Supplemental Information

APPENDIX: EXPANDED NOTES ON STUDY METHODS, SUPPLEMENTAL TABLES, AND SUPPLEMENTAL FIGURES

Characteristics of the CCJTDC

Consistent with juvenile detainees nationwide,[1] nearly 90% of detainees at CCJTDC were male; most were racial/ethnic minority youth.

Sampling

There were a total of 13 sampling strata, as listed in the following sections. There were too few female detainees of each race/ethnicity and detainees identified as "other" race/ethnicity to further stratify these groups. Detainees aged 10 to 13 years were not stratified according to legal status because they were generally too young to be considered for transfer to adult court. The final sampling fractions for the strata ranged from 0.018 to 0.689.

Strata:

African-American female detainees

Non-Hispanic white female detainees

Hispanic female detainees

African-American male detainees aged 10 to 13 years

Non-Hispanic white male detainees, aged 10 to 13 years

Hispanic male detainees, aged 10 to 13 years

African-American male detainees, aged ≥14 years and processed as adult transfer

Non-Hispanic white male detainees, aged ≥14 years and processed as adult transfer

Hispanic male detainees, aged ≥14 years and processed as adult transfer

African-American male detainees, aged ≥14 years and processed as a juvenile

Non-Hispanic white male detainees, aged ≥14 years and processed as a juvenile

Hispanic white male detainees, aged ≥14 years and processed as a juvenile

Other race/ethnicity

All detainees who were awaiting the adjudication or disposition of their case were eligible to participate in the study. Among these, 2275 detainees were randomly selected; 4.2% (34 youth and 62 parents or guardians) refused to participate. There were no significant differences in refusal rates according to gender, race/ethnicity, or age. Twenty-seven youth left the detention center before an interview could be scheduled; 312 left CCJTDC while we attempted to locate their caretakers for consent. Eleven others were excluded from the sample because they were unable to complete the interview. The final sample size comprised 1829 participants: 1172 males (64%), 657 females (36%); 1005 African American (55%), 296 non-Hispanic white (16%), 524 Hispanic (29%), 4 "other" race/ethnicity (<1%); age range, 10 to 18 years (mean: 14.9 years; median: 15 years).

Participation at Follow-up Interview

Participants were interviewed regardless of where they were living: in the community (66.9%), at correctional facilities (28.8%), or by telephone (4.3%). Median time between baseline and follow-up was 3.0 years (mean [SD]: 3.2 [0.3] years; range: 2.7–4.5 years). Between baseline and the follow-up interview, 31 participants died, 5 participants withdrew from the study, and 42 could not be located. Ninety-two participants were interviewed >18 months after their interview due date (outside of the follow-up range).

Youth Processed in Juvenile or Adult Court

Although most juvenile offenders are processed in juvenile court, all 50 states and Washington, DC, have legal mechanisms to try juveniles as adults in criminal court.[2,3] Transfers to adult criminal court typically result from: (1) judicial waiver on a case-by-case basis[4–6]; (2) automatic transfers based on the type of offense, criminal history, and age of the detainee[4]; and (3) prosecutorial direct-file mechanisms, which allow prosecutors to determine when to file certain juvenile cases directly in adult criminal court. The increased availability of legal mechanisms to process juveniles in adult criminal court is largely responsible for the 366% increase between 1983 and 1998 in the number of juveniles held in adult jails.[7] As of 2004, ~7% of the ~2 million arrests of youths eligible for processing in the juvenile justice system were cases in which the youth was transferred directly to adult criminal court.[1,8]

Procedures for Obtaining Parental Consent for Minor Youth for Baseline and Follow-up Interviews, and for Scheduling Follow-up Interviews

Baseline Interview

Study liaisons tried to reach detainees' parents or guardians in 2 ways. First, they attempted to call them by telephone at least 3 times over 2 days. Second, they tried to obtain consent from the parents or guardians in person during visiting hours. In the absence of a parent or guardian, the participant advocate protected the interests of the youth and determined that they were consenting

voluntarily, understood the research procedure, and were not being coerced to participate. Consistent with federal regulations, we excluded detainees who did not wish to participate, even if their parents or guardians consented.[9,10]

Follow-up Interview

Two weeks before a follow-up interview was due, a liaison telephoned the parent or guardian of minors to obtain their consent. If they provided consent, the liaison then contacted the youth to obtain assent and schedule their interview. The Illinois Department of Child and Family Services allowed us to recontact and interview participants who were under their guardianship, provided that we received assent from the youth. As with baseline interviews, we excluded detainees who did not wish to participate, even if their parents or guardians consented. As with baseline interviews, minors could still participate even if we could not reach their parent or guardian. If we could not reach them after 1 week and at least 5 attempts, we initiated the participant advocate system described earlier. In these cases, the liaison contacted the participant directly to request his or her assent. If we could not reach the participant by telephone, an interviewer traveled to his or her location.[9,10]

Clinical Research Interviewers

For baseline and follow-up interviews, female participants were interviewed by female interviewers. Most interviewers had graduate degrees in psychology or an associated field and had experience interviewing at-risk youth; one-third were fluent in Spanish. All interviewers were trained for at least 1 month. Follow-up interviews were longer than baseline interviews because, at the request of our funding agencies, we added additional variables.

Measuring Substance Use Disorder

DISC-2.3, administered at baseline, assesses the presence of disorders in the past 6 months based on *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition,* criteria. It is highly structured, contains detailed symptom probes, has acceptable reliability and validity, and requires relatively brief training.

At follow-up, participants who met criteria for substance use disorder with "partial recovery" with the DIS-IV were scored as having the disorder, consistent with the National Comorbidity Survey Replication.[11] Consistent with criteria of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, impairment was not required for a diagnosis of substance use disorder. We did not implement *Diagnostic and Statistical Manual of Mental Disorders* exclusionary criteria.

Our measure of substance use disorder changed over time for 2 reasons: (1) the release of newer measures based on *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition,* criteria mid-study; and (2) our need to use a more comprehensive measure of substance use disorder (DIS-IV) for the follow-up interviews. Previous analyses showed little impact of these measurement changes on rates of substance use disorders for this sample.[12]

Other Drug Use

Other drug use, often referred to as "hard drug" use, indicates self-reported prior use (yes/no) of cocaine/crack, heroin/opiates, hallucinogens, glue/inhalants, stimulants, tranquilizers, or barbiturates. Questions about other drug use are part of the DISC-2.3 module used to assess substance use disorders.

Official Records

Deaths

Deaths were identified by: (1) contacting participants' friends, family members, and other acquaintances; (2) checking death records at the Cook County Medical Examiner's office; and (3) submitting our participants' names to the National Death Index. Cause and manner of death were verified by using records from the medical examiner when possible.

Incarceration

We obtained intake and exit dates for correctional stays from the baseline interview through 2011 from the Illinois Department of Corrections adult and youth divisions, the Cook County Department of Corrections, and the Clerk of the Court of Cook County. Because it was not feasible to collect records for participants in federal prisons, out-of-state prisons, and detention facilities outside of Cook County, dates for stays in these facilities were based on self-report (<3% of stays).

Population Data

Population counts by age, gender, and race/ethnicity are from the US Census 2000, 2005, and 2008 mid-year population estimates for Cook County, Illinois.[13] We used *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (ICD-10),[14] codes to match cause and manner of death in our sample to those from vital records.

SUPPLEMENTAL REFERENCES

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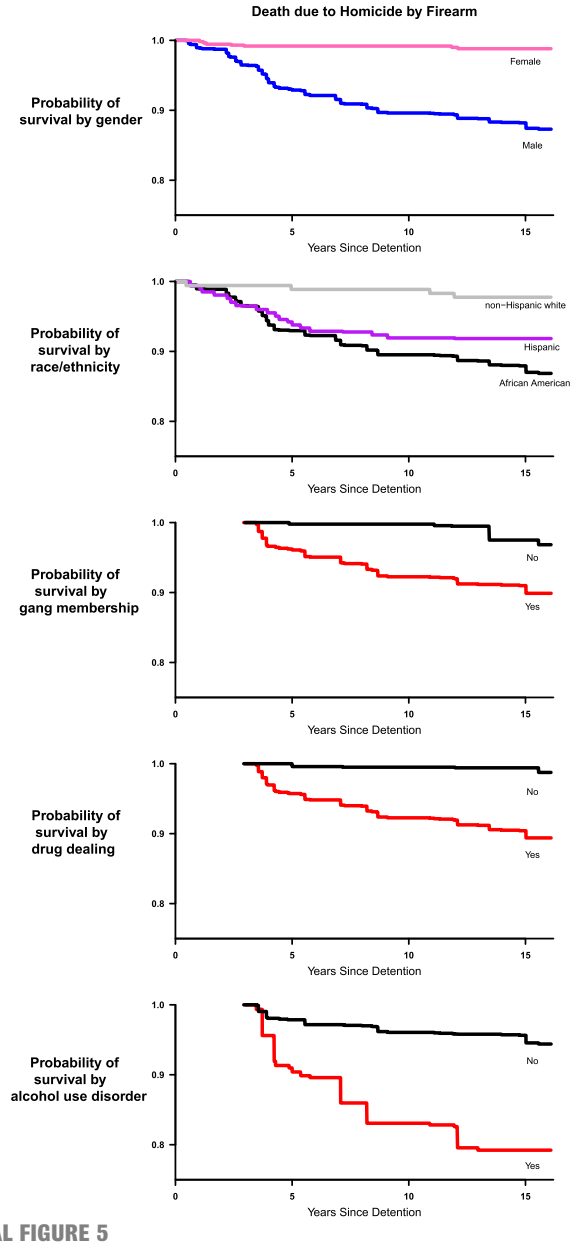
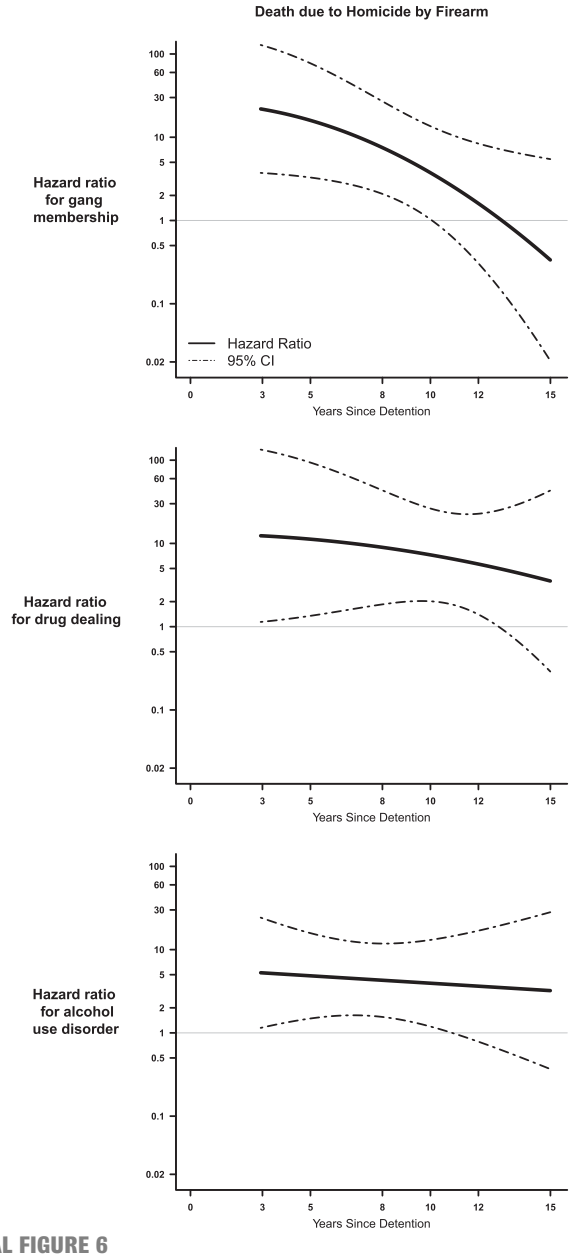


SUPPLEMENTAL FIGURE 5

Kaplan-Meier estimates of the probability of survival in delinquent youth after detention according to demographic characteristics and risk factors. Estimates for survival by gender and race/ethnicity are estimated for $n = 1798$ participants (of the original 1829 participants, 4 identified as other race/ethnicity, 6 were missing correctional records, and 21 were incarcerated during the entire study period). Estimates for survival by gang membership and drug dealing are estimated for $n = 1619$ participants (of the original 1829 participants, 31 died before the follow-up interview, 5 withdrew from the study, 42 were lost to follow-up, 92 were interviewed past the 4.5-year cutoff, 4 participants identified as other race/ethnicity, 6 were missing correctional records, 19 were incarcerated during the entire study period, and 11 were missing "selling drugs" and "gang membership"). Estimates for survival by alcohol use disorder are estimated for $n = 1615$ participants (of the original 1829 participants, 31 died before the follow-up interview, 5 withdrew from the study, 42 were lost to follow-up, 92 were interviewed past the 4.5-year cutoff, 4 participants identified as other race/ethnicity, 6 were missing correctional records, 19 were incarcerated during the entire study period, and 15 were not assessed for alcohol use disorder).



SUPPLEMENTAL FIGURE 6

Hazard ratio estimates of homicide by firearm in delinquent youth after juvenile detention: time-dependent risk factors. Hazard ratio estimates for gang membership and drug dealing are estimated for $n = 1619$ participants (of the original 1829 participants, 31 died before the follow-up interview, 5 withdrew from the study, 42 were lost to follow-up, 92 were interviewed past the 4.5-year cutoff, 4 participants identified as other race/ethnicity, 6 were missing correctional records, 19 were incarcerated during the entire study period, and 11 were missing "selling drugs" and "gang membership"). Hazard ratio estimates for alcohol use disorder are estimated for $n = 1615$ participants (of the original 1829 participants, 31 died before the follow-up interview, 5 withdrew from the study, 42 were lost to follow-up, 92 were interviewed past the 4.5-year cutoff, 4 participants identified as other race/ethnicity, 6 were missing correctional records, 19 were incarcerated during the entire study period, and 15 were not assessed for alcohol use disorder).

SUPPLEMENTAL TABLE 2 Risk Factors for External-Cause Mortality Among Delinquent Youth: Percent Mortality and Cox Proportional Hazards Estimates

Covariate	% Mortality		Unadjusted Models		Adjusted for Demographic Characteristics	
	Yes	No	HR	95% CI	aHR	95% CI
Demographic characteristics						
Male	9.3	3.0	4.6	2.6–7.9*	4.4	2.5–7.6*
Race/ethnicity[a]						
Non-Hispanic white (Ref)	5.7	9.0	—	—	—	—
African American	9.4	7.1	2.1	1.1–4.1	2.1	1.1–4.0
Hispanic	7.6	9.1	1.7	0.9–3.2	1.6	0.8–3.1
Age at baseline	—	—	1.1	0.9–1.3	1.1	0.9–1.3
Baseline risk factors (n = 1795; external-cause deaths = 104)[b]						
Other drug use	6.7	9.2	0.7	0.4–1.2	0.8	0.5–1.5
Alcohol use disorder	9.2	8.7	1.0	0.5–2.1	1.0	0.5–2.0
Any drug use disorder	10.6	7.6	1.4	0.8–2.7	1.4	0.7–2.7
Marijuana use disorder	10.7	7.6	1.4	0.8–2.7	1.4	0.7–2.7
Other drug use disorder	8.9	8.9	0.9	0.4–2.1	1.4	0.5–3.6
Follow-up interview risk factors (n = 1626; external cause deaths = 67)[c]						
Alcohol use disorder[d]	13.5	4.5		NA		NA
Any drug use disorder	9.9	5.2	2.0	0.9–4.5	1.9	0.8–4.5
Marijuana use disorder	9.9	5.2	2.0	0.8–4.5	1.9	0.8–4.4
Other drug use disorder	5.0	6.4	0.8	0.3–2.4	1.0	0.3–3.3
Sold drugs[d]	7.1	3.5		NA		NA
Used gun	7.0	4.1	2.0	0.8–5.5	1.7	0.6–4.8
Gang member[d]	6.8	4.0		NA		NA

HR, hazard ratio; aHR, adjusted hazard ratio; *, $p < .05$; NA, not applicable.

[a] Excludes other race/ethnicity (n = 4).

[b] Of the original 1829 participants, 4 identified as other race/ethnicity, 6 were missing correctional records, 21 were incarcerated during the entire study period, and 3 were not assessed for disorders or other drug use. One death was treated as censored because the participant had withdrawn from the study before dying.

[c] Of the original 1829 participants, 31 died before the follow-up interview, 5 withdrew from the study, 42 were lost to follow-up, and 92 were interviewed past the 4.5-year cutoff. In addition, 4 participants identified as other race/ethnicity, 6 were missing correctional records, 19 were incarcerated during the entire study period, and 4 were not assessed for risky behaviors or disorders.

[d] Time-dependent risk factor. See Figure 4 for HR estimates.

SUPPLEMENTAL TABLE 3 Risk Factors for Homicide Among Delinquent Youth: Percent Mortality and Cox Proportional Hazards Estimates

Covariate	% Mortality		Unadjusted Models		Adjusted for Demographic Characteristics	
	Yes	No	HR	95% CI	aHR	95% CI
Demographic characteristics						
Male	8.5	1.6	7.7	3.7–15.7*	7.3	3.5–14.9*
Race/ethnicity						
Non-Hispanic white (Ref)	2.5	8.3	—	—	—	—
African American	8.8	5.0	4.6	1.8–11.4*	4.5	1.8–11.2*
Hispanic	5.9	8.4	2.9	1.2–7.5*	2.8	1.1–7.2*
Age at baseline			1.1	0.9–1.4	1.1	0.9–1.4
Baseline risk factors (n = 1795; homicide deaths = 75)						
Other drug use	4.3	8.5	0.4	0.2–0.9*	0.7	0.3–1.3
Alcohol use disorder	8.2	7.8	1.0	0.5–2.2	1.0	0.5–2.2
Any drug use disorder	9.9	6.6	1.5	0.8–3.0	1.5	0.8–3.1
Marijuana use disorder	10.0	6.6	1.6	0.8–3.1	1.6	0.8–3.1
Other drug use disorder	5.9	8.0	0.6	0.2–1.9	1.4	0.4–4.7
Follow-up interview risk factors (n = 1626; homicide deaths = 45)						
Alcohol use disorder[d]	12.3	3.7		NA		NA
Any drug use disorder	8.9	4.3	2.1	0.9–5.3	2.1	0.8–5.3
Marijuana use disorder	9.0	4.4	2.1	0.9–5.4	2.1	0.8–5.2
Other drug use disorder	1.7	5.6	0.3	0.0–2.3	0.5	0.1–3.8
Sold drugs[d]	6.1	3.0		NA		NA
Used gun	6.4	2.3	3.3	1.0–11.5	2.7	0.8–9.5
Gang member[d]	5.8	3.6		NA		NA

aHR, adjusted hazard ratio; HR, hazard ratio; NA, not applicable. *$P < .05$.

[a] Excludes "other" race/ethnicity (n = 4).

[b] Of the original 1829 participants, 4 identified as other race/ethnicity, 6 were missing correctional records, 21 were incarcerated during the entire study period, and 3 were not assessed for disorders or other drug use. One death was treated as censored because the participant had withdrawn from the study before dying.

[c] Of the original 1829 participants, 31 died before the follow-up interview, 5 withdrew from the study, 42 were lost to follow-up, and 92 were interviewed past the 4.5-year cutoff. In addition, 4 participants identified as other race/ethnicity, 6 were missing correctional records, 19 were incarcerated during the entire study period, and 4 were not assessed for risky behaviors or disorders.

[d] Time-dependent risk factor. See Figure 4 for HR estimates.

SUPPLEMENTAL TABLE 4 Risk Factors for Homicide by Firearm Among Delinquent Youth: Percent Mortality and Cox Proportional Hazards Estimates

Covariate	% Mortality		Unadjusted Models		Adjusted for Demographic Characteristics	
	Yes	No	HR	95% CI	aHR	95% CI
Demographic characteristics						
Male	8.0	1.1	10.7	4.6–24.7*	10.1	4.4–23.3*
Race/ethnicity						
Non-Hispanic white (Ref)	1.8	7.9	—	—	—	—
African American	8.3	4.6	5.9	2.0–17.2*	5.7	2.0–16.8*
Hispanic	5.6	7.9	3.8	1.3–11.2*	3.6	1.2–10.8*
Age at baseline	—	—	1.1	0.9–1.4	1.1	0.9–1.4
Baseline risk factors (n = 1795; homicide by firearm = 68)						
Other drug use	3.9	8.1	0.4	0.2–0.9*	0.6	0.3–1.3
Alcohol use disorder	6.7	7.8	0.8	0.4–1.9	0.8	0.4–1.9
Any drug use disorder	9.1	6.4	1.5	0.7–2.9	1.5	0.7–3.0
Marijuana use disorder	9.2	6.4	1.5	0.7–3.0	1.5	0.7–3.0
Other drug use disorder	5.9	7.6	0.7	0.2–2.0	1.6	0.4–5.5
Follow-up interview risk factors (n = 1626; homicide by firearm = 40)						
Alcohol use disorder[d]	12.1	3.1		NA		NA
Any drug use disorder	8.8	3.7	2.5	1.0–6.3	2.4	0.9–6.4
Marijuana use disorder	8.9	3.7	2.5	1.0–6.4	2.4	0.9–6.2
Other drug use disorder	1.7	5.2	0.3	0.0–2.5	0.6	0.1–4.6
Sold drugs[d]	6.0	0.7		NA		NA
Used gun	5.8	2.2	3.1	0.9–11.5	2.5	0.7–9.2
Gang member[d]	5.7	2.0		NA		NA

aHR, adjusted hazard ratio; HR, hazard ratio; NA, not applicable. *P < .05.

[a] Excludes other race/ethnicity (n = 4).

[b] Of the original 1829 participants, 4 identified as other race/ethnicity, 6 were missing correctional records, 21 were incarcerated during the entire study period, and 3 were not assessed for disorders or other drug use. One death was treated as censored because the participant had withdrawn from the study before dying.

[c] Of the original 1829 participants, 31 died before the follow-up interview, 5 withdrew from the study, 42 were lost to follow-up, and 92 were interviewed past the 4.5-year cutoff. In addition, 4 participants identified as other race/ethnicity, 6 were missing correctional records, 19 were incarcerated during the entire study period, and 4 were not assessed for risky behaviors or disorders.

[d] Time-dependent risk factor. See Supplemental Figure 6 for HR estimates.