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The Unpredictability of Murder: Juvenile Homicide in the Pathways to Desistance Study

Matt DeLisi[1], Alex R. Piquero[2,3], and Stephanie M. Cardwell[2]

Abstract

There is minimal research that has investigated the characteristics distinguishing youth who commit murder to other juvenile offenders. Of the research that has been done, scholars have identified a wide variety of factors that distinguish these offenders, including poor family environments, emotional and social problems, poor mental health, and behavioral disorders. Using data from Pathways to Desistance, a study of 1,354 serious youthful offenders, we examined how 8 demographic characteristics and 35 risk factors distinguish between those youth who were charged with some type of homicide and those youth who were not charged with any type of homicide. We find that only 18 (1.33%) youth were charged with a homicide offense. Among the predictors, age, intelligence quotient (IQ), exposure to violence, perceptions of community disorder, and prevalence of gun carrying are significantly different across the two groups. Results from a rare-events logistic regression that simultaneously examined the relationship between these five risk factors and their ability to distinguish between the two groups indicate that only lower IQ and a greater exposure to violence were significant. Finally, a higher number of risk factors were associated with a higher likelihood that youth would be charged with homicide.

Keywords

juvenile homicide, murder, criminal career; Pathways to Desistance, crime prediction

Introduction

In the wake of a spate of homicides involving juvenile victims and, often, juvenile offenders, First Lady Michelle Obama has urged policy makers, law enforcement personnel, and community leaders

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to allocate resources to better understand the predictors of juvenile homicide (Lee, 2013). Although recent years have seen sizeable reductions in homicide generally and juvenile homicide specifically, it is also true that young age is one of the most robust predictors of homicide offending and victimization (Farrington, Loeber, Stallings, & Homish, 2012; Fox & Piquero, 2003; Heide, 2003; Loeber & Farrington, 2011) especially among delinquent youth (Teplin, Abram, McClelland, & Mileusnic, 2005; Teplin et al., 2014). For instance, between 1992 and 2011, the U.S. homicide rate declined by almost 50%, from 9.3 homicides per 100,000 U.S. residents in 1992 to 4.7 in 2011 (Smith & Cooper, 2013). The homicide rate is highest among males, Blacks, and young adults and firearms account for the majority of them. With respect to age, Smith and Cooper (2013, p. 5) reported that "From 2002 to 2011, young adults ages 18 to 24 had the highest homicide rate of any age group. Young adults also experienced the largest homicide rate decline (down 22%), from 15.2 per 100,000 in 2002 to 11.9 in 2011. Persons age 65 or older (down 17%) and youth ages 12 to 17 (down 19%) also experienced large declines in their homicide rates from 2002 to 2011."

These trends are important but equally important is identifying the risk factors that are associated with homicide perpetration. Although popular press and public discourse are replete with anecdotes and commentary about the sole reason why some persons kill (see Zimring, 2013), the research evidence does not exist to back up such claims. Two principal reasons underlie this unfortunate happenstance. First, empirical research into the correlates and causes of homicide perpetration are very rare, largely because of the lack of such data even in large data sets of offenders (Cornell, Benedek, & Benedek, 1987; DeLisi, 2001; DeLisi & Scherer, 2006; Woodworth, Agar, & Coupland, 2013). Second, many studies of criminal activity collect both self-report and official data regarding violence, but most of those investigations reveal that violence, especially serious violence (and most certainly homicide perpetration), is also very rare (Elliott, Huizinga, & Morse, 1986; Farrington, 1989; Piquero, 2000; Piquero, Farrington, & Blumstein, 2003, 2007; Reiss & Roth, 1993, p. 374). In fact, there have only been a handful of investigations looking into the characteristics that may distinguish persons who committed murder compared to persons who may have committed other crimes but not murder. These are reviewed next.[1]

Predictors of Juvenile Homicide Offending

A diminutive literature has investigated predictors of juvenile homicide with comparisons to other antisocial youth or violent delinquents. In their case control study comparing 21 male juveniles convicted of homicide to 21 convicted burglars incarcerated in the United Kingdom, Hill-Smith, Hugo, Hughes, Fonagy, and Hartman (2002) identified several risk factors that differentiated murderers from their antisocial peers. Youth convicted of murder were more likely to have been reared by emotionally and physically harsh parents, to have mothers and fathers who had been arrested, and to have had generally greater and more extensive educational and school problems. Like their antisocial peers, juvenile homicide offenders led childhoods of abuse and deprivation and faced considerable obstacles in school.

Several studies using data from the high-risk Pittsburgh Youth Study (PYS) (Farrington, Loeber, & Berg, 2012; Farrington, Loeber, Stallings, & Homish, 2012; Loeber & Farrington, 2011; Loeber et al., 2005) have shown that several background factors are associated with homicide offending status independently of their association with delinquency and violent delinquency. For instance, Loeber and his colleagues (2005) compared 33 juvenile homicide offenders, 193 youth who were convicted of other serious violent crimes, and nearly 500 youth who self-reported their violent delinquency. They found that youth with four or more risk factors for homicide were over 14 times more likely to later commit homicide than their antisocial peers with fewer than four risk factors. Across their studies, a mélange of risk factors have been shown to predict later homicide. These include weapon carrying, living in a bad neighborhood, having a young mother, having a positive attitude

toward drug abuse or delinquency, school suspension, gang fighting, African American status, and prior behavioral problems. Moreover, youth with the greatest number of risk factors and prior arrests were also the most likely to become a homicide offender (Loeber & Farrington, 2011, pp. 79–94; also see, Muftić & Moreno, 2010).[2]

Drawing on PYS data when 37 participants had been convicted of murder, Farrington, Loeber, and Berg (2012) found that several behavioral indicators differentiated young homicide offenders from their antisocial peers. Having a disruptive behavioral disorder, serious delinquency, peer delinquency, cruelty toward people, school suspension, truancy, having positive attitudes toward delinquency and drugs, and covert behaviors significantly increased the odds of a homicide conviction with odds ratios ranging from 1.9 to 4.9. There were also offense-specific effects whereby involvement in robbery, aggravated assault, gang fighting, weapons offenses, burglary, vehicle theft, and several forms of larceny/shoplifting were significantly associated with homicide perpetration. These effects were more robust when predicting homicide through offenders aged 14 years.

Other studies based on cross-sectional designs indicate that juvenile homicide offenders are relatively comparable to other violent delinquents on many social, behavioral, and developmental background factors. For instance, Dolan and Smith (2001) compared 46 juvenile homicide offenders to 106 juvenile arsonists and found that homicidal youth had higher prevalence of father psychopathology, frequent school changes, and alcohol abuse and alcohol intoxication at their homicide event. On the other hand, homicidal youth were less likely to have a psychotic disorder and less likely than arsonists to have participated in professional counseling/treatment services. Similarly, Shumaker and McKee (2001) compared 30 males charged with homicide as adolescents to 62 males charged with other violent offenses across nearly 3 dozen risk factors. Overall, juvenile homicide offenders were generally similar to other delinquent youth; however, murderers were more likely to commit their offense without a codefendant and were more likely to commit a domestic-related crime.

DiCataldo and Everett (2008) compared 33 youth awaiting trial for homicide to 38 violent albeit nonhomicidal youth on a variety of background factors. In terms of family history, delinquency history, mental health, and other developmental factors, the nonhomicidal youth were generally more severe in their profiles. However, homicidal youth had greater gun and substance abuse exposure than their other violent peers. Based on data from 127 homicidal youth and matched controls, Zagar, Grove, Busch, Hughes, and Arbit (2009) found that neurological deficits/lower executive functioning, violent family history, and alcohol abuse were associated with homicide status. Otherwise, homicidal youth were comparable to their delinquent peers on many background factors.

Current Aim

In this study, we capitalized on a unique data source—the Pathways to Desistance study—that collected information on 1,354 serious youthful offenders who were adjudicated of a serious offense (predominantly felonies) in Philadelphia, PA and Phoenix, AZ in the early 2000s (Mulvey et al., 2004). We examined how 8 demographic characteristics and 35 risk factors distinguish between those youth who were charged with some type of homicide compared to those youth who were not charged with any type of homicide. Although our sample of homicide perpetrators is not very large, as is true in other studies, samples and analyses of persons who have committed homicide are the exception and not the rule in criminology. We believe that since the knowledge base on the characteristics of young homicide perpetrators is thin that even the most basic, descriptive information is useful.

Method and Data

In this study, we used data from the Pathways to Desistance study, a longitudinal study of serious youthful offenders transitioning from adolescence to young adulthood. Participants in the Pathways

study are youth who were found guilty of a serious offense (almost entirely felony offenses) in the juvenile or adult court systems of Maricopa County, AZ or Philadelphia County, PA. These youth were aged 14–17 years at baseline. A total of 1,354 adolescents were enrolled in the study, representing about 1 in 3 adolescents adjudicated on the enumerated charges in each locale during the recruitment period (November 2000 through January 2003). The full sample is comprised of predominantly minority (41.4% African American, 33.5% Hispanic) males (86.4%). Information regarding the rationale and overall design of the study can be found in Mulvey et al. (2004), while details regarding recruitment, a description of the full sample, and the study methodology may be found in Schubert et al. (2004).

For purposes of this article, we focused solely on the baseline data, which contains the charge that the youth were adjudicated upon in order to separate those youth charged with homicide/murder and those who were not. Specifically, 18 (1.32%) of the 1,354 youth were charged with homicide/murder of some sort. The 18 homicide charges were mainly for attempted murder, murder, or involuntary manslaughter. Across race/ethnicity, gender, and study location, the 18 homicide charges were distributed as follows: 3 among White youth, 9 among African American youth, 4 among Hispanic youth, and 2 among other race/ethnicity youth. Across gender, 17 of the 18 homicide charges were against males. And across the 2 sites, 12 of the homicide charges were in Philadelphia and 6 in Phoenix. We discuss this small sample throughout the results and discussion sections.

Variables

Demographic. Eight demographic indicators from the baseline interview were used in this study.

Age. Continuous variable coded as the subject's age at the time of the interview.

Highest grade completed. Coded as 6th grade or less (= 1), 7th grade (= 2), 8th grade (= 3), 9th grade (= 4), 10th grade (= 5), 11th grade (= 6), and high school graduate (= 7).

Gender. Participants were coded as *male* (= 1) or *female* (= 2).

Site. Pathways used two sites, *Philadelphia* (= 1) and *Phoenix* (= 2).

Race. We included four separate indicators for *Black* (= 1, *else* = 0), *White* (= 1, *else* = 0), *Hispanic* (= 1, *else* = 0), and "*other race/ethnicity*" (= 1, *else* = 0).

Individual, familial, environmental, and situational risk factors. Thirty-five different risk factors were considered.

Brief Symptom Inventory (BSI) Clinical. The BSI (Derogatis & Melisaratos, 1983) is a 53-item self-report inventory in which participants rated the extent to which they have been bothered (0 = *not at all* to 4 = *extremely*) in the past week by various symptoms. The BSI has the following nine subscales designed to assess individual symptom groups: somatization (e.g., faintness or dizziness), obsessive-compulsive (e.g., Having to check and double-check what you do), interpersonal sensitivity (e.g., Feeling inferior to others), depression (e.g., Feeling no interest in things), anxiety (e.g., Feeling tense or keyed up), hostility (e.g., Having urges to break or smash things), phobic anxiety (e.g., Feeling uneasy in crowds, such as shopping or at a movie), paranoid ideation (e.g., Others not giving you proper credit for your achievements), and psychoticism (e.g., The idea that something is wrong with your mind). The BSI also includes three scales that capture global psychological distress. We used a variable that is associated with the clinical status of the case, which is equal to 1 for cases that reach clinical significance on two or more subscales (else = 0).

Emotionality Activity, Sociability, and Impulsivity Inventory (EASI). The EASI is a measure of temperament that was modified for this study to assess the adolescent's internal emotionality (Buss & Plomin, 1984). This measure was only used at the baseline interview; it was not repeated at follow-up interviews. Examples of items are "I am almost always calm—nothing ever bothers me" and "I tend to be nervous in new situations." The scale contains 14 items to which participants responded on a 5-point Likert-type scale ranging from *strongly disagree* to *strongly agree*. Higher scores indicate greater emotionality.

Parent's occupational status. Our measure of parent's occupational position reflects both the combined level of education and occupation for both parents and was computed based on a formula suggested by Hollingshead (1971, "index of social position"). The variable incorporates the mean of the mother and father's occupation using the following formula: ([occupation score $\times$ 7] + [education score $\times$ 4]).

Family member criminal history. An indicator obtained from the youth regarding whether anyone in the respondent's family had ever been arrested.

Head injury. A dichotomous measure indicating the presence of a head injury which caused unconsciousness or needed medical attention.

School suspension. A dichotomous measure obtained from the youth regarding whether he or she was ever suspended from school.

Bullying offending. A dichotomous measure obtained from the youth regarding whether they ever bullied anyone.

Bullying victimization. A dichotomous measure obtained from the youth regarding whether they were ever picked on by a bully.

Wechsler Abbreviated Scale of Intelligence (WASI) Full-Scale IQ. The WASI (Wechsler, 1999) produces an estimate of general intellectual ability based on two subtests, that is, vocabulary (42 total items that require the subject to orally define 4 images and 37 words presented both orally and visually) and matrix reasoning (35 incomplete grid patterns that require the participant to select the correct response from five possible choices). Administered in approximately 15 min, the WASI is a quick estimate of an individual's level of intellectual functioning, with higher scores indicating greater intellectual ability. The WASI is linked to both the Wechsler Intelligence Scale for Children (WISC-III) and the Wechsler Adult Intelligence Scale (WAIS-III) and has been normed for individuals aged 6 to 89 years.

Walden Self-Regulation Scale. The Children's Emotion Regulation scale was adapted for this study to serve as a self-report measure of the adolescent's ability to regulate emotions (Walden, Harris, & Caltron, 2003). Only a subset ($n = 12$) of the 33 original items contained in this scale are included in the Pathway's version. Examples of items are "I know things to do to make myself more happy" and "I can change my feelings by thinking of something else". Participants responded on a 4-point Likert-type scale ranging from *not at all like me* to *really like me*. Higher scores indicate a better ability to regulate emotion.

Number of prior petitions/arrests. This item reflects the participant's history of legal involvement based on the total number of prior petitions to court before the baseline assessment. This count includes the study initial referring petition as well as petitions prior to the initial referring petition.

Psychopathy Checklist: Youth Version (PCL-YV). The PCL-YV (Forth, Kosson, & Hare, 2003) assesses psychopathic characteristics among youth. Procedures advocated by the authors suggest a 60- to 90-min, semi-structured interview to assess the youth's interpersonal style, obtain information on

a variety of aspects of his or her history and current functioning, and assess the credibility of his or her statements. In this study, we used three of the measures: (1) the total score, (2) Factor I (interpersonal/affective), and (3) Factor II (socially deviant lifestyle).

Composite International Diagnostic Interview (CIDI). The CIDI (World Health Organization, 1990) is a comprehensive, fully structured interview used to assess mental disorders. By means of computerized algorithms, the CIDI provides both lifetime (ever) and current (past year and past 30 days) diagnoses as defined by the Fourth Edition of Diagnostic and Statistical Manual of Mental Disorders and Tenth Revision of the International Classification of Diseases, and for this study we use information from the past-year responses. During the interview, all participants were asked questions about selective symptoms of psychiatric disorders. Based on predetermined skip patterns, positive responses to these screening items were followed by more detailed questions to determine if the endorsed symptom is a psychiatric symptom and is not due to medication, drugs, alcohol or to a physical illness or injury. If symptoms were endorsed and occurred in a pattern that suggested a diagnosis might be present, additional questions were asked to establish the onset and recency of the symptoms. For purposes of this study, we used four of the subscales: depression, posttraumatic stress disorder, alcohol abuse, and drug abuse. For each of these measures, cases are marked (= 1) if they meet the criteria under study.

Exposure to Violence (ETV) Inventory. The ETV Inventory (Selner-O'Hagan, Kindlon, Buka, Raudenbush, & Earls, 1998) was modified for this study to assess the frequency of exposure to violent events. Items from the ETV document the types of violence the adolescent has both experienced (i.e., victim—6 items, e.g., Have you ever been chased where you thought you might be seriously hurt?) and observed (i.e., witnessed—7 items, e.g., Have you ever seen someone else being raped, an attempt made to rape someone, or any other type of sexual attack?). We used the total measure, which includes the count of items where the subject was a victim and the count of items where the subject witnessed violence.

Gang membership. A dichotomous measure obtained from the youth regarding whether they were a member of a gang in the six months prior to detention.

Moral disengagement. The Mechanisms of Moral Disengagement (Bandura, Barbarnelli, Caprara, & Pastorelli, 1996) was used for this study to measure the adolescent's attitudes concerning the treatment of others. The self-report measure contains 32 items to which participants responded on a 3-point Likert-type scale ranging from *disagree* to *agree*, with higher scores indicating a greater moral detachment. Items from the scale tap the following eight dimensions: moral justification (e.g., It is alright to beat someone who bad mouths your family.), euphemistic language (e.g., Slapping and shoving someone is just a way of joking.), advantageous comparison (e.g., It is okay to insult a classmate because beating him/her is worse.), displacement of responsibility (e.g., Kids cannot be blamed for using bad words when all their friends do it.), diffusion of responsibility (e.g., A kid in a gang should not be blamed for the trouble the gang causes.), distorting consequences (e.g., Teasing someone does not really hurt them.), attribution of blame (e.g., If kids fight and misbehave in school it is their teacher's fault.), and dehumanization (e.g., Some people deserve to be treated like animals.). We used the overall measure of the scale.

Neighborhood disorder. The Neighborhood Conditions Measure was adapted for this study to assess the environment surrounding the adolescent's home (Sampson & Raudenbush, 1999). Items from the self-report measure tap physical disorder of the neighborhood (e.g., cigarettes on the street or in the gutters and graffiti or tags), as well as social disorder (e.g., adults fighting or arguing loudly and people using needles or syringes to take drugs). The scale contains 21 items to which participants responded on a 4-point Likert-type scale ranging from *never* to *often*, with higher scores

indicating a greater degree of disorder within the community. An additional item was included to determine the amount of time the participant spends within his or her neighborhood where responses range from *none of my time* to *all of my time*. We used the total score in this study.

Peer delinquency. The Peer Delinquent Behavior items are a subset of those used by the Rochester Youth Study (Thornberry, Lizotte, Krohn, Farnsworth, & Jang, 1994) to assess the degree of antisocial activity among the adolescent's peers. In the current study, we used the peer antisocial behavior measure, which contained 12 items (e.g., During the last six months how many of your friends have sold drugs?). Scale responses were on a 5-point Likert-type scale ranging from *none of them* to *all of them*.

Peer resistance. The Resistance to Peer Influence (Steinberg & Monahan, 2007) measure was developed for this study to assess the degree to which adolescents act autonomously in interactions with their peer group. Participants were first presented with two conflicting scenarios (e.g., Some people go along with their friends just to keep their friends happy and Other people refuse to go along with what their friends want to do, even though they know it will make their friends unhappy) and were then asked to choose the scenario that most closely reflected their behavior. Finally, the participant was asked to rate the degree to which the statement is accurate (i.e., sort of true or really true). Ten such sequences were presented to the participant, each exploring a different dimension of potential influence, that is, go along with friends, fitting in with friends, changing their mind, knowingly do something wrong, hiding true opinion, breaking the law, changing the way you usually act, taking risks, saying things don't really believe, and going against the crowd. High scores indicate less influence, and low scores indicate more influence.

Unsupervised routine activities. Items from the routine activities measure were drawn from the Monitoring the Future Questionnaire (Osgood, Wilson, O'Malley, Bachman, & Johnston, 1996) and are used to assess the frequency of unstructured socializing. Items specifically tap activities that occur in the absence of an authority figure (e.g., How often did you get together with friends informally?). The scale contains 3 items to which participants respond on a 5-point Likert-type scale ranging from *never* to *almost every day*. Higher scores indicate a greater involvement in unstructured activities. A fourth item was asked to specify the number of evenings in a typical week the participant spends on ''fun'' activities. Items were previously scored independently without an ''unstructured socializing'' total score (Osgood et al., 1996); however, a combined score was created for the purpose of this study.

Gun carrying. A dichotomous measure obtained from the youth regarding whether they ever carried a gun.

Offending variety. We used a 22-item variety scale of self-reported offending with items ranging in seriousness from shoplifting to murder that reference the 6-month period before detention (Huizinga, Esbensen, & Weihar, 1991). We used a variety score because it is not dominated by less serious items (unlike summed frequencies), distinguishes between less serious and more serious offenders (unlike dichotomies), and has high validity and reliability but is also strongly correlated with offense frequency (Monahan & Piquero, 2009).

Psychologist, counselor, and social worker. A dichotomous measure obtained from the youth regarding whether they had ever been to a psychologist, counselor, or social worker.

Substance abuse. The substance use/abuse inventory is a modified version of a substance use measure developed by Chassin, Rogosch, and Barrera (1991) for use in a study of children of alcoholics. This measure considers the adolescent's use of illegal drugs and alcohol over the course of his or her lifetime and in the past 6 months. In this study, we used the past 6-month reference period and

considered both alcohol use and marijuana use. Response options included (1) *not at all*, (2) *1–2 times*, (3) *less than 1× per month*, (4) *once per month*, (5) *2–3 times per month*, (6) *once per week*, (7) *2–3 times per week*, (8) *4–5 times per week*, and (9) *everyday*.

Weinberger Adjustment Inventory (WAI). The WAI (Weinberger & Schwartz, 1990) is an assessment of an individual's social–emotional adjustment within the context of external constraints. We used all four subscales, namely impulse control (e.g., I say the first thing that comes into my mind without thinking enough about it.), suppression of aggression (e.g., People who get me angry better watch out.), consideration of others (e.g., Doing things to help other people is more important to me than almost anything else.), and temperance. The measure asks participants to rank how much (1 = *false* and 5 = *true*) their behavior in the past 6 months matches a series of statements. Higher scores on each of the subscales delineated below indicate more positive behavior (i.e., more impulse control, greater temperance, and greater consideration for others).

Age at first offense. A continuous official record measure indicating the age at the first offense. Note this item uses the age at the initial referring petition if the youth had no priors.

Results

Out of the 1,354 youth in the Pathways study, only 18 (1.33%) were charged with some type of homicide. On average, these youth were about 16.5 years old, had 3.27 prior petitions/arrests, over half were Black, followed by Hispanic (22.22%), White (16.67%), and other race/ethnicity (11.11%), all but 1 was male, 12 were from Philadelphia and 6 from Phoenix, and in only 3 cases the 2 biological parents were in the home.

Table 1 presents the results of 43 mean–difference comparisons regarding the 8 demographic variables and 35 risk factors that we compared across the youth charged with homicide to the youth not charged with homicide at the baseline interview. Here, only five variables are significantly different across the two groups. With respect to demographic characteristics, only age significantly differs between the two groups of youth, with homicide offenders being slightly older than nonhomicide offenders (16.5 vs. 16.03). Four of the risk factors are significantly different across youth charged with homicide and youth charged with an offense other than homicide. Homicide offenders had significantly lower IQ (79.27 vs. 84.59), higher exposure to violence (7.44 vs. 5.31), higher perceptions of living in a neighborhood characterized by disorder (2.75 vs. 2.34), and reported a higher prevalence of gun carrying (0.72 vs. 0.46). Across all of the other nonsignificant comparisons, there was a mixture of risk factors for which those charged with homicide evinced higher risk, whereas on other risk factors those charged with homicide evinced lower risk. Nevertheless, and bearing in mind the small sample of homicide offenders among the serious youthful offenders in the Pathways study, there are many more similarities than there are differences between those youth who are charged with homicide and those youth who are not charged with homicide at the study's inception.

The next part of the analysis involved area under the receiver–operating characteristic (AUC)–receiver operating characteristic (ROC) curves. This analytical technique plots the sensitivity (true positives) versus 1 − specificity (false positives), and the greater the AUC, the stronger the predictive validity of the covariate (Metz, Herman, & Shen, 1998). Values of 0.50 represent mere chance classification and are effectively the same as if flipping a coin. Values that approach 1.0 indicate that the independent variable is strongly associated with the occurrence of the dependent variable. We also calculated AUC-ROC curves for the five variables that were significantly different across groups, and these were generally unimpressive: age (AUC = 0.61), WASI IQ (AUC = 0.38), exposure to violence (AUC = .71), neighborhood disorder (AUC = 0.65), and gun carrying (AUC = 0.62). As it may be that risk is mostly carried among the top quartile of these risk factors, we created

Table 1. Descriptive statistics.[a]

Variable	Nonhomicide Mean (*SD*)	Homicide Mean (*SD*)
Demographics (8)		
Age	16.037 (1.141)	16.5 (1.2)*
Highest grade completed	4.024 (1.248)	4.222 (1.555)
Gender (1 = male, 2 = female)	1.136 (0.343)	1.055 (0.235)
Site (1 = Philadelphia, 2 = Phoenix)	1.485 (0.499)	1.333 (0.485)
Black	0.413 (0.492)	0.5 (0.514)
White	0.202 (0.402)	0.166 (0.383)
Hispanic	0.336 (0.472)	0.222 (0.427)
Other race/ethnicity	0.047 (0.212)	0.111 (0.323)
Risk factors (35)		
BSI (clinical)	0.125 (0.331)	0.133 (0.351)
EASI (internal emotionality)	2.708 (0.524)	2.703 (0.487)
Parent's occupational status	51.396 (12.291)	52.305 (13.203)
Family member arrested	0.784 (0.411)	0.722 (0.460)
Head injury	0.304 (0.460)	0.222 (0.427)
School suspension	0.9 10 (0.284)	0.833 (0.383)
Bully offend	0.228 (0.419)	0.166 (0.383)
Bully victim	0.334 (0.472)	0.277 (0.460)
WASI Full-Scale IQ	84.595 (13.041)	79.277 (11.265)*
Walden Self-Regulation Scale	2.757 (0.657)	2.877 (0.750)
Prior petitions/arrests	2.914 (2.142)	3.277 (2.321)
PCL: Youth version	15.891 (7.742)	17.25 (7.733)
PCL: Youth version factor 1	5.026 (3.468)	5.75 (4.919)
PCL: Youth version factor 2	8.328 (3.881)	8.25 (2.932)
CIDI: depression past year	0.051 (0.221)	0.111 (0.323)
CIDI: PTSD past year	0.039 (0.195)	0 (0)
CIDI: alcohol abuse past year	0.081 (0.274)	0.058 (0.242)
CIDI: drug abuse past year	0.193 (0.395)	0.058 (0.242)
Exposure to violence (total)	5.315 (2.995)	7.444 (2.035)*
Gang member	0.167 (0.373)	0.277 (0.460)
Moral disengagement	1.617 (0.352)	1.650 (0.364)
Neighborhood disorder	2.341 (0.752)	2.757 (0.703)*
Peer delinquency	2.313 (0.928)	2.488 (1.140)
Peer resistance	2.989 (0.576)	2.833 (0.534)
Unsupervised routine activities	3.823 (0.848)	3.944 (0.859)
Gun carrying	0.468 (0.499)	0.722 (0.460)*
Offending variety (past 6 months)	0.148 (0.151)	0.167 (0.225)
Ever saw psychologist, counselor, or social worker	0.309 (0.462)	0.277 (0.460)
Alcohol use (past 6 months)	2.895 (2.435)	2.722 (2.946)
Marijuana use (past 6 months)	4.199 (3.414)	3.277 (3.561)
WAI: Impulse control	2.959 (0.951)	3.196 (0.815)
WAI: Suppression of aggression	2.770 (0.985)	3.135 (0.978)
WAI: Consideration of others	3.491 (0.877)	3.277 (1.230)
WAI: Temperance	2.870 (0.855)	3.166 (0.742)
Age at first offense	14.938 (1.626)	14.673 (2.268)

Note. WAI = Weinberger Adjustment Inventory; CIDI = Composite International Diagnostic Interview; PTSD = posttraumatic stress disorder; PCL = Psychopathy Checklist; WASI = Wechsler Abbreviated Scale of Intelligence; EASI = Emotionality Activity, Sociability, and Impulsivity Inventory; BSI = Brief Symptom Inventory.

[a]A total of 18 offenders were charged with homicide of some sort.

*$p < .05$ (one-tailed).

Table 2. Rare-Events Logistic Regression Predicting Murder Using Five Significant Variables.

Variable	Coeff. (Robust *SE*)	95% CI
Age	0.234 (0.264)	[−0.285, 0.753]
WASI IQ	−0.032 (0.016)*	[−0.064, −0.000]
Exposure to violence	0.208 (0.096)*	[0.018, 0.398]
Neighborhood disorder	0.361 (0.358)	[−0.341, 1.063]
Gun carry	0.256 (0.619)	[−0.957, 1.469]
Constant	−7.680 (4.559)	[−16.615, 1.255]

Note. *SE* = standard error; CI = confidence interval; WASI = Wechsler Abbreviated Scale of Intelligence. Standard logit models yielded the same substantive result. A rare-events logit model using the dichotomous variables was also run and none of the effects were significant.
*$p < .05$.

Table 3. Rare-Events Logistic Regression Predicting Murder Using Full Risk Factor Variable Only.

Variable	Coeff. (Robust *SE*)	95% CI
Full risk factor composite	0.510 (0.183)*	[0.150, 0.871]
Constant	−5.086 (0.435)	[−5.939, −4.232]

Note. *SE* = standard error; CI = confidence interval. Standard logit models yielded the same substantive result.
*$p < .05$.

a risk factor index which was a summed index of the top quartiles of each of the five risk factors (i.e., each risk factor was dichotomized so that $1 = \textit{the top 25\% of risk}$, $0 = \textit{otherwise}$; $M = 1.347$, $SD = 1.102$, range 0–4). Not surprisingly, youth charged with homicide had a significantly higher average score than their nonhomicide charged counterparts (2.0 vs. 1.33; $p < .05$). Still, the AUC for this risk factor index was only 0.61. Figures of all AUC-ROC curves are available upon request and are not included here to reduce manuscript length.

In our final analysis, we performed a rare-events logistic regression distinguishing between youth charged with homicide and youth charged with a crime other than homicide. The rare-events model is an extension of the logistic regression designed to deal with data that contain very rare events where $\Pr(Y = 1)$ is underestimated and hence $\Pr(Y = 0)$ is overestimated (King & Zeng, 2001; Tomz, King, & Zeng, 1999). This technique has previously been used in criminology to study homicide victimization (Piquero, MacDonald, Dobrin, Daigle, & Cullen, 2005) and premature death (Chassin, Piquero, Losoya, Mansion, & Schubert, 2013). For our purposes, we consider the five variables that were significant discriminators as depicted above.

As can be seen in Table 2, when all five risk factors are considered simultaneously only two of them, WASI IQ and exposure to violence, were statistically significant. Youth charged with homicide had significantly lower IQ and higher exposure to violence compared to youth who were not charged with homicide. We also estimated a second rare-events logistic regression, this time replacing the five separate risk factors with the 5-item risk factor index, the results of which indicated a significant and positive effect, that is, a higher number of risk factors (each of which was based on the top quartile of risk) were associated with a higher likelihood that the youth were charged with homicide. Additional specifications are also shown in Table 3.

Discussion

Homicide is a serious social, public health, and criminal justice problem that imposes extraordinary human (Krug, Mercy, Dahlberg, & Zwi, 2002; Stretesky, Shelley, Hogan, & Unnithan, 2010), social

(Cross & Pruitt, 2013; Reckdenwald & Parker, 2010), and fiscal (DeLisi et al., 2010) costs. While aggregate-level data are very useful for understanding patterns and trends in homicide over time (see Heide, Roe-Sepowitz, Solomon, & Chan, 2012), there is much less information at the individual level, other than basic demographic and relationship-type questions, that afford researchers, practitioners, and policy makers with the kinds of risk factors that may be related to homicide perpetration. This neglect is not necessarily due to the lack of interest among such parties but instead more a function of the lack of data on serious offenders that contain enough persons who have committed murder as well as inclusive of a litany of important risk factors. Also, this neglect is unfortunate as the popular press and media are often fraught with too many post hoc conjectures of the causes of homicide, especially after horrific school shootings in which commentators routinely look at mental health factors as the cause.

In an effort to shed some light on this issue, this study capitalized on a very unique data source, the Pathways to Desistance study, which is a longitudinal study of a large sample of serious youthful offenders in two major urban areas, which contained a small subsample of youth who were charged with murder at the start of the study. Accordingly, we examined the extent to which a large set of risk factors were able to distinguish between youth who were charged with homicide compared to youth who were not charged with homicide. Our results yielded three main conclusions.

First and foremost, our investigation of how these two groups differed on over 43 variables spanning a range of individual, familial, and situational domains revealed that only one demographic measure (age) and four risk factors (exposure to violence, gun carrying, neighborhood disorder, and IQ) were able to significantly distinguish between youth charged with murder compared to youth who were charged for crimes other than murder. For these variables, youth charged with murder had greater exposure to violence and perceived greater neighborhood disorder, were more likely to carry guns, and scored lower on a prominent IQ measure. Moreover, across the remaining nonsignificant comparisons, there was no overall pattern for youth charged with murder to always score higher, that is, evince more risk. Not surprisingly, with one exception (exposure to violence), the AUC-ROC curve estimates were rather unimpressive. Second, in a rare-events logistic regression that simultaneously examined the relationship between these five risk factors and their ability to distinguish those charged with murder from their counterparts, only two predictors emerged as significant, that is, lower IQ and a greater exposure to violence. Lastly, a 5-item risk factor index calculated by summating the top quartile of each risk factor was found to significantly distinguish youth charged from murder from those youth not charged with murder.

In sum, and with a large array of measures that have often been found to distinguish offenders from nonoffenders, as well as persistent offenders from those less-persistent offenders (Barnes, 2014; DeLisi & Piquero, 2011; Jennings & Reingle, 2012; Ribeiro da Silva, Rijo, & Salekin, 2012), our results paint a picture marked more by similarities than by differences. But readers should not be too skeptical about this conclusion as the offense of murder, even in a sample of serious adolescent offenders, is exceedingly rare. Instead, this is a case where a finding of more similarities than differences is very important because they demonstrate that it is very difficult to distinguish those youth charged with homicide from those youth charged with other offenses even in a high-risk sample like Pathways. In this regard, these results may go ways to dispel some of the stereotypes about homicide perpetrators—that they are necessarily psychopaths or drug addicts who suffer from severe mental health illness—as none of these assumptions emerged in the Pathways study. On the contrary, it may more likely be that murders are assaults and fights gone bad, more situationally and emotionally driven than they are a product of deficient personalities, compromised family situations, and the like. Of course, this is not meant to connote that these risk factors are not potentially important in individual cases, which are completely out of the realm of a priori predictability. Instead, among a sample of persons who have been charged with murder, these factors are not distinguishing characteristics.

Our work is only the beginning of what we hope to be a growing research agenda. Due to some data limitations, there were questions we could not address and issues we could not fully explore. For example, although the Pathways study contains a very large sample of serious adolescent offenders, there were only 18 youth charged with murder. If we were to select a unique sample of murderers, we would of course be able to do a more in-depth investigation of their risk factors, but we would not be able to compare them to another set of persons not charged with murder. In one sense, we hope that future research can obtain information on a larger sample of both murderers and nonmurderers, but of course this would imply that murders would continue to occur, which we hope is actually not the case. While the Pathways study certainly contains an expansive range of data, not every risk factor was available. We believe that one promising avenue is the collection of neuropsychological information that has been emerging over the past 20 years as a result of advances in brain scanning. Raine's work, in particular, has generated an intriguing set of findings regarding differences between murderers and a control group with respect to prefrontal cortex activity, a part of the brain that is involved in self-regulation (see Raine et al., 1994; Raine, Buchsbaum, & La Casse, 1997). Lastly, we did not consider the extent to which the various risk factors considered in the Pathways study could predict subsequent homicide offending over the life course, which is research topic that has been under investigation, but one that is of relevance (for an important exception, see Loeber et al., 2005).

Given so few significant differences between juvenile homicide offenders and nonhomicide offenders, we are reluctant to delve too far into implications for clinical practice and supervision of juvenile delinquents. At the very least, however, practitioners who supervise clients in juvenile justice settings should be mindful of the assorted risk factors here (e.g., age, lower IQ, gun carrying, neighborhoods disorder, and exposure to violence). Youth who display many or perhaps all of these risks certainly warrant additional services and oversight on the part of staff, as they might be the youth who are most likely to perpetrate a homicide. It is our hope that additional research are to be carried out to arrive at a valid and reliable profile and ultimately an assessment tool for juvenile homicide risk similar to what exists for homicide risk in domestic violence contexts (see Campbell, 1986; Campbell, Webster, & Glass, 2009).

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Authors' Note

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Notes

1. We differentiate studies that analyze predictors of juvenile homicide vis-à-vis other violent offenders from other important literatures, for example, that examine the recidivism and institutional outcomes of juvenile homicide offenders (e.g., Drury & DeLisi, 2011; Hagan, 1997; Liem, 2013; Myers, Chan, Vo, & Lazarou, 2010; Trulson, Caudill, Haerle, & DeLisi, 2012; Trulson, DeLisi, & Marquart, 2011; Vries & Liem, 2011), linkages between homicide and criminal careers (DeLisi, Hochstetler, Jones-Johnson, Caudill, & Marquart, 2011; Vaughn, DeLisi, Beaver, & Howard, 2009), and forensic-oriented studies that investigate the psychopathology of juvenile murderers (e.g., Bailey, 1996; Myers et al., 2010; Myers, Scott, Burgess, & Burgess, 1995; Rodway, Norrington-Moore, Appleby, & Shaw, 2011; Roe-Sepowitz, 2007).
2. Similar findings emerge from studies of juvenile homicide victimization. Drawing on data from The Northwestern Juvenile Project, a prospective longitudinal study of health needs and outcomes of a stratified random sample of 1,829 youth detained between 1995 and 1998, Teplin, Abram, McClelland, and Mileusnic (2005) found that 65 respondents died during the follow-up period. Just over 90% of these deaths were due to homicide and 93% of the homicides were from gunshot wounds. Similarly, Teplin and colleagues (2014) analyzed risk factors that were drawn from interviews and death records obtained up to 16 years after detention. They found that till the age of 29 years, delinquent youth had significantly higher mortality rates than the general population. Compared with the general population, delinquent youth were especially likely to die of homicide and firearm-perpetrated homicide. Chassin, Piquero, Losoya, Mansion, and Schubert (2013) used data from the Pathways to Desistance, also used herein, to examine the distal and proximate correlates of premature death and found that while gang membership, gun carrying, and substance use problems were risk factors for early mortality, Black youth still exhibited an elevated risk for premature death. Piquero, MacDonald, Dobrin, Daigle, and Cullen (2005) analysis of the relationships between self-control, violent offending, and homicide victimization in a sample of California Youth Authority parolees who were followed 5 years after parole revealed that a behavioral measure of self-control was related to both homicide offending and homicide victimization, as were other risk factors. Further, Black parolees were at increased risk of both homicide victimization and violent offending.

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