), but with a different measure of state-level crime rates revealed a statistically significant and negative association, where states with lower average IQs had, on average, higher aggregate crime rates (Pesta, McDaniel, & Bertsch, 2010).

In the third study, Bartels, Ryan, Urban, and Glass (2010) also examined the association between state IQ and crime statistics at the state level. They used the same measure of state IQ that was used by McDaniel (2006); however, instead of only examining the aggregate violent crime rate in general, they examined the association between state IQ and nine different measures of crime drawn from 2005 to 2006 data. Their analysis revealed statistically significant associations between state IQ and the total violent crime rate, the murder rate, the aggravated assault rate, the robbery rate, the total property crime rate, the burglary rate, the theft rate, and the motor vehicle theft rate.

Taken together, the results of these three studies indicate differences in crime rates at the state level are associated with differences in the average IQ of citizens in the state. Our study builds on and extends this prior research in two important ways. First, instead of examining the association between IQ and crime rates at the state-level, we use the county-level. There is reason to believe that aggregation at lower levels will provide stronger associations because there is less heterogeneity within lower levels of aggregation. Second, the extant studies employ the same measures of IQ thereby raising questions about whether the results would be replicated when using different measures of IQ. In the current study, we use aggregated scores on a shortened version of the Peabody Picture Vocabulary Test (PPVT) to measure IQ at the county level. To the extent that the association between aggregate IQ and aggregate crime rates is robust and not due to a methodological or statistical artifact, our results should parallel those detected previously.

## 2. Method

### 2.1. Sample

Data for this study were drawn from wave 1 of the National Longitudinal Study of Adolescent Health (Add Health; Udry, 2003). The Add Health is a longitudinal study that consists of a nationally representative sample of American youths who were enrolled in middle or high school. Data collection began in 1994–1995 when students at 132 middle and high schools were administered a self-report survey that asked a variety of questions germane to adolescence, including questions about their social relationships and their home life. Approximately 90,000 adolescents participated in the wave 1 in-school component to the Add Health study. A subsample of respondents was then selected to be reinterviewed at their homes along with their primary caregivers (typically their mother). Youths were asked detailed questions about their involvement in risky behaviors, their use of drugs and alcohol, and their peer networks. A total of 20,745 youths and 17,700 of their primary caregivers were included in the wave 1 in-home component of the study (Harris et al., 2003).

Along with individual-level data gathered from the participants, contextual data were also collected at wave 1 from various sources, including from the Census, from the Center for Disease Control (CDC), and from the Federal Bureau of Investigation (FBI). The contextual-level data were collected at multiple units of analysis, including the tract-level, the block-level, the county-level, and the state-level (Billy, Wenzlow, & Grady, 1998). We opted to use data aggregated at the county-level because it was the lowest level of aggregation where crime rates were available. In total, the analyses in this study were based on a final analytical sample that consisted of $N = 243$ counties nested within 31 states, with an average of approximately 26 counties in each state.

### 2.2. Measures

#### 2.2.1. County-level IQ

During wave 1 interviews, youths were administered the Picture Vocabulary Test (PVT). The PVT is a shortened version of the widely used Peabody Picture Vocabulary Test-Revised (PPVT), which is designed to measure verbal skills and receptive vocabulary. Prior researchers analyzing the Add Health have used the PVT as a measure of verbal IQ (Rowe, Jacobson, & Van den Oord, 1999). County-level IQ was estimated by aggregating individual-level PVT scores to the county-level. To ensure that the county-level IQ estimates were not being driven by just a few outliers, the final analytical sample only included counties where PVT scores were aggregated for at least 19 respondents. Importantly, the models were also recalculated with varying numbers of respondents in each county (e.g., >1, >5, >10, >25, etc.) and the pattern of results remained unchanged.

#### 2.2.2. Concentrated disadvantage

Criminological research has revealed that concentrated disadvantage is an important correlate to crime (Sampson et al., 1997). This measure captures the effects of some of the most robust associations with crime rates. As a result, a concentrated disadvantage factor score was included in the analyses to help ensure that any association between county-level IQ and county-level crime rates was not spurious owing to the effect of concentrated disadvantage. Concentrated disadvantage was created by using items that paralleled those used by Sampson et al. (1997). Specifically, the concentrated disadvantage scale included the following five items (all measured at the county-level): 1) the proportion of African Americans living in the county, 2) the proportion of female-headed households in the county, 3) the proportion of households with an annual income<$15,000, 4) the proportion of households receiving public assistance, and 5) the unemployment rate. Factor analysis revealed that all of the items loaded on a unitary factor (all factor loadings were above .78). Following prior research (Sampson et al., 1997), a weighted factor score was created, with higher values representing more concentrated disadvantage.

### 2.2.3. County-level crime rates

The Add Health sample included information drawn from the Uniform Crime Reports (UCR) about county-level crime rates. The current study analyzed the following seven crime rates: the property crime rate of the county, the burglary rate of the county, the larceny rate of the county, the motor vehicle theft rate of the county, the violent crime rate of the county, the robbery rate of the county, and the aggravated assault rate of the county. In addition, we also created a weighted factor score to create a composite crime rate measure. This weighted factor score was derived from the rates of the five specific crime rates (i.e., the burglary rate, the larceny rate, the motor vehicle theft rate, the robbery rate, and the aggravated assault rate).

## 2.3. Analytical strategy

The analysis for this study follows a three-step process. First, bivariate correlations are calculated for all of the variables/scales. Second, the county-level IQ measure is used to predict each of the seven UCR crime-rate measures described above. These models provide baseline estimates of the effect of IQ on crime rates at the county-level. Third, after estimating the baseline model, the concentrated disadvantage factor scale is introduced into the equation to ensure that the results are not confounded by previously identified correlates to crime. All of the models were estimated using ordinary least squares (OLS) regression analysis.

## 3. Results

The analysis begins by examining the interrelationships among the variables/scales. The results of these analyses are presented in Table 1. As can be seen, county-level IQ maintains a statistically significant and negative association with all of the crime rate measures and with the concentrated disadvantage factor score. These findings, in short, reveal that as county-level IQ increases, rates of crime as well as levels of concentrated disadvantage decrease.

**Table 2**
The association between county-level IQ and county-level property crime rates ($N=243$ counties).

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | Beta | $t$ | $p$ | Beta | $t$ | $p$ |
| Property crime | | | | | | |
| IQ | −.40 | −6.76 | <.001 | −.32 | −4.71 | <.001 |
| Concentrated dis. | | | | .17 | 2.51 | .013 |
| Burglary | | | | | | |
| IQ | −.44 | −7.54 | <.001 | −.28 | −4.38 | <.001 |
| Concentrated dis. | | | | .32 | 5.08 | <.001 |
| Larceny | | | | | | |
| IQ | −.29 | −4.74 | <.001 | −.21 | −2.97 | .003 |
| Concentrated dis. | | | | .17 | 2.41 | .017 |
| Motor vehicle theft | | | | | | |
| IQ | −.51 | −9.14 | <.001 | −.55 | −8.62 | <.001 |
| Concentrated dis. | | | | −.09 | −1.34 | .182 |

The next set of analyses examined the association between county-level IQ and county-level property crime rates. Table 2 displays the results. Note that for each of the dependent variables two equations are estimated: one with only IQ included as a predictor variable (Model 1) and one with IQ and concentrated disadvantage included as predictor variables (Model 2). The results for the overall property crime rate are included in the first row and indicate a statistically significant and negative association. Model 2 shows that the association between IQ and the overall property crime rate remains statistically significant even after controlling for concentrated disadvantage. Similar results were garnered for the models estimating the association between IQ and the burglary rate, the larceny rate, and the motor vehicle theft rate. In all of the models, the association between IQ and crime was statistically significant both before and after controlling for concentrated disadvantage.

The last models are duplicates of those presented in Table 2, except that only violent crime rates and the composite crime rate are examined. Table 3 presents the results and shows a pattern of results that is strikingly similar to the one generated

**Table 1**
Correlation matrix for selected Add Health study variables.

| | | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 | X11 | X12 | X13 | X14 | X15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IQ | X1 | 1.00 | | | | | | | | | | | | | | |
| Property crime | X2 | −.40[a] | 1.00 | | | | | | | | | | | | | |
| Burglary | X3 | −.44[a] | .95[a] | 1.00 | | | | | | | | | | | | |
| Larceny | X4 | −.29[a] | .97[a] | .88[a] | 1.00 | | | | | | | | | | | |
| Motor vehicle theft | X5 | −.51[a] | .76[a] | .70[a] | .59[a] | 1.00 | | | | | | | | | | |
| Violent crime | X6 | −.58[a] | .77[a] | .79[a] | .64[a] | .84[a] | 1.00 | | | | | | | | | |
| Robbery | X7 | −.54[a] | .69[a] | .68[a] | .53[a] | .88[a] | .91[a] | 1.00 | | | | | | | | |
| Aggravated assault | X8 | −.52[a] | .72[a] | .75[a] | .62[a] | .69[a] | .93[a] | .70[a] | 1.00 | | | | | | | |
| Composite crime | X9 | −.53[a] | .93[a] | .92[a] | .83[a] | .89[a] | .94[a] | .87[a] | .86[a] | 1.00 | | | | | | |
| Concentrated dis. | X10 | −.49[a] | .32[a] | .46[a] | .27[a] | .19[a] | .57[a] | .36[a] | .66[a] | .44[a] | 1.00 | | | | | |
| African American | X11 | −.43[a] | .44[a] | .56[a] | .42[a] | .18[a] | .60[a] | .38[a] | .69[a] | .51[a] | .82[a] | 1.00 | | | | |
| Female-headed house | X12 | −.56[a] | .56[a] | .64[a] | .50[a] | .44[a] | .76[a] | .62[a] | .76[a] | .68[a] | .84[a] | .85[a] | 1.00 | | | |
| Less than $15,000 | X13 | −.27[a] | .12 | .25[a] | .13[a] | −.09 | .23[a] | .03 | .36[a] | .15[a] | .83[a] | .56[a] | .49[a] | 1.00 | | |
| Public assistance | X14 | −.46[a] | .13[a] | .27[a] | .05 | .13[a] | .46[a] | .28[a] | .55[a] | .29[a] | .92[a] | .63[a] | .70[a] | .76[a] | 1.00 | |
| Unemployment rate | X15 | −.38[a] | .16[a] | .27[a] | .09 | .14[a] | .39[a] | .23[a] | .46[a] | .27[a] | .84[a] | .49[a] | .56[a] | .73[a] | .80[a] | 1.00 |

[a] Significant at the .05 level, two-tailed test.

**Table 3**
The association between county-level IQ and county-level violent crime rates and the county-level composite crime rate ($N = 243$ counties).

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | Beta | *t* | *p* | Beta | *t* | *p* |
| Violent crime | | | | | | |
| IQ | −.58 | −11.16 | <.001 | −.40 | −7.26 | <.001 |
| Concentrated dis. | | | | .37 | 6.66 | <.001 |
| Robbery | | | | | | |
| IQ | −.54 | −10.07 | <.001 | −.49 | −7.89 | <.001 |
| Concentrated dis. | | | | .12 | 1.86 | .065 |
| Aggravated assault | | | | | | |
| IQ | −.52 | −9.56 | <.001 | −.27 | −4.98 | <.001 |
| Concentrated dis. | | | | .53 | 9.84 | <.001 |
| Composite crime | | | | | | |
| IQ | −.53 | −9.68 | <.001 | −.41 | −6.74 | <.001 |
| Concentrated dis. | | | | .24 | 3.92 | <.001 |

for property crimes. Specifically, IQ is a statistically significant predictor of the total violent crime rate, the robbery rate, the aggravated assault rate, and the composite crime rate both before and after the inclusion of the concentrated disadvantage scale.

## 4. Discussion

A large body of empirical research has revealed that an individual's IQ is moderately to strongly predictive of an array of adolescent and adulthood outcomes ranging from educational attainment to involvement in criminal behaviors (Herrnstein & Murray, 1994). Given the diverse effects of IQ, some researchers have begun to examine whether IQ at different levels of aggregation are associated with variation between macro-level units. The results of these studies have tended to mirror those found at the individual level where higher aggregate-level IQ is associated with more positive outcomes, such as higher GDP and longer life expectancy, and lower aggregate IQ is associated with more negative outcomes, such as a higher percentage of babies being born at a low birth weight (McDaniel, 2006) and higher crime rates (Bartels et al., 2010). The current study sought to extend this body of research by examining the association between county-level IQ and county-level crime rates using data drawn from the National Longitudinal Study of Adolescent Health (Add Health). To our knowledge, this is the first study to examine this association at the county level.

The results of our study revealed two main findings. First, and in line with the results of studies examining state IQ, there was a statistically significant and negative bivariate association between county-level IQ and the property crime rate, the burglary rate, the larceny rate, the motor vehicle theft rate, the violent crime rate, the robbery rate, and the aggravated assault rate. Even though these analyses were carried out at the county-level, the results and the effect sizes were remarkably similar to those generated by previous research at the state level (Bartels et al., 2010; McDaniel, 2006; Pesta et al., 2010). That the associations were detected across all crime measures underscores the likelihood that county-level IQ has general effects that sweep across all crimes, not just a few specific crimes.

Second, we also examined the effect that concentrated disadvantage had on crime rates. Recall that prior research has reported that measures of concentrated disadvantage are among the strongest predictors of crime rates (Sampson et al., 1997). When concentrated disadvantage was introduced into the equations, the association between county-level IQ and the crime rates remained statistically significant. Importantly, we calculated Sobel tests (Baron & Kenny, 1986; Sobel, 1982) to determine whether concentrated disadvantage was mediating part of the association between county-level IQ and county-level crime rates. The results of the Sobel tests indicated that concentrated disadvantage did not mediate the IQ-crime association in any of the models. Taken together, these results strongly suggest that the effect of IQ on crime rates is independent of the effects of concentrated disadvantage, a construct that simultaneously takes into account the effects of race, poverty, and other known factors associated with crime rates.

If the association between aggregate IQ and crime rates continues to be replicated, it will have serious implications for macro-level research examining the predictors of crime rates. For the most part, macro-level research only examines socio-environmental factors as causes of crime rates. At the same time, these studies have ignored the possibility that aggregate IQ maintains a strong association with various crime rates. As the results of this and other studies reveal, however, this is a serious oversight. IQ at the individual level is known to render certain associations spurious; it is quite possible that much of the macro-level criminological research is misspecified as it fails to take into account a substantive strong predictor of crime rates (i.e., aggregate IQ). Moreover, aggregate IQ is likely associated with many of the factors that are typically employed as predictors of crime rates, such as racial composition, poverty status, and even concentrated disadvantage. The end result could be the production of erroneous and biased results among macro-level research because of the lack of controlling for aggregate-level IQ. Future research is needed to explore the true extent of this potential problem.

With these findings in mind, it is important that replication studies are conducted that address some of the limitations with our study. First, our measure of IQ was limited to scores drawn from the Add Health's PVT test. Even though the results of our study corroborate those using different measures of IQ (Bartels et al., 2010; McDaniel, 2006; Pesta et al., 2010), future research needs to examine whether or not other standardized IQ tests would produce similar results. Second, the measure of IQ was based on adolescents' IQ scores aggregated to the county level. It would be interesting to explore whether the same pattern of results would be observed if adult IQ scores were used instead of adolescents. These limitations await future researchers to address. As for now, the results of our study call attention to the very real possibility that crime rates are partially a function of aggregate-level IQ scores and criminological macro-level studies that fail to control for IQ are at-risk for producing spurious results owing to the confounding effects of aggregate IQ.

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