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Diffusion Processes in Homicide

by

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BACKGROUND

Blumstein (1995) examined the rapid growth in youth homicide beginning in 1985, particularly involving non-white offenders and victims. The doubling of youth homicides between 1985 and 1991 (in the absence of any growth for adults) was almost entirely associated with growth in handgun use in homicides (with no growth in non-handgun homicides). That rise in youth homicide occurred at about the same time as a doubling in the arrest rate of non-white juveniles for drug offenses, also beginning in about 1985.

While not beginning until 1988, there was also a major increase in arrest rates for homicide by white juvenile offenders–an increase of about 80 percent compared to 120 percent for non-whites between 1985 and 1991. Notably, there was no significant increase in the arrest rate of white juveniles for drug offenses over the same period.

Potential Role of Crack Markets in the Staggering Rise in Youth Homicides

Tying these observations together with the onset of the crack cocaine epidemic beginning in the mid-1980s suggested that the two were somehow connected. Crack represented a major innovation in the marketing of cocaine. It made cocaine and its psychoactive effects accessible to the many people who could not afford to buy powder cocaine in the smallest marketed quantities. But crack, selling in five to ten dollars lots, was affordable. The influx of new customers was compounded by an increase in the number of transactions per customer, because these new purchasers would buy small quantities in each transaction.

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Responding to the growth in market volume—as well as replacing the many older sellers who were being sent to prison for drug offenses in rapidly increasing numbers during the 1980s--required that crack markets recruit many new people to work in the distribution networks. This was especially true in street markets in inner city neighborhoods where most crack was sold.

Non-white juveniles in those neighborhoods were very attractive candidates for that role. Without many good prospects in the legitimate market place, non-white juveniles were available at a relatively low cost. As juveniles, they also needed a much smaller premium to compensate for their relatively low risk of punishment by the criminal justice system.

These young people in crack markets needed to protect themselves against the street predators who found them to be attractive targets. Drug dealers had valuable property in drugs and money, and recourse to the police was obviously out of the question. Powerful handguns—readily available from adult confederates--were the weapons of choice for self protection among youth involved in street-level crack markets.

Potential Role of Gangs in Rising Youth Homicide

Newly emerging youth gangs paralleled the arrival of crack markets. Gang rivalries and violence were integral parts of daily gang life, and the onset of new gangs brought this gang violence--previously limited to larger, traditional gang cities like Los Angeles and Chicago--to many medium sized cities. These new gangs were distinguished from earlier urban gangs by the youthfulness of participants and a proliferation of powerful handguns in the hands of gang members. Gangs often collectively controlled and stored small armories of guns, providing gang members with ready access to an assortment of guns for private or gang use.

Gang locales tend to be centers of persistently high crime rates, especially violent crimes. Using data from Pittsburgh, Tita (1999) demonstrates that youth gangs are more likely to form in areas that already have high crime rates, and that those high crime rates continue unchanged after gangs emerge in an area. Rates of shots fired, a crime specifically linked to gang activities, increase after gangs form. The same areal concentration and increasing rates characterize gang-related homicides. Sixty percent of all gang-related homicides in Pittsburgh occur within a short distance from locations where gangs hang out.

Persistence of violent gang rivalries, which often transcend the participation of particular gang members, is an important factor in maintaining high levels of violence. Gunfire and shootings were common in gang areas, and youthful gang members rely heavily on guns as both offensive and defensive weapons.

Crack Markets and Gangs—A Complex Relationship

Crack markets and violent youth gangs waxed and waned at varying times during the years from 1985 to 1995. Unfortunately, there are no direct measures to indicate the exact timing of each in individual cities. In-depth city-level analyses, however, suggest that different patterns prevail across cities. Similarly, no single dynamic characterizes the relationship between these two enterprises. In some cases the two go hand-in-hand, with gangs serving as organizational catalysts for emerging crack markets. Alternatively, new crack markets might spawn the emergence of gangs as a means of protecting participants. In other cities, the two were only loosely related, with individual gang members selling drugs, but not as part of a gang enterprise.

Because these two factors arose so closely in time and shared some participants in common, isolating their relative contributions to the growth and subsequent decline in youthful gun homicides is extremely difficult. The empirical basis for distinguishing between their separate effects does not exist yet. The two factors are nevertheless clearly implicated as potentially important contributing factors in recent trends for youth violence.

Potential Spread of Guns to Other Youth

The danger levels that accompanied the initial spread of guns among young recruits in drug markets and gangs rapidly diffused to a need for guns felt more broadly among their peers. This diffusion process presumably worked its way out along peer networks to spread guns to other neighborhoods in the city, eventually encompassing white juveniles. This secondary diffusion could occur reasonably rapidly in light of the tightness of teen networks and their general desire to imitate their peers.

With the sudden introduction of an innovation into a community, it inevitably takes some time before the community learns how to use it well. Most of the affected urban youth had no prior experience with guns, other than vicariously seeing their unrestrained use in movie or television films. The sudden presence of guns transformed typical teen-age disputes from fights–their normal mode of dispute resolution–into situations with far more lethal consequences. In a typical fistfight, the loser can withdraw or a third party can intervene before serious damage is done. When a gun is present, the dynamics move much too quickly and with potentially lethal consequences to participants and bystanders alike.

The increasing dangerousness created strong incentives to teens living in violence prone neighborhoods to be sure they also had a gun. As the perceived risk of random attack increases, there are also incentives to use guns preemptively. The

potential results of this dynamic are an escalating neighborhood arms race, and much greater use of guns in situations which previously involved only a fist fight.

NIJ FUNDED RESEARCH ON HOMICIDE DIFFUSION

The hypothesis that diffusion processes might be at work stimulated a variety of studies into the dynamics of homicide diffusion by a team of collaborating researchers at Carnegie Mellon University. National mortality data permit analysis of the instrumentality effects of guns in youth violence through contrasts of time trends in the manner of death—homicide, suicide, or accidents—for gun and non-gun deaths of youth (Cork, 1996; Blumstein and Cork, 1996).

The initial hypothesis of a connection between youth homicides, youth involvement in crack markets, and guns were first stimulated by analyses of national data (Blumstein, 1995). If such a diffusion process is at work, then we ought to be able to detect similar results with city-level data (Cork, 1999). The hypothesized role of gangs suggests intra-city diffusion across neighborhoods within a city (Cohen and Tita, 1999). Finally, we returned to national data to explore some of the factors that might be at work in the recent decline in youth homicide (Blumstein and Rosenfeld, 1998). Each of these studies is discussed in more detail below.

Important Role of Gun Availability in Rising Youth Homicide Rates

The fact that guns figure prominently in the rapidly growing homicide rates of youth during the late 1980s is undisputed. It is less obvious, however, whether gun use simply facilitates increases in violent propensities among offenders, or physical features of guns increase the likelihood of lethal consequences. The former would be a "propensity" effect, and the latter an "instumentality" effect of guns in violent outcomes. By documenting the manner

and means of death over time, national mortality data from death certificates provide some basis for distinguishing between these alternative scenarios.

Using the mortality data, it is possible to identify gun and non-gun deaths among homicides, suicides, and accidents, along with the age, sex and race of the deceased. Blumstein and Cork (1996; see also Cork, 1996) examines time trends in these alternative rates over the period 1968 to 1991. The contrasts between homicide rates on one hand, and suicide or accident rates on the other, provide valuable clues for distinguishing the relative contributions of changes in the propensity for lethal violence among youths—an issue in homicide, but not in suicide and accidents--and changes in youth access to guns.[3] Likewise, similar trends in both gun and non-gun homicide rates would suggest that violent propensities by youth are more important, while an absence of trends in non-gun homicides suggests a greater role of instrumentality effects.

Gun suicide and accident rates of teenage victims ages 15 to 19 exhibited rapidly growing rates similar to the trends observed in gun homicides. Somewhat slower, but still significant growth occurred in gun suicide rates of victims in their early 20s. The increases during the 1980s started slightly later for whites than for non-whites. There were no similar upward trends in any of the corresponding non-gun rates. This diverse pattern of trends for gun and non-gun incidents among homicides, suicides and accidents is fully consistent with an important influence of increased gun availability on the rising gun deaths of juveniles.

Diffusion from Juvenile Involvement in Drug Markets to Juvenile Homicides

National arrest data suggest a link between rising juvenile arrests for drug offenses—associated with rapidly growing crack cocaine markets--and juvenile arrests for homicides during the mid-1980s (Blumstein, 1995). Since crack

[3] These inferences presume that offenders and victims share similar demographic attributes, an assumption that is largely supported in SHR data on the characteristics of participants

arrived in different cities at different times, the timing of escalations in juvenile homicides should vary similarly across cities. This expectation is a basis for examining inter-city diffusion processes of crack markets and youth homicides.

Cork (1999) modifies an epidemic model of Bass (1969) to examine the relationship between the timing of rapid growth in arrests of juveniles for drug offenses and similar growth for homicides in U.S. cities. Three distinct phases characterize the diffusion process during an epidemic. An initial "innovation" period of relatively slow increase is followed by an abrupt shift to rapid growth during an "imitation" period. Imitation persists until some saturation point when the remaining number of potential new imitators is no longer sufficient to support continuing growth, and the epidemic subsides. The analysis focuses on the timing of these "change points" in the rate of growth of these two phenomena in individual cities.

Model estimates for both juvenile drug arrests and juvenile homicide arrests are available for 53 cities. For crack arrests the mean change-point was 1985.4, with 41% of the city change points falling in the interval 1984-1986. The mean change point for juvenile homicide arrests was three years later in 1988.5. The mean lag between the drug and homicide change points in a city was 3.1 years, and 60% of cities have lags of one to five years. It is striking that 45 cities displayed positive lags with drugs leading homicides, three occurred in the same year, and the juvenile homicide change-point preceded the crack change-point in just five cities. A sign test of these results strongly favors ($p < .0001$) the hypothesis that crack arrival precedes the escalation in juvenile homicides.

A geographical analysis of the change-points suggests a geographic diffusion process among cities. The crack epidemic, signaled by the median change point in juvenile drug arrests, began in about 1984 on the West Coast and 1985 in the Northeast, and then worked its way inland to the Rust Belt and the South two or three years later. The juvenile gun homicide epidemic displayed a similar pattern,

beginning in the Northeast and Southern California, but lagging the crack change-points by about 2-3 years. The Texas/South and Midwest homicide change-points occur in about 1988 and 1989. Finally, the Rust Belt experienced its change-point as late as 1992. The pattern of geographic spread is similar for the epidemics of juvenile crack arrests and gun homicides. Both started on the coasts and worked inland, but with a lag of about 2-3 years between the start of the sharp rise in crack and the sharp rise in gun homicide. The lag is somewhat longer in the Rust Belt where the homicide epidemic started later, and then rose more quickly.

These findings are still short of proving the basic hypothesis of gun diffusion within individual cities, but they are certainly consistent with it. Across individual cities, we note a consistent (albeit not universal) lag of a just few years between the arrival of crack and the rise in the juvenile gun homicide. This occurs in diverse cities across the country, even though there are considerable differences in the timing of the process across the cities. It is also interesting that the differences in timing across cities are smaller when one examines the cities on a regional basis.

Spatial Diffusion of Homicide within a City

The above provides prima facie evidence in support of the original diffusion hypothesis. But the original hypothesis derives fundamentally from notions of diffusion *within* a city. It was hypothesized that, similar to the role of a mosquito in transmitting malaria, guns serve as a vector of the homicide epidemic. Presumably the presence of guns is transmitted from individuals directly involved in crack markets or youth gangs, and the neighborhoods in which these enterprises are located, to other non-participating youths. Those others would likely be peers from the same neighborhood or adjoining neighborhoods, but could also be physically more remote because social networks are not necessarily confined geographically.

Role of Youth Gangs in Spatial Diffusion of Homicide in One City

Cohen and Tita (1999) examines spatial diffusion of homicide *within* a city using homicide data collected in Pittsburgh. Annual citywide counts of "drug-related" homicides changed very little over the period 1987 to 1995.[4] Because of this limited impact overall, the analysis of spatial diffusion within the city did not pursue drug-related homicides any further. Youth gangs, by contrast, were a major factor in the homicide epidemic in Pittsburgh, with gang-related homicides growing from 10% of total homicides in 1991 to 33% in 1992, and then 45% in 1993, the peak year of homicides. The gang share of homicides remained at levels of 45% or more through the last year of data in 1995.

Homicides were classified as "gang-related" if any of the participants were gang members, or the homicide involved some gang motivation (e.g., inter-gang disputes). After the emergence of youth gangs in 1991, gang motivated homicides were about two-thirds of all gang-related homicides in every year except the last (1995) when they dropped to one-third and member-only homicides dominated. The analysis of intra-city spatial diffusion of homicide focuses on the changes in the distribution of *youth-gang*, *youth-nongang*, and *non-youth* homicides across Pittsburgh neighborhoods.[5]

Augmenting exploratory spatial data analysis (ESDA) techniques of Anselin (1998), Cohen and Tita (1999) introduce a new analytical method for detecting spatial diffusion processes by examining the patterns of change in homicide rates in local census tracts and their adjoining neighbor tracts. They look for diffusion of the same type of homicide across census tracts, as well as cross-tract diffusion between different types of homicide.

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[4] Any mention of drugs was sufficient to qualify a homicide incident as drug-related. These cases were overwhelmingly related to drug trafficking activities and rarely involved drug use.

Contagious diffusion of increasing homicide rates across neighboring tracts is evident only during the year of peak growth in total homicides, when high local rates of youth-gang homicides are followed by significant increases in neighboring youth-nongang rates. This pattern is consistent with a spread of homicides from gang youth to non-gang youth. Otherwise, the increases in both youth-gang and youth-nongang homicides generally occur simultaneously in non-neighboring tracts. Some contagion is also evident early in the observation period when decreased rates of youth-nongang rates ripple among neighboring tracts in the same year that youth-gang homicides just begin to grow. Youth-gang homicides display similar contagious declines in later years. Such declines are symptomatic of the kind of subsiding rates that are expected during a homicide epidemic.

Diffusion of Homicide to Other Youth

The presence of gangs and drug markets is a salient factor in all considerations of the youth homicide epidemic that began in the mid-1980s. Data collected on homicides within the cities of Chicago and St. Louis provide another opportunity to examine the diffusion patterns of homicides involving gangs, drugs, or youth with guns (Cohen, Cork, Engberg, Tita, 1998). Both gang- and drug-related homicides contribute to subsequent increases in other homicides involving youth with guns. This occurs in both cities, but the initial stimulus is drug homicides in St. Louis and gang homicides in Chicago. Both cities also provide little evidence of cross-type effects between drug and gang homicides, suggesting that the two activities are largely independent of one another, especially in St Louis.

As in Pittsburgh, there is also evidence of distinctive self-limiting processes within drug and gang homicides in the two cities. The occurrence of drug- or gang-related homicides in a neighborhood tends to *reduce* the likelihood

[5] Youth homicides of both the gang and non-gang variety involve at least one participant (offender or victim) between the ages of 12 and 24. Any mention of gang member or gang motive

of another homicide of the same type in the same place in the near term. Such declines are compatible with epidemic processes. While not explicitly examined in the current analysis, the apparent suppression effects may reflect a response to heightened police presence during investigations of drug- or gang-related homicides. Or they may reflect protective adaptations in which drug and gang activities move off the street to safer indoor locations. Both mechanisms would effectively reduce the number of individuals who remain susceptible to the homicide epidemic, thereby contributing to declining homicide rates. Further research is needed to explicitly explore these hypotheses.

Rise and Decline of Youth Homicide Rates

The analyses of diffusion processes during the period of rising youth violence from 1985 to 1991 also help in understanding the decline in youth violence since 1993. Focusing on national data for the US as a whole, Blumstein and Rosenfeld (1998) highlight the saliency of handguns in the 1985-1991 rise among youth (18-25) and among juveniles (<18). During the period of decline following the peak in 1993, the number of handgun homicides by youth and by juveniles flattens out between 1993 and 1994, and then declines steadily after 1994.

Time trends of weapons arrests of persons under age 25 closely match the pattern in homicide arrests of youth, peaking sharply in 1993 and then declining steadily. The weapon arrest rate reflects a combination of varying levels of criminal activity (illegal carrying of a gun) and varying intensity by police to pursue that offense (typically through stop-and-frisk or other forms of search). There is no indication that police diminished their pursuit of illegal gun-carrying since 1993, so it is reasonable to infer that the reduction in weapon arrests reflects a real reduction in illegal gun carrying by young people.

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involvement was sufficient to qualify as a youth-gang homicide.

The strong similarity in time trends for weapons and homicide arrests suggests that handgun carrying by young people is a salient factor in both the rise and fall in youth homicide rates. Again, principles of diffusion contribute to understanding that process. In many places aggressive police tactics aimed at taking guns away from young people removed some guns directly through seizures, and could propagate through deterrent effects to reduce gun carrying by other youth. The resulting decline in gun carrying by youth could also lead to diminished incentives to carry guns among youth generally, resulting in a youth "disarmament race."

It is likely that other changes in the environment besides police activities directed against illegal gun carrying also contributed to the recent decline in youth homicides. Notably, crack markets shrank as the number of new crack users declined. Markets serving the remaining long-time users also became more orderly, and smaller markets reduced the need for recruiting large numbers of young people into crack markets. Youth gangs may also have diminished in recent years as new recruits were not sufficient to replace early members who drifted away or were incarcerated. The reduced opportunities in crack markets and declining influence of violent gangs occurred at the same time that renewed strength in the domestic economy provided a large increase in legitimate employment opportunities for youth who might otherwise have been recruited into illicit drug markets. While these hypothesized factors are compelling on their face, their actual influence remains to be tested empirically.

CONCLUSIONS

The collection of research--involving national data, and cross-city and within-city analyses—leads to a number of important conclusions about the factors contributing to the growth of youth homicide in the late 1980s and its subsequent decline after 1993.

- The principal factor in the growth of youth homicide was growth in access to handguns by young people.

- Across different cities, there is considerable variation in the beginning of an epidemic of youth involvement in the crack industry and in the escalation of youth homicide. The rise in youth homicide follows the rise in youth involvement in crack markets by about 3 years.

- At about the same time, newly emerging youth gangs in many cities became major participants in violence and the transmission of guns to their members.

- Crack markets and youth gangs contributed to escalating youth violence both directly through the activities of participants, and indirectly by serving as important vehicles for the diffusion of guns and the associated lethal violence to youth more broadly. Analyses of the circumstances of homicides in three cities all find evidence of cross-type influences from the occurrence of drug- or gang-related homicides involving youth to higher rates of homicides by other youth as well.

- While varying somewhat across cities, the activities of crack markets and youth gangs contribute separately to youth homicides. There is little overlap between drug and gang involvement in the same homicides, and little evidence that the occurrence of one type increases the likelihood of the other.

- Analyses of time trends in youth homicides at the national, inter-city and intra-city levels find that declining rates were well underway by 1995. Such pervasive declines are compatible with the self-limiting processes that signal the waning of an epidemic.

- There is also clear evidence that reduced use of guns was an important factor contributing to the decline in youth homicide by the mid-1990s. But those

effects are confounded by mutual influences of changing drug markets (fewer new users) and participation in youth gangs, as well as a robust economy providing legitimate jobs for inner city youth who otherwise might have been recruited into the drug industry in the mid-1980s.

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