On the Road Again: Crime and Major Transportation Routes

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Abstract

Conventional wisdom asserts that crime follows and thrives around major transportation routes. Empirical research is lacking in this area, with existing studies being conducted by private industries solely interested in their own loss prevention. This longitudinal study tests this pervasive contention by plotting official UCR data with the location of interstate highways.

Modern crime is assumed to have a well known parasitic relationship with transportation routes. The media has dutifully reported events ranging from interstate commercial truck highjacking to freeway snipers to robberies of drivers and passengers in personal vehicles. Whether on the road, stopped at a rest area, or in involuntary interaction with other hyper-reactive, enraged drivers, the American public is constantly being alerted to dangers in and around the highways. The calls for caution and prudence while traveling seem very timely, and many people shake their heads in disappointment to see what they perceive as the current incursion and escalation of crime onto what they once considered safe roadways.

They are wrong. As long as there have been established routes for goods and people to traverse from point A to point B, there have been opportunistic criminals taking advantage of them. Such criminals are operating on the same premise that motivates predators to skulk on the outskirts of watering holes. Sooner or later, something worth attacking will come along. That they do this is not in question, and one does not have to look very far in literature or law to see evidence that this fact is as established as travel itself.

The New Testament story from the Bible of the Good Samaritan reports the attack by thieves of a man traveling from Jerusalem to Jericho. This well known trade conduit in biblical times boasted equally well known dangers to those who journeyed along it, hence its mention in the parable. Travelers of the time often waited until a large caravan was heading to their desired destination, and sought passage with the group, relying on the safety afforded by numbers.

In England, by 1285, the alarmingly constant predation of bandits and highwaymen upon the common roads in Britain inspired King Edward I to issue a proclamation known as the Statute of Winchester. Beyond its goal of reestablishing local responsibility for law enforcement, it mandated an early crime prevention measure along the public roads. The order was cried "that highways leading from one market town to another shall be enlarged where as bushes, woods, or dykes be, so that there neither be dyke nor bush whereby a man may lurk to do hurt within two hundred feet of the one side and two hundred feet of the other side of the way." The idea was to deny concealment for these brigands. When considering the lack of current heavy machinery to accomplish such clear cutting, one begins to see how serious the problem was thought to be. It is unclear whether this provision was ever actively enforced (Vernon, 2002), and the perils of travel persisted.

The wayfarers in Geoffrey Chaucer's celebrated The Canterbury Tales (circa 1385) banded together for journeying to religious shrines for both companionship and mutual safety. The success of highway robbery continued to attract the attention and bemusement of both the government and public. The highwayman's business was romanticized, even immortalized in the early 1900s by Alfred Noyes poem of the same name. Whatever one thinks of the poetry, one has to remember that the reason Noyes protagonist could not stay with Bess, the landlord's daughter was because he was "after a prize this night." In other words, he was off to attack and rob someone traveling the roads.

Land transportation was not alone with its problems. Pirates, whether freelance or government sponsored, plied the sea lanes, creating havoc with shipping interests of various countries. Even now Indonesia is struggling with an updated version of piracy.

Frontier times in the United States also saw its share of crime along whatever means moved goods and people. Stagecoaches and the railroad suffered from the determined onslaught of outlaws who made their livings and legends from daring hold ups.

These are just a few of the existing examples taken from history, yet they strongly underscore what appears to be a continuing pattern.

All times, all countries acknowledge that there does seem to be a strong association between roadways and crime. Exactly what that relationship is has never been resolved by empirical research. Is crime actually more likely to occur on or close to highways than compared to other areas? Theories dealing specifically with the geographic distribution of crime tend to fall under the designation of Situational Crime Prevention, and to date only one study done on a very limited geographic area has tested the assumption that crime rates are high in and around interstate highways (Robinson, 1998). When her data were assessed, they yielded contradictory results. The environmental impact on crime that was theorized did not materialize. Presence of an interstate highway and its interchanges did not appear to have significant impact on crime rates on and adjacent to it. Please note here that the study only looked at four interchanges, and admits its findings were ultimately inconclusive. Yet the importance of understanding this relationship and its limits cannot be over emphasized. As times have changed, it is believed that the problem has grown exponentially.

The technology and availability of transportation in modern times innovated travel, opening up opportunities to more people than ever before to get on the move. Proliferation of privately owned vehicles mandated the development of ever increasing highway systems to accommodate them. Airlines, ships, buses, trains, cars- all establish optimum routes to follow, and in so doing, expand the venues into which crime can encroach.

The Issue of Accessibility

Most research to date into transportation routes and criminal activity focuses on small scale areas, such as neighborhoods or communities. Lack of the power of current mapping programs was partially responsible for the micro-level of study, as was funding availability. Grants were more often available for areas of cities that were clearly experiencing high or escalating crime rates. Although the studies were microlevel, they did include a common variable: traffic patterns.

Twenty-three years ago Rubenstein and his colleagues examined the issue of accessibility of transportation routes and crime in neighborhood settings. Their study reported that heavy foot and automobile traffic was associated with higher victimization rates in single- and multi-family residences. In addition to the traffic rates, the study also reported that the shape of existing intersections in the community had an influence on the crime rate. These writers stated that cross intersections were the most accessible, that "T" and "L" intersections were less accessible, and that cul-de-sacs were considered the least accessible (1980).

Besides the layout of the intersections, these scholars reported that isolated areas also show an increased vulnerability to crime, as do houses that have easy access and egress paths. Lastly, if the home is located on a street with heavy traffic, then the vulnerability to crime increases.

Taylor and Gottfredson (1986) also examined the role of accessibility. These authors report that a neighborhood is more permeable to criminal activity if it directly adjoins a four-lane road or it if is close to an exit off a major highway. This is important to potential offenders for a good reason. It decreases their entry and exit time, reducing their risk of detection. Even if the perpetrators are detected, they have a greater chance of evading capture by the police due to the presence of roadway accessibility.

Both writers also believe that crime rates will be higher in neighborhoods that have two-way streets instead of one-way streets. Cross intersections and through streets also contribute to higher crime rates. These features impact on the ease with which criminals can learn the street design of the neighborhood. It is more difficult to learn areas with "T" intersections, one-way streets, and roads that dead-end. In an area with these features it would be easy for the potential thieves to get lost or to be apprehended by the police because they turn down the wrong street.

These works, while interesting, do not target the issue of crime and its relationship to established travel routes. While limiting itself to looking at American interstate highways, this study directly tests the assumptions about crime and its prevalence on and around roadways. Common sense tells us there is a solid association, and certainly the available anecdotal in newspapers and other media sources support the idea, but what is lacking is empirical testing. Can this be supported through research?

Methodology

For this longitudinal study, all 3,112 counties in the United States were examined for their Part I Uniform Crime Offense Rates (which include murder, rape, robbery, aggravated assault, burglary, larceny, motor vehicle theft, and arson), the presence of an Interstate Highway, and the county population.   The Uniform Crime Report (UCR) data for the present study was obtained from the Inter-university Consortium for Political and Social Research (ICPSR). Crime levels used here were determined by using SPSS for

Windows to divide the sum of the 24 year period into three equal groups. Low crime is a crime rate of less than 1,850 incidents per 100,000 people. Medium crime is defined as a rate between 1,850 to 3,486 incidents per 100,000 people. High crime is more than 3,486 criminal incidents per 100,000 people. From 1977 until 2000, the UCR collected 74,688 county level crime statistics. In Table 1, 11,661 counties (over 24 years) did not report information, which left 63,003 reporting counties.

Table 1: Crosstabulation of UCR Year by Crime Level

| | | | Crime Level | | | Total |
			Low Crime (<1850)	Med Crime (>1849<3487)	High Crime (>3486)	
UCR YEAR	1977	Count	60	60	96	216
		% within UCR YEAR	27.8%	27.8%	44.4%	100.0%
	1978	Count	1149	939	866	2954
		% within UCR YEAR	38.9%	31.8%	29.3%	100.0%
	1979	Count	999	977	1009	2985
		% within UCR YEAR	33.5%	32.7%	33.8%	100.0%
	1980	Count	867	952	1146	2965
		% within UCR YEAR	29.2%	32.1%	38.7%	100.0%
	1981	Count	901	932	1130	2963
		% within UCR YEAR	30.4%	31.5%	38.1%	100.0%
	1982	Count	953	938	1050	2941
		% within UCR YEAR	32.4%	31.9%	35.7%	100.0%
	1983	Count	1022	991	913	2926
		% within UCR YEAR	34.9%	33.9%	31.2%	100.0%
	1984	Count	1095	997	834	2926
		% within UCR YEAR	37.4%	34.1%	28.5%	100.0%
	1985	Count	1075	988	886	2949
		% within UCR YEAR	36.5%	33.5%	30.0%	100.0%
	1986	Count	1049	959	943	2951
		% within UCR YEAR	35.5%	32.5%	32.0%	100.0%
	1987	Count	1020	938	983	2941
		% within UCR YEAR	34.7%	31.9%	33.4%	100.0%
	1988	Count	922	891	937	2750
		% within UCR YEAR	33.5%	32.4%	34.1%	100.0%
	1989	Count	968	931	1036	2935
		% within UCR YEAR	33.0%	31.7%	35.3%	100.0%
	1990	Count	900	964	1068	2932
		% within UCR YEAR	30.7%	32.9%	36.4%	100.0%
	1991	Count	856	917	1079	2852

	% within UCR YEAR		30.0%	32.2%	37.8%	100.0%
1992	Count	919	936	1077	2932
	% within UCR YEAR	31.3%	31.9%	36.7%	100.0%
1993	Count	831	903	998	2732
	% within UCR YEAR	30.4%	33.1%	36.5%	100.0%
1994	Count	885	931	931	2747
	% within UCR YEAR	32.2%	33.9%	33.9%	100.0%
1995	Count	848	927	963	2738
	% within UCR YEAR	31.0%	33.9%	35.2%	100.0%
1996	Count	804	900	909	2613
	% within UCR YEAR	30.8%	34.4%	34.8%	100.0%
1997	Count	1			1
	% within UCR YEAR	100.0%			100.0%
1998	Count	835	935	824	2594
	% within UCR YEAR	32.2%	36.0%	31.8%	100.0%
1999	Count	949	994	736	2679
	% within UCR YEAR	35.4%	37.1%	27.5%	100.0%
2000	Count	1004	1063	714	2781
	% within UCR YEAR	36.1%	38.2%	25.7%	100.0%
Total	Count	20912	20963	21128	63003
	% within UCR YEAR	33.2%	33.3%	33.5%	100.0%

However, such information as seen in Table 1 can still indicate where a county previously having a low crime rate experiences a significant increase. By comparing annual reports from the 24 years starting in 1977 and ending with 2000 for all the U.S. counties, results are more likely to uncover true trends, pulling outliers and flukes in data into proper perspective.

Using the idea that modern crime is assumed to have a strong, well known parasitic relationship with transportation routes, two research hypotheses were developed:

Hypothesis 1: Counties that contain interstate highways have a higher crime rate than counties not having an interstate highway.

Hypothesis 2: Counties that contain interstate highways have a lower crime rate than counties having interstate toll systems.

Results

For statistically evaluating the two hypotheses, SPSS for Windows was utilized. Only Chi-square results which are statistically significant at the .05 level or lower are reported. Chi-square was chosen as the statistical test because the presence of a toll or interstate system is a binary factor. The current section contains an animated map that was produced using ArcView and Ulead Animation software. A qualitative analysis of the results concludes this section.

Relationship between Crime Rates and Interstate Highways

Table 2 shows that counties containing interstate highways have higher crime rates than counties not containing an interstate. This relationship is statistically significant (χ^2=5105.524, d.f.=2; p=0.0001). Therefore, hypothesis 1 is supported.

Table 2: Crosstabulation of Crime Levels by Presence of an Interstate Highway

			INTERSTATE		Total
			No Interstate Highways	Interstate Highways	
Crime Level	Low Crime (<1850)	Count	15031	5881	20912
		% within INTERSTATE	43.2%	20.9%	33.2%
	Medium Crime (>1849 <3487)	Count	11883	9080	20963
		% within INTERSTATE	34.1%	32.2%	33.3%
	High Crime (>3486)	Count	7883	13245	21128
		% within INTERSTATE	22.7%	47.0%	33.5%
Total		Count	34797	28206	63003
		% within INTERSTATE	100.0%	100.0%	100.0%

Hypothesis 2 is examined in Table 3. It would seem logical that crime rates would be lower on toll roads, as people have to stop and pay to exit these systems. Since there was an association between crime and interstate highways, would statistical analysis show a relationship between toll interstate highway systems and nontoll system?

Table 3: Crosstabulation of Crime Levels by Presence of a Toll Interstate Highway

			Toll Interstate Highway		Total
			Interstate Highway	Toll Interstate Highway	
Crime Level	Low Crime (<1850)	Count	5291	590	5881
		% within Toll Interstate Highway	21.9%	14.7%	20.9%
	Medium Crime (>1849 <3487)	Count	7604	1476	9080
		% within Toll Interstate Highway	31.4%	36.8%	32.2%
	High Crime (>3486)	Count	11305	1940	13245
		% within Toll Interstate Highway	46.7%	48.4%	47.0%
Total		Count	24200	4006	28206
		% within Toll Interstate Highway	100.0%	100.0%	100.0%

(χ^2=117.485, d.f.=2; p=0.0001)

[Table 3](#) shows the category of high crime to be slightly higher for toll systems (48.4%) than for non-toll systems (46.7%). The largest difference is in the category of low crime. Twenty-one (21.9%) percent of non-toll interstate highways report low crime, compared to 14.7% of toll systems. Hypothesis 2 is supported by the data.
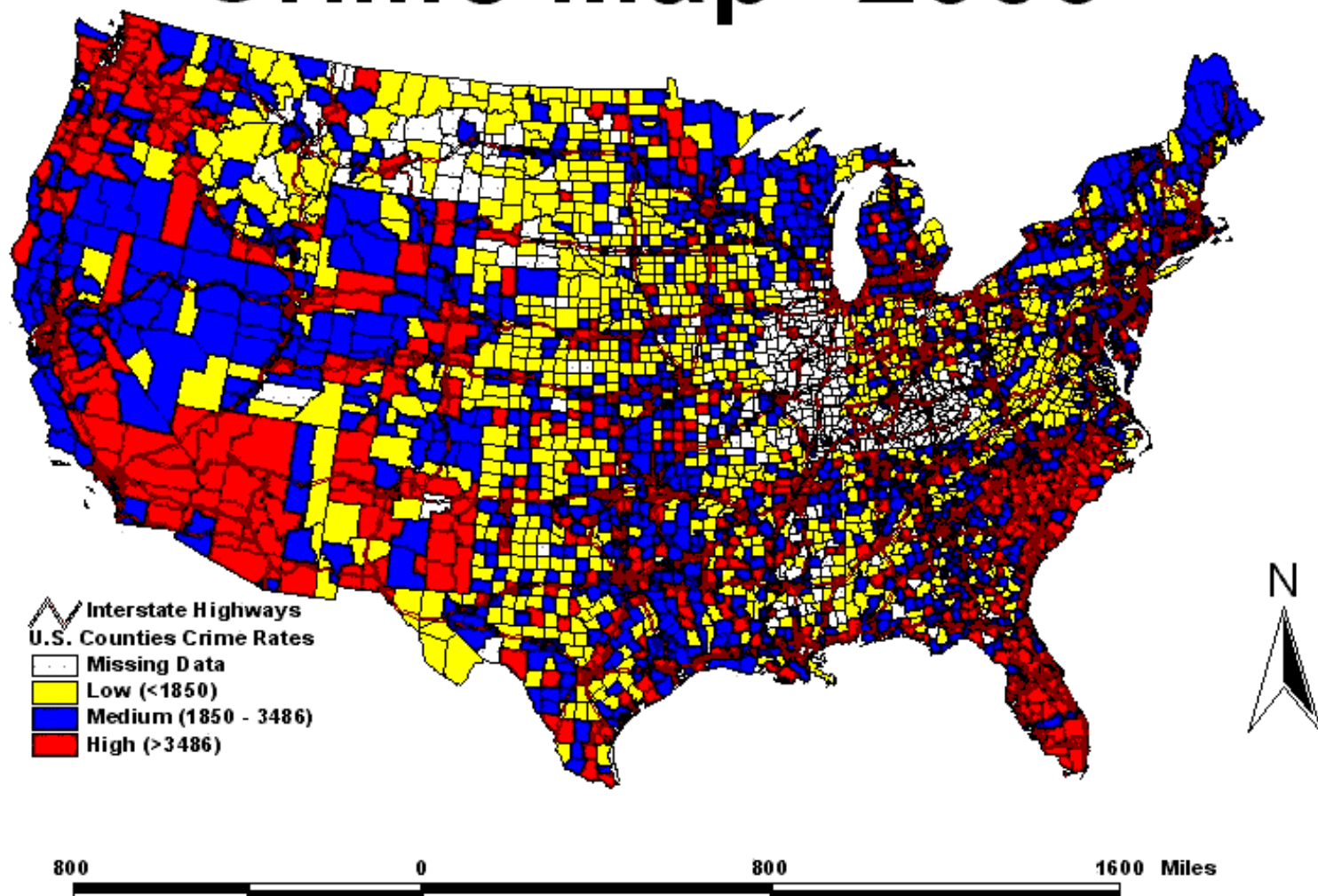
Qualitative Analysis

Employing a color coded legend, crime rate information is mapped per county per year (24 years total), with gold indicating areas with the lowest crime rates (less than 1,850 per 100,000 people annually) shifting through the spectrum to bold blue for medium rates (1,850 to 3,486 incidents per 100,000 people annually), and brightest red for counties with the highest crime rates (greater than 3,486 per 100,000 people annually).

As can be seen in Figure 1, produced by using ArcView, counties containing interstate highways or those close to an interstate system have the highest crime rates. Counties that are not close to interstate systems have the lowest.

As interesting as the static [ArcView](#) map plots are, their real ability to demonstrate the changes in crime movement over time is blunted. The necessity of the reader having to look from map to map, remembering and making comparisons can prove to be cumbersome and taxing. The impact of the data is often lost. By adding [Ulead](#) animation, the problem disappears. Watching the animated Figure 1 displaying the changes in crime patterns from year to year alerts the viewer to the flow of crime from location to location in a compelling and impressive fashion. In animation, the fluid movement of crime becomes indisputably observable.

Crime Map--2000

Interstate Highways
U.S. Counties Crime Rates
Missing Data
Low (<1850)
Medium (1850 - 3486)
High (>3486)

N

800   0   800   1600 Miles

The power of combined ArcView plots and Ulead animation can be harnessed to serve a number of purposes. For those in academia, the clear illustration of the migration of a crime over time drives the point home to students and colleagues efficiently. For practitioners in criminal justice charged with enforcement responsibilities, these tools can facilitate planning for future statewide or multijurisdictional task force strategies as well as showcasing the impact of on-going police efforts to combat intrastate and interstate crime. For smaller rural agencies facing budget battles over the need for increased monies to fight a burgeoning drug problem, this form of presentation becomes a powerful weapon in defending the argument that even "out here in the sticks" the issue is real and immediate. The visible wave of change in crime rates bearing down on their jurisdiction via the interstate road systems makes the statement eloquently in a way numbers and graphs cannot.

Conclusion

As is the case with most exploratory studies, further research needs to be done. Some of the shift in the pattern is probably accountable for by variation in county populations, population growth, and population movement within the United States. Part of the shift in numbers is also indicative of the spread of greater recognition and enforcement of criminal violations. Even with the limitations of official data, this is still one of the best indices we possess to track crime. Cynics and paranoiacs aside, the police are unlikely to execute enforcement where crime is not present. Another factor to be considered when looking into the change in patterns of crimes is the addition of major and medium traffic corridors (U.S. or State Routes). Continuing research by these authors is focusing on those additional considerations.

References

ESRI (1996). ArcView GIS (Version 3.1) Redland, CA: Environmental Systems Research Institute, Inc.

Rubenstein, H., Murray, C., Motoyama, T., Rouse, W. V., & Titus, R. M. (1980). The Link between Crime and the Built Environment: The Current State of Knowledge. Volume 1. United State Department of Justice.

Robinson, Deborah M. (1998). A Comparative Analysis of Environmental Characteristics Related to Criminal Victimization in Activity Areas on Interstate Highway Interchanges and Local Highway Intersections. Journal of Security Administration, 21(1), 45-57.

SPSS (2000). SPSS for Windows (Version 10.0.7). Chicago, Illinois: SPSS, Inc.

Taylor, R. B., & Gottfredson, S. (1986). Environmental Design, Crime and Prevention: An Examination of Community Dynamics. In A. J. Reiss and M. Tonry (Ed.), Communities and Crime (Volume 8) (pp. 387-416). Chicago: The University of Chicago Press.

Ulead Systems (2000). GIF Animator (Version 4.0). Torrance, CA: Ulead Systems, Inc

U.S. Department of Justice, Federal Bureau of Investigation. Uniform Crime Reporting Program Data [United States]: County-Level Detailed Arrest and Offense Data, 1977 - 2000 [Computer file]. ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [producer and distributor]. 2002.

Vernon, Biff (2002). A1-The Great North Road: The Law [on-line]. http://www.biffvernon.freeserve.co.uk/the_law.htm

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