

## Gun Availability and Crime in West Virginia: An Examination of NIBRS Data

Presentation at the  
BJS/JRSA Conference  
October, 2008

Stephen M. Haas, WV Statistical Analysis Center  
John P. Jarvis, FBI Behavioral Science Unit  
Eric Jefferis, Kent State University  
Erica Turley, WV Statistical Analysis Center

### Firearm Violence and Victimization

- While rates of victimization has improved over the past decade, violent victimizations by firearms continue to be a serious problem, particularly among youth.
  - Firearms were used in 68% of murders committed in 2006 (FBI, 2007)
- Hoskin (2001) proposed two reasons to explain why the U.S. *lethal* crime rate is so high as it relates to gun availability:
  - The prevalence of handguns is much higher than in other nations; and
  - The difference between rates of gun and non-firearm violence is greater in the U.S. compared to other countries.

## Informing Practice

- Project Safe Neighborhoods
  - Gun violence reduction initiative
  - Data-driven decision making
  - Spatially focused interventions (large geographic area of responsibility)
  - Evaluation of efforts
- Problem
  - Availability of consistent and reliably reported data
- Potential Solutions
  - Local agency data
  - State vital statistics data on violent deaths
  - Supplementary Homicide Reports (SHR)
  - Incident-Based Reporting Data (NIBRS)

## Research on Gun-Crime Relationship

- Much research has been dedicated to understanding the relationship between gun availability and violent crime (e.g., Cook & Ludwig, 2004; Hepburn & Hemenway, 2004; Hoskin, 2001; Moody & Marvell, 2005; Stolzenberg & D'Alessio, 2000; Wells & Horney, 2002)
- Hoskins (2001) suggests the relationship can be viewed in three different ways:
  - Possible there is no relationship between guns and violent crime;
  - Gun availability increases violent crime; and
  - The presence of guns actually reduces the crime rate.

## Research on Gun-Crime Relationship

- Others have explored the possibility of substitution:
  - If guns were not available, violent individuals would select another types of lethal weapons to commit crime
- Moody and Marvell (2005) examined handgun ownership and violent crime relationship in 50 states (1977-1998).
  - While guns were more prevalent in some crime categories (e.g., rape), overall guns had a minimal net effect on crime.
  - If the reported gun ownership were to doubled from 26% to 52%, major crime would increase by only 1%

## Research on Gun-Crime Relationship

- Griffiths and Chavez (2004) analysis of homicide trajectories in Chicago from 1980-1995.
  - Half (50.2%) of all homicides were committed with the use of street guns.
  - They concluded that street guns were a significant factor in Chicago's violent crime spike of the early 1990s.
  - Found evidence that increase in gun use was coupled with reduction in use of other weapons (substitution).

## Competing Hypotheses

Stolzenberg and D'Alessio (2000): explored the integration of two seemingly contradictory hypotheses.

- Objective dangerousness hypothesis:
  - Availability of guns has a positive relationship with gun violence
  - i.e., gun availability increases levels of violence
  - Supported by Blumstein, McDowall, and others
- Deterrence or self-defense hypothesis:
  - Negative relationship between gun availability and violence
  - i.e., gun availability for law-abiding citizens deters or reduces violence
  - Supported by Lott, Lott & Mustard

## Competing Hypotheses

- Stolzenberg and D'Alessio (2000) found that availability of illegal guns has a significant positive relationship to violent crime.
  - Counties with high concentrations of *illegal* guns were associated with violent crime, gun crime, and juvenile gun crime;
  - No impact on crimes committed with a knife, suggesting no displacement of gun to knife violence.
  - No relationship between legal gun availability and measures of violent crime.

## Present Study

- Replication and extension: Stolzenberg, L. and D'Alessio, S.J. (2000). Gun availability and violent crime: New evidence from the National Incident-Based Reporting System, *Social Forces*, 78(4).
- Their findings were consistent with removing *illegal* guns from communities.
- Question still remains: Are their findings applicable to other localities where the dynamics of gun ownership (whether legal or illegal) are likely to be different, such as West Virginia?

## Study Objectives

- Three study objectives:
  - To examine the spatial dynamics of guns and crime in West Virginia;
  - To replicate previous research investigating the relationship between guns and crime;
  - To examine the utility of NIBRS data for examining criminal justice policy and practice.
- Explored effects of legal and illegal gun availability on:
  - Violent crime rate
  - Gun crime rate
  - Knife crime rate

## Data Sources

- County-level analysis across 55 West Virginia counties
- Data Sources:
  - NIBRS reporting agencies in West Virginia;
  - U.S. Bureau of the Census (Census 2000) data;
  - County-level demographic data from various governmental agencies in WV.
- WV IBRS data over a three-year period, 2000-2002
  - "full" reporting state

## Measures

- Independent variables:
  - Illegal gun availability (WV IBRS): Number of guns stolen in each county per 100,000 population
    - Effort to replicate S&D's research
    - Illustrate utility of NIBRS data
    - Few widely accepted and available measures
  - Legal gun availability (County Sheriffs): Number of concealed weapon permits issued in each county per 100,000 pop lagged one year

## Measures

- Control Variables (county-level):
  - Population density rate;
  - Percent receiving Temporary Assistance for Needy Families (TANF)
  - Divorce rate;
  - Juvenile commitment rate;
  - Percent unemployed;
  - Prison admission rate;
  - High school dropout rate;
  - Arrest rate;

## Analysis Methods

- Analysis of univariate descriptives for variables of interest
- County-level GIS analysis
  - Geographic maps and statistical modeling
  - Visual inspection
  - “Hot spots” and “cold spots”
  - Co-occurring and notable pockets of criminal incidents and presence of legal and illegal guns
- Ordinary least squares regression (OLS)
  - Control for community level variables

## OLS Diagnostics

- Multicollinearity tests (correlations, VIF & tolerance)
  - No significant problems identified
- Spatial autocorrelation (Moran's I & Anselin's Local Indicators)
  - GEODA used to construct a spatial weights matrix using county centroids and spatial regression model calculated
  - Moran's I was significant in multivariate model; however, IVs were not substantially impacted
  - Therefore, OLS results presented here for ease of interpretation
- One poor reporting county (Ohio) removed from analysis, made no substantive difference

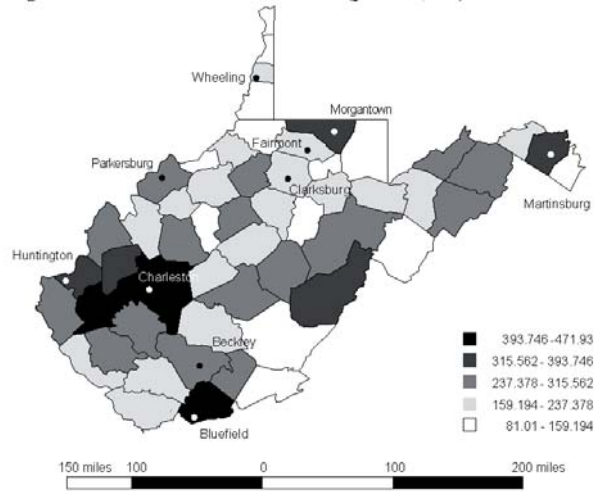
## Univariate Descriptives

- Mean violent crime rate: 231.53 per 100,000 residents
- Mean gun crime rate: 43.45 (about 20% of VCR)
- Knife crime rate: 22.33 (about 10% of VCR)
- Higher prevalence of legal guns (142.13) compared to illegal guns (79.12)

	Min	Max	Mean	SD
Violent Crime Rate	55.94	732.77	231.53	113.33
Gun Crime Rate	0.00	177.57	43.45	32.32
Knife Crime Rate	0.00	104.80	22.33	18.80
Gun Theft Rate	0.00	221.72	79.12	47.12
Gun Carrying Permits	22.00	683.00	142.13	114.87

# Violent Crime

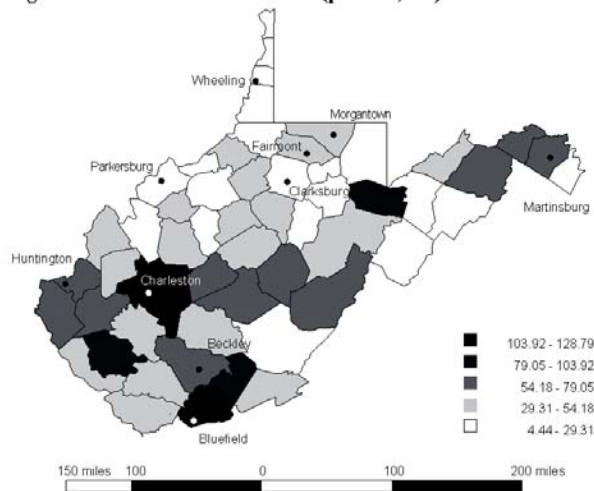
Figure 1 Violent Crime Rate in WV (per 100,000)



Source: 2000-2002 WV Incident-based Reporting System data

# Gun Crime

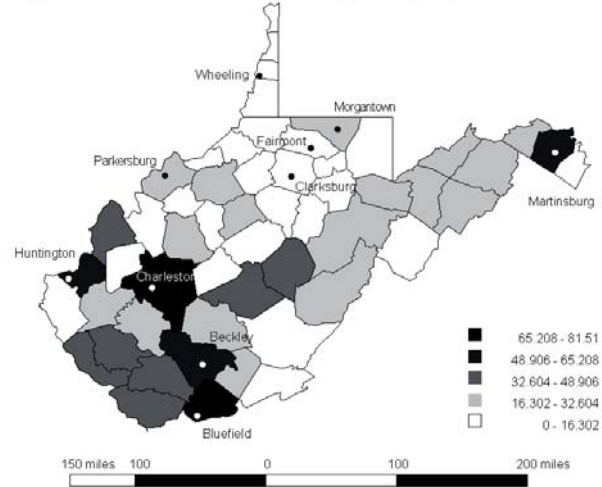
Figure 2 Gun Crime Rate in WV (per 100,000)



Source: 2000-2002 WV Incident-based Reporting System data

# Knife Crime

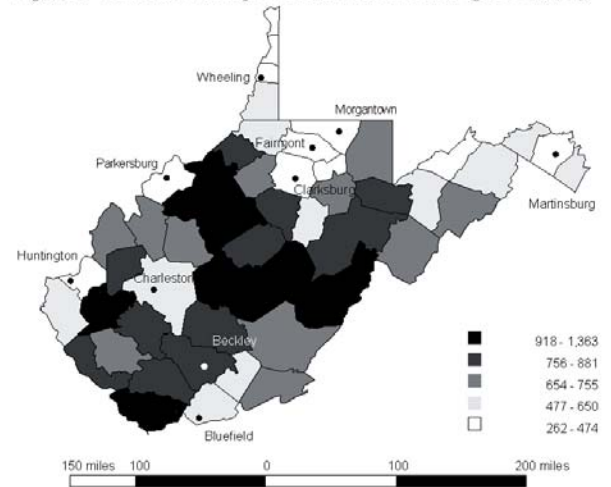
**Figure 3 Knife Crime Rate in WV (per 100,000)**



Source: 2000-2002 WV Incident-based Reporting System data

# Concealed Weapon Permit

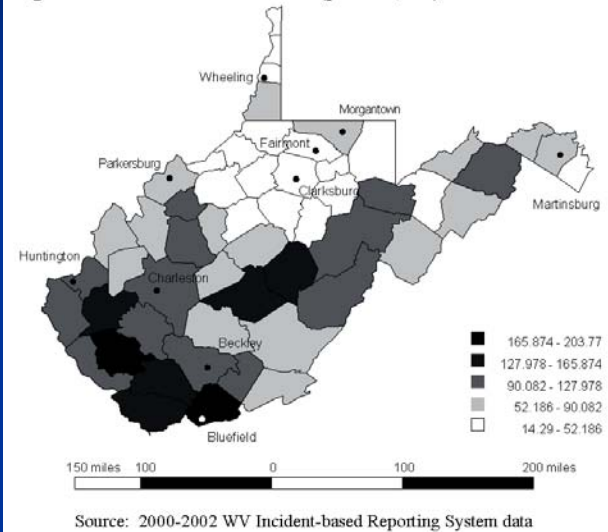
**Figure 4 Concealed Weapon Permit Rate in WV (per 100,000)**



Source: 2000-2002 WV Incident-based Reporting System data

## Gun Theft

Figure 5 Gun Theft Rate in WV (per 100,000)



## Multivariate Results

	Violent Crime (Beta)	Gun Crime (Beta)	Knife Crime (Beta)
<i>Independent Variables of Interest</i>			
Gun Theft Rate	.333*	.378*	.299*
Concealed Carry Rate	.224*	.220*	.292*
<i>Model Statistics</i>			
F-Value	14.857*	11.420*	9.386*
Adjusted R <sup>2</sup>	.588	.517	.463

## Discussion and Conclusions

- Findings only partially support Stolzenberg and D'Alessio:
  - Positive relationship between illegal gun availability and violent crime and gun crime
  - However, we also found *legal* gun availability is also significant and positive across all three models
  - Likewise, positive association with knife crime is counter to S&D (they found no influence, therefore no evidence of substitution)
- Both the legal and illegal gun measures were positively and significantly related to each of the three offenses examined in this study—violent crimes, gun crimes, and knife crimes.

## Discussion and Conclusions

- Findings support the notion that guns are related to elevations in violent crime and that guns *do not* lead to lower crime rates.
- Definitive conclusions are complicated by:
  - The relative strength of the regression coefficients; and
  - The presence of two competing explanations for the relationship between guns and crime.
- Magnitude of the estimates are comparatively more supportive of the objective dangerousness hypotheses; however, legal guns as significant predictor is supportive of the self-defense hypothesis.

## Implications

- Study demonstrates WV IBRS has utility for state-wide spatial analysis to inform practice and policy
  - Gun crimes are not uniformly distributed across the state
  - Can inform firearm reduction initiatives such as PSN
  - County-level analysis likely to be useful in states with few large population centers
- NIBRS data is useful:
  - For identifying potential areas for future crime reduction initiatives and
  - Providing evidence to better inform the debate over the relationship between gun availability and crime.

## Future Research

- Currently, this is no easily accessible and widely agreed upon metric for measuring gun availability (National Research Council, 2004).
- This study relied upon an illegal measure used in previous work; however, it is likely to underestimate the true level of illegal gun activity present in a community.
- Development of more reliable and valid data sources is needed (Kleck, 2004)

## Publication

Haas, Stephen M., John P. Jarvis, Eric Jefferis, and Erica Turley (2007). Gun Availability and Crime in West Virginia: An Examination of NIBRS Data. *Justice Research and Policy Journal*. Vol. 9(2): 139-157.

## Contacts

Stephen Haas, Ph.D., [Stephen.M.Haas@wv.gov](mailto:Stephen.M.Haas@wv.gov)

Eric Jefferis, Ph.D., [ejefferi@kent.edu](mailto:ejefferi@kent.edu)

John Jarvis, Ph.D., [jjarvis@fbiacademy.edu](mailto:jjarvis@fbiacademy.edu)

Erica Turley, B.S., [Erica.E.Turley@wv.gov](mailto:Erica.E.Turley@wv.gov)