Reducing Gun Violence

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Introduction: Recent mass murders have raised the desire to reduce the rate of violent crimes, especially gunrelated homicides. Gun-related homicides account for approximately 65% of homicides¹. Homicides have been decreasing considerably over time² (Figure 1), although there was a recent increase during the period from 1950 through 1995. The current homicide rate is half of what it was in 1993 (20 years ago). Nevertheless, we might examine if the rate can readily be further decreased. Herein we look only at the correlations between murders involving guns and various sociological measurements.



Figure 1: History of the Homicide Rate in the United States

The purpose of our report is to present data that describes the environment in which we live, addressing the factors that might contribute to gun murders and that might prevent gun murders. Note that we are presenting data, not opinion; therefore, we have not sought endorsement by any organization.

Summary: The factors that correlate strongly with murders with guns are race³ (correlation coefficient = 0.77 with percent blacks⁴), fatherless homes (0.74), and high-school graduation (-0.60) – the very factors that Bill Cosby has been discussing⁵. Gun murders are weakly correlated with poverty (0.42) and abortion rate (0.25) – the respect for life. Self defense (-0.30) is also weakly correlated with gun murders. Population density has a very weak effect (0.15). Gun restriction (0.05) and religious practice (0.36), being positive, have counterintuitive effects; however, perhaps where there are more gun murders, people pray more. (These are first-order correlation coefficients. See Appendix C for a more extensive regression analysis.)

The individual factors are not all independent, so we include in Appendix B the cross correlations. For example, fatherlessness and the black percentage have a correlation coefficient of 0.73; therefore, separating the effects of these two, although calculable, is problematic. Fatherlessness is the likely cause, but it so happens that fatherlessness is higher where the black percentage is higher. High-school graduation and the black percentage have a correlation coefficient of -0.77, so this link is also problematic. Fatherlessness and poverty (0.69) are also highly correlated. Nevertheless, as Bill Cosby has said, getting black children to finish high school, get a job, and stay married to the mother of their children would address all three of these issues. All children, not only black children, would benefit from this strategy; gun murders would then decrease. Although these issues may be dismissed as cultural and therefore beyond the reach of government, the government, through the public schools, greatly influences the culture.

¹ We consider only murder in this report. In the U.S. in 2010, over 16,250 people were victims of homicide and over 38,360 took their own life. (<u>http://www.cdc.gov/violenceprevention/</u>).

² <u>http://www.icpsr.umich.edu/icpsrweb/content/NACJD/guides/homicide.html</u>

³ "Race" is measured as the percent of the state population that is black, white, or Asian.

⁴ A correlation coefficient of 1.0 implies that when one occurs, the other always occurs. A correlation coefficient of

^{-1.0} implies that when one occurs, the other never occurs. A correlation coefficient of 0.0 implies that the two are independent.

⁵ <u>http://www.californiaindianeducation.org/indian_humor/blame_whites.html</u>

Discussion:

A June 8, 2013, Washington Post article cited a study by the Institute of Medicine⁶, a gun-control-advocacy group that called for more research into various aspects of gun violence. The study never asks "why" gun violence occurs and seems to anticipate that children can be taught the guns are "unhealthy." It also implies that people who are out of control (mental disorders, alcohol, drugs) are the major culprits, along with the gunfilled environment that surrounds them.

A 2012 article⁷ cited a report that provides an estimate of the role of mental illness in murders, "A detailed examination of Indiana murder convicts found that 18 percent were diagnosed with 'schizophrenia or other psychotic disorder, major depression, mania, or bipolar disorder." So the role of mental disorders is unsettled, but does not seem as prevalent as the Washington Post article implied.

We consider herein several factors that might contribute to gun-related homicides and their prevention. We do not try to unravel the role of mental disorders. We consider not only possible environmental contributors but also possible deterrents. Perhaps the most obvious deterrent would be the fear of eternal punishment (in hell). Potential murderers might become convinced of such impending eternal punishment. Although the existence of hell and the possibility of going to hell are ascribed to religion, there is no essential link to the existence of God. Buddhism, which has no god, speaks of karma as a link between evil actions and punishment after death. We commonly hear, "What goes around, comes around," Nevertheless, the government seems reluctant to make use of such a concept, even though the government greatly influences the culture, especially through public education. At the very least, politicians and public officials can teach about hell, for example in their speeches.

Except where noted, the data in the following sections are state-by-state data, with murder rates for CY 2010. There are 50 points on each graph, one point per state. We did not include the District of Columbia because its statistics are those of a city rather than a state. When we included the DC data, the results changed drastically, with DC being an outlier in almost every case.

As you examine the statistics, keep in mind that correlation does not mean causation; however, a lack of correlation (i.e., a correlation coefficient near zero) strongly implies a lack of causation.

Environmental causes

Gun Availability

Recent mass murders have given rise to a call for gun control, for the restriction of gun sales. The argument is that fewer guns would result in fewer murders. The data imply otherwise⁸ (Figure 2). The correlation coefficient is only 0.05. The linear trend line shows that gun murders increase slightly as gun restrictions increase – a counter-intuitive effect that can result when the correlation coefficient is so low. The slope is 0.003; the one-sigma uncertainty in the slope is 0.010 – three times the value of the slope. (The highest murder rate, 7.7 per 100,000 population, is for Louisiana.)

⁶ <u>http://www.iom.edu/~/media/Files/Report%20Files/2013/Firearm-Violence/FirearmViolence_Insert.pdf</u>
⁷ http://www.fed-soc.org/publications/detail/madness-deinstitutionalization-murder

⁸ http://www.ask.com/wiki/Gun_violence_in_the_United_States_by_state?o=2800&gsrc=999



Legalization of Abortion

Because murder involves disrespect for life, perhaps there is a link between the murder rate and the abortion rate, in which case making abortions illegal might decrease the murder rate. The correlation coefficient is only 0.25^9 (Figure 3). Notice that the abortion rate is approximately 100 times the gun-murder rate.



Figure 3: Gun Murders – Weakly Correlated with Abortion Rate

Fatherlessness

Because fathers frequently provide worldly guidance to their children, perhaps there is a link between absent fathers and the murder rate. Indeed, the correlation coefficient between the percent of children living with one parent and the murder rate is 0.74 - very high for sociological data (Figure 4)¹⁰. Although there is no state-by-state data on fatherless homes, there is data on single-parent homes. National data show that in approximately 90% of single-parent homes, the mother is the single parent. We used the single-parent data as fatherless data.

⁹ http://www.abort73.com/images/states-data.jpg

¹⁰ <u>http://datacenter.kidscount.org/data/tables/106-children-in-single-parent-families?loc=1&loct=2#detailed/2/10-19,2,20-29,3,30-39,4,40-49,5,50-52,6-9/false/867,133,38,35,18/any/429,430</u>



Figure 4: Gun murders - strongly correlated with one-parent homes

Further study is needed to determine what should be done about fatherless homes. We can ask what might the government do to foster having fathers stay with their children. Alternatively, we can ask what might the government be doing today that discourages fathers from staying with their children. Because the government influences the culture, especially in the public schools, the government is involved in the fatherless phenomenon.

Recklessness

Gun violence might be influenced by recklessness, especially among those in the age group, 18 to 40, the ages at which most gun murders are committed. To gage recklessness, we used alcohol-related driving fatalities. The correlation coefficient is only 0.11^{11} (Figure 5). The slope of the line looks significant, but the one-sigma uncertainty in the slope is 0.12 – more than the slope. The correlation would be much higher were it not for the high alcohol/low murder rate in Wyoming, Montana, and North Dakota (the three points in the lower right of the graph). The correlation coefficient between the use of illegal drugs and gun-murders, for which we do not present a graph, is also low (0.03), again indicating the two are unrelated.



Figure 5: Gun murders - not correlated with alcohol-related driving fatalities

¹¹ <u>http://www-nrd.nhtsa.dot.gov/Pubs/811699.pdf</u>

Gun Ownership

Gun ownership was determined in the Behavioral Risk Factor Surveillance System (BRFSS) in North Carolina in 2001, which surveyed 201,881 respondents nationwide¹². The correlation coefficient is only -0.11, the negative indicating that the more households that have guns, the fewer are the gun murders. However, the one-sigma uncertainty in the slope of the trend line is greater than the slope (Figure 6).



Figure 6: Gun murders – not correlated with gun ownership

Demographics

The unrest caused by poverty is sometimes suggested as a cause for crime, so we looked at the data from the U.S. Bureau of the Census' "quickfacts" for each of the states¹³. The correlation coefficients between each variable in the quickfacts and the per capita gun-murder rate can be found in Appendix A of this report. The cross correlations between every pair of factors is tabulated in Appendix B.

The number of persons living below the poverty level has a weak correlation (0.42), whereas the per-capita income has almost no effect (-0.10) (Figure 7). (The negative sign indicates that higher income results in lower gun-murder rates.) Poverty is strongly correlated with fatherlessness (0.69, see Appendix B).



Figure 7: Gun murders – weakly correlated with poverty

Other measures of economic status, although not measures of poverty, can also be found in the Census data. We examined retail sales (-0.40), median household income (-0.15), and median value of housing units (-0.15). The latter two are weakly correlated with the gun-murder rate. The retail sales is marginally correlated, but the

¹² http://www.washingtonpost.com/wp-srv/health/interactives/guns/ownership.html

¹³ http://quickfacts.census.gov/qfd/index.html

range in retail sales is small (Figure 8). (The retail trend line is obscured by the concentration of retail data points.)



Figure 8: Gun murders – weakly correlated with economic status

The correlation with high-school graduation (Figure 9) is significant (-0.60); the negative sign shows that those who graduate from high-school are less likely to murder than are those who do not.



Figure 9: Gun murders - Correlate Strongly with High-School Graduation

Gun murders seem to increase with population density, the correlation coefficient being small but positive (0.15). Home ownership has little effect (-0.03) and the concentration of multi-family units decreases the gunmurder rate (-0.12) (Figure 10).



Figure 10: Gun murders -- Slightly Correlated with Population Density

Although we do not show a graph, the data show a significant correlation with gender (0.45) (Appendix A) – gun murders increasing with an increasing number of women; however, as with the home-ownership correlation, the range in gender percents is quite narrow (47.9% to 52.7%).

The census data show the strongest correlation with race (0.77 for blacks, Figure 11). Because the correlation coefficient between the percent of the population that is black and the percent of the families with single parents is 0.73, some of the black-race effect is due to the number that are single parents (as Bill Cosby has cited). In addition, the correlation between black families and high-school graduation is -0.77, indicating, as Bill Cosby has also cited, that blacks are much less likely to graduate from high school than are members of other races.



Figure 11: Gun murders -- Strongly Correlated with Race

In Figure 11, the trend line for Asians is skewed by Hawaii, which has a large Asian population and a low crime rate. Absent Hawaii, the trend line for Asians would be steeply upward and the range in percent would only be up to 13.9% (California).

Media portrayal of violence

We sought, unsuccessfully, to find violent-video sales on a state-by-state basis.

Although many people suggest that gun violence is related to games and movies that portray gun violence, there is no firm data to show a link. Because the sale of violent videos has been increasing and the rate of gun murders has been decreasing, the time history indicates that there is no connection. In fact, the time history implies that increased fantasy violence reduces actual violence.

A recent Australian study claims to have proven that there is no link between violent games and violent behavior; however, it was only a few-minute test¹⁴. It did not measure the long-term effects – the effects of playing violent video games for many months. A study at the Center for the Study of Violence, Department of Psychology, Iowa State University showed there is a definite link between playing violent video games and violent behavior. The study involved 364 children, ages 9 to 12, who had played violent games over a 5- to 6-month period¹⁵. The correlation coefficient was 0.40, which was considered by the researchers a strong correlation! Almost every university has a center for the study of violence; however, the goals are primarily the prevention of campus violence. Many have editorials, but without supporting data¹⁶.

¹⁴ http://hothardware.com/News/Australian-Study-Finds-No-Link-Between-Violent-Video-Games-and-AntiSocial-Behavior/

¹⁵ http://www.psychology.iastate.edu/faculty/caa/abstracts/2005-2009/08ASGISYNK.pdf

¹⁶ http://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-gun-policy-and-research/

Deterrents

<u>Jail</u>

The prospects of serving jail time or of being executed should be deterrents from murder. Of the murders committed, 37% are unsolved¹⁷ (Figure 12), so the prospects of jail time are diminished relative to a system in which all murderers would be caught and punished. Individuals that I have known seem to think that, despite the statistics, they will not be caught doing bad things (not including murder). The correlation coefficient between the gun-murder rate and the percent of solved cases is -0.18. The prospects of jail are not much of a deterrent.



Figure 12: Unsolved Murder Cases

The correlation coefficient between the 2010 gun-murder rate and 2010 executions is only 0.09 and between the 2010 gun-murder rate and the total executions since 1977 is only 0.01; therefore, executions seem to be insufficient to deter gun-murderers.

Self Defense

Gun advocates claim that self-defense deters potential murderers. The correlation coefficient is 0.29^{18} (Figure 13); however, the correlation shows that the more common is self-defense, the higher the gun-murder rate. This surprising result serves as a warning concerning errors in analyzing data.

In this case, the opportunities for self defense increase with the number of murders attempted. The proper way to assess the impact of self defense is to consider the fraction of attempts that were repelled by self defense, the ratio of self-defense killings to the sum of self-defense killings and murders (Figure 14). The correlation coefficient is -0.30. So self defense does reduce the murder rate.

¹⁷ http://www.tcpalm.com/news/2010/may/21/murder-mysteries/

http://online.wsj.com/article/SB10001424052702303404704577311873214574462.html?mod=WSJ_hp _LEFTTopStories#articleTabs%3Dinteractive



Figure 13: Self Defense Appears to Increase Gun-Murder Rate



Figure 14: Self Defense Decreases Gun-Murder Rate

Religiosity

Religiosity was measured by the Gallup Poll by asking the question¹⁹, "Is religion an important part of your daily life?" The Poll reported the percent who replied "yes." The correlation coefficient is 0.49 (Figure 15). The perhaps surprising result is that the greater the religiosity, the greater the murder rate.

Data from the U.S. Bureau of Census gives a greatly different picture. The Census reports the number of adherents, state by state, as reported by religious organizations²⁰. Christians account for 77% of the adherents. The correlation coefficient between Christian adherents and the gun-murder rate is -0.07. It appears that religion has a small if salutary impact.

¹⁹ http://www.gallup.com/poll/114022/State-States-Importance-Religion.aspx#2

²⁰ http://www.census.gov/compendia/statab/cats/population/religion.html



Figure 15: Religiosity May Increase Gun-Murder Rates

Pew Research lists the percent that attend religious services weekly²¹. The correlation coefficient with gun murders is 0.36, again showing the more religion means more murders. Pew reports that, nationally, 39% attend weekly services.

The positive correlation coefficient may be due to the absence of preaching about hell, a phenomenon prevalent since the 1960's (see, for example, <u>http://www.christianitytoday.com/ct/2011/aprilweb-only/willgraham.html</u>.) It may also be that where there are more gun murders, people pray more.

²¹ http://religions.pewforum.org/maps

Appendix A: Correlation Coefficients between Per-Capita Gun-Murder Rate and Demographic Factors

The following table was computed from the data on all 50 states at <u>http://quickfacts.census.gov/qfd/index.html</u>. Appendix B has the cross correlations for all of the factors considered in the body of our report.

		Correlation
Line	Description	coefficient
1	High school graduate or higher, percent of persons age 25+, 2007-2011	-0.601
2	White alone, not Hispanic or Latino, percent, 2012	-0.465
3	White alone, percent, 2012 (a)	-0.458
4	Retail sales per capita, 2007	-0.403
5	% repelled in self defense	-0.304
6	Bachelor's degree or higher, percent of persons age 25+, 2007-2011	-0.240
7	Native Hawaiian and Other Pacific Islander alone, percent, 2012 (a)	-0.201
8	Two or More Races, percent, 2012	-0.189
9	Native Hawaiian and Other Pacific Islander-owned firms, percent, 2007	-0.185
10	% solved	-0.180
11	Median value of owner-occupied housing units, 2007-2011	-0.153
12	Median household income, 2007-2011	-0.147
13	Housing units in multi-unit structures, fraction, 2007-2011	-0.121
14	Asian alone, percent, 2012 (a)	-0.107
15	Per capita money income in the past 12 months (2011 dollars), 2007-2011	-0.099
16	Persons 65 years and over, percent, 2012	-0.097
17	American Indian and Alaska Native alone, percent, 2012 (a)	-0.086
18	Asian-owned firms, percent, 2007	-0.056
19	Homeownership rate, 2007-2011, fraction	-0.031
20	Population percent change April 1 2010 to July 1 2012	-0.022
21	Land area in square miles 2010	0.022
22	American Indian- and Alaska Native-owned firms percent 2007	0.012
22	Living in same house 1 year & over nercent 2007-2011	0.010
24	Persons under 5 years persont 2012	0.076
24	Alcohol-Impaired Driving Establisher per 100,000 population	0.070
25	Porcons under 18 voors porcont 2012	0.114
20	Fersions under 18 years, percent, 2012	0.122
27	Language other than English speken at home, percent age 5+, 2007, 2011	0.135
20	Language other than English spoken at nonne, percent age $3+$, 2007-2011 Percons per square mile 2010 (excluding D C)	0.143
29	Hispanis or Lating, porcent, 2012 (b)	0.150
30	Rispanic of Latino, percent, 2012 (b)	0.156
31	Private nonnann employment, percent change, 2010-2011	0.105
32	Lienania aunad firma narrant. 2007	0.229
33	Hispanic-owned firms, percent, 2007	0.239
34	Building permits, 2012	0.240
35	2005 abortion rate per 100,000 population	0.253
36	Merchant wholesaler sales, 2007 (\$1000)	0.254
37	Private nonfarm establishments, 2011	0.294
38	Total number of firms, 2007	0.296
39	Accommodation and food services sales, 2007 (\$1000)	0.303
40	Nonemployer establishments, 2011	0.303
41	Private nonfarm employment, 2011	0.306
42	Retail sales, 2007 (\$1000)	0.313
43	Population, 2012 estimate	0.318
44	Population, 2010 (April 1) estimates base	0.319
45	Population, 2010	0.319
46	Households, 2007-2011	0.330
47	Housing units, 2011	0.342
48	Women-owned firms, percent, 2007	0.342
49	Manufacturers shipments, 2007 (\$1000)	0.347
50	Veterans, 2007-2011	0.366
51	Mean travel time to work (minutes), workers age 16+, 2007-2011	0.403
52	Persons below poverty level, percent, 2007-2011	0.422
53	Female persons, percent, 2012	0.446
54	Percent that claim religion important in their everyday life	0.493
55	Black-owned firms, percent, 2007	0.729
56	Fatherless rate (% of children with single parent)	0.740
57	Black or African American alone, percent, 2012 (a)	0.765

Appendix B: Cross Correlations among Variables

Cross Correlations (colored values are those exceed 0.6 in absolute value	Gun-murder rate per 100,000 population	Fatherless rate	2005 abortion rate per 100,000 population	% solved	% of children with single parent	Alcohol-Impaired Driving Fatalities per 100,000 population	% repelled in self defense	Percent that claim religion important in their everyday life	People QuickFacts	Population, 2012 estimate	Ponulation 2010 (Anril 1) actimates hase	r opulation, so to (npin 1/ catiliates vast	Population, percent change, April 1, 2010 to July 1, 2012	Population, 2010	Persons under 5 years, percent, 2012	Persons under 18 years, percent, 2012	Persons 65 years and over, percent, 2012	Fernale persons, percent, 2012		White alone, percent, 2012 (a)	Black or African American alone, percent, 2012 (a)	American Indian and Alaska Native alone, percent, 2012 (a)	Asian alone, percent, 2012 (a)	Native Hawaiian and Other Pacific Islander alone, percent, 2012 (a)	Two or More Races, percent, 2012	Hispanic or Latino, percent, 2012 (b)	White alone, not Hispanic or Latino, percent, 2012	Living in same house 1 year & over, percent, 2007-2011	Foreign born persons, percent, 2007-2011	Language other than English spoken at home, percent age 5+, 2007-2011	Hgh school graduate or higher, percent of persons age 25+, 2007-2011	Bachelor's degree or higher, percent of persons age 25+, 2007-2011	t10C_COC	Veterel allo, 2007 - 2014 Martin - Martin - Martin Marian (Marian International Anna 164 - 2007,2011
Gun-murder rate per 100,000 population	1.00)																																
Fatherless rate	0.74	1.00																																
2005 abortion rate per 100,000 population	0.25	5 0.15	1.00																															
% solved	-0.18	3 -0.24	-0.51	1.00																														
% of children with single parent	0.74	1.00	0.15	-0.24	1.00																													
Alcohol-Impaired Driving Fatalities per 100,000 population	0.11	L 0.18	-0.46	0.39	0.18	1.00																												
% repelled in self defense	-0.30	0 -0.16	-0.20	0.11	-0.16	-0.10	1.00																											
Percent that claim religion important in their everyday life	0.49	0.49	-0.28	0.16	0.49	0.46	-0.25	1.0	0																									
People QuickFacts																																		
Population, 2012 estimate	0.32	2 0.19	0.29	-0.25	0.19	-0.22	-0.23	0.0	8	1.00)	_																						
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Population, percent change, April 1, 2010 to July 1, 2012	-0.02	2 -0.21	0.26	0.04	-0.21	0.17	0.10	0.0	9	0.06	5 0.0	6 1.0	00	_																				
Population, 2010	0.32	2 0.19	0.29	-0.25	0.19	-0.22	-0.23	0.0	8	1.00	1.0	0 0.0	06 1.	.00	_																			
Persons under 5 years, percent, 2012	0.08	3 -0.17	-0.26	0.20	-0.17	0.18	0.06	0.4	4	0.03	3 0.0	2 0.5	53 0.	.02 1	1.00																			
Persons under 18 years, percent, 2012	0.12	2 -0.14	-0.43	0.19	-0.14	0.09	0.04	0.4	0	0.11	0.1	1 0.2	20 0.	.11 0).89	1.00																		
Persons to years and over, percent, 2012	-0.10	0.17	-0.13	0.07	0.17	0.17	-0.05	-0.0	9	-0.12	-0.1	2 -0.5	od -0.	.12 -0	.70 -	0.58	1.00	1.00																
Female persons, percent, 2012	0.45	0.56	0.48	-0.31	0.56	-0.26	-0.43	0.2	4	0.16	0.1	6 -0.2	29 0.	.16 -0).49 -	0.46	0.33	1.00																
White alone percent 2012 (a)	-0.44	.0.45	-0.52	0.29	-0.45	0.07	0.00	-0.2	2	-0.11	-0.1	1 -0 3	25 -0	11 .0	00	0.12	0.25	-0.27	,	1.00														
Black or African American alone percent 2012 (a)	0.7	7 0 72	0.02	-0.26	0.45	-0.02	-0.36	0.5	1	0.11	1 0.1	3 0 1	18 0	13 .0	04 -	0.17	-0.17	0.27		-0.66	1.00													
American Indian and Alaska Native alone, percent, 2012 (a)	-0.09	-0.07	-0.18	0.22	-0.07	0.32	0.35	-0.0	9	-0.21	-0.2	1 0 3	29 -0	.21 0	0.38	0.27	-0.27	-0.59		0.05	-0.33	1.00												
Asian alone, percent, 2012 (a)	-0.11	-0.12	0.32	-0.21	-0.12	-0.26	0.21	-0.2	6	0.19	0.1	9 0.1	17 0.	.19 0	0.01 -	0.09	-0.07	-0.16		-0.63	-0.08	-0.09	1.00											
Native Hawaijan and Other Pacific Islander alone, percent, 2012 (a)	-0.20	0 -0.13	0.05	-0.08	-0.13	-0.06	0.35	-0.1	3	-0.10	0 -0.1	0 0.1	17 -0.	.10 0	0.10 -	0.02	-0.01	-0.27	,	-0.58	-0.15	0.00	0.90	1.00										
Two or More Races, percent, 2012	-0.19	9 -0.13	0.10	-0.07	-0.13	-0.06	0.39	-0.2	0	-0.09	.0.0	9 0.2	21 -0.	.09 0	0.10 -	0.03	-0.06	-0.33		-0.59	-0.19	0.16	0.90	0.97	1.00									
Hispanic or Latino, percent, 2012 (b)	0.16	5 0.15	0.33	-0.23	0.15	-0.14	-0.08	-0.1	2	0.53	0.5	2 0.2	29 0.	.52 0	0.26	0.27	-0.24	-0.10	1	-0.06	-0.10	0.18	0.21	0.02	0.05	1.00								
White alone, not Hispanic or Latino, percent, 2012	-0.47	7 -0.45	-0.59	0.35	-0.45	0.13	0.05	-0.1	4	-0.40	0 -0.3	9 -0.4	15 -0.	.39 -0	.23 -	0.06	0.34	-0.16	i	0.82	-0.48	-0.07	-0.60	-0.45	-0.47	-0.62	1.00							
Living in same house 1 year & over, percent, 2007-2011	0.05	5 0.08	0.12	-0.03	0.08	-0.17	-0.25	-0.0	7	0.13	0.1	4 -0.6	56 0.	.14 -0).57 -	0.38	0.47	0.51		0.04	0.07	-0.41	0.06	-0.06	-0.14	-0.23	0.18	1.00						
Foreign born persons, percent, 2007-2011	0.13	0.02	0.70	-0.39	0.02	-0.48	-0.10	-0.3	3	0.62	2 0.6	1 0.2	26 0.	.61 -0	.03 -	0.06	-0.18	0.12		-0.38	0.09	-0.12	0.58	0.26	0.28	0.71	-0.69	0.03	1.00					
Language other than English spoken at home, percent age 5+, 2007-2011	0.14	0.08	0.54	-0.33	0.08	-0.35	-0.03	-0.3	0	0.60	0.5	9 0.2	26 0.	.59 0	0.10	0.10	-0.23	-0.03		-0.27	-0.05	0.10	0.49	0.22	0.25	0.90	-0.71	-0.04	0.92	1.00				
High school graduate or higher, percent of persons age 25+, 2007-2011	-0.60	0 -0.77	-0.09	0.13	-0.77	-0.17	0.23	-0.6	1	-0.43	-0.4	3 0.0	05 -0.	.43 -0	.09 -	0.11	0.02	-0.43		0.29	-0.51	0.18	0.07	0.15	0.19	-0.34	0.45	-0.03	-0.19	-0.25	1.00			
Bachelor's degree or higher, percent of persons age 25+, 2007-2011	-0.24	4 -0.42	0.71	-0.36	-0.42	-0.51	-0.12	-0.5	3	0.04	0.0	4 0.3	31 0.	.04 -0).24 -	0.39	-0.23	0.26		-0.23	0.17	-0.12	0.24	0.04	0.08	0.13	-0.24	0.10	0.47	0.33	0.41	1.00	(
Veterans, 2007-2011	0.37	0.25	0.24	-0.24	0.25	-0.19	-0.22	0.1	3	0.97	0.9	7 0.0	07 0.	.97 -0	0.02	0.08	-0.03	0.19		-0.10	0.16	-0.23	0.14	-0.11	-0.11	0.48	-0.36	0.09	0.55	0.53	-0.42	-0.01	. 1.0	0
Mean travel time to work (minutes), workers age 16+, 2007-2011	0.40	0.31	0.68	-0.42	0.31	-0.49	-0.27	-0.0	8	0.45	0.4	5 -0.0	0.	.45 -0).35 -	0.33	-0.04	0.63	1	-0.49	0.53	-0.49	0.34	0.07	0.04	0.24	-0.52	0.41	0.63	0.46	-0.34	0.45	0.4	3 1.0

Housing units, 2011 Homeownership rate, 2007-2011, fraction Housing units in multi-unit structures, fraction, 2007-2011 Median value of owner-occupied housing units, 2007-2011	00000000000000000000000000000000000000	East rate 0.22 -0.05 -0.15	60.0 18.0 18.0	ba Alos % -0.26 0.30 -0.38	0.22 0.05 0.15 0.25	0.0 0 12 12 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0	% rebelled in set detense 0.02 0.09	0 0 0 9 15 0 1 Percent that claim religion important in their everyday life	People QuickFacts	6600 6670-2520-2 6712 estimate	60. 12:0- 12:0- 12:0-	15:00 27:000	01001 00100 001001 001000 001000000	0.012 0.02 0.02 0.02 0.02 0.02 0.02 0.02	PF0-0 99700 - 18 years, percent, 2012	PT:00 Persons 65 years and over, percent, 2012	6000 f 6000 f 6100 f 6000 f 60	50.0 White alone, percent, 2012 (a)	0.00 18 Black or African American alone, percent, 2012 (a)	0.0.0 12.0.0 12.0.0 12.0.0 12.0 12.0 12.	540-0 400-0 400-00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	20.00 12:00 14:000	850°- 860°- 800°-	0	10.00 11.00	89:00 89:00 2007-2011	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	20.00 12.00 14.00 15.00 15.4, 2007-2011	20. 0 b 24. 0 Bachelor's degree or higher, percent of persons age 25+, 2007-2011	80.0 11.0- 80.0	6 0 0- 0- 0 55 52 B Mean travel time to work (minutes), workers age 16+, 2007-2011
Households 2007-2011	0.22	0.20	0.05	-0.34	0.20	-0.45	-0.25	0.07		1.00	1.00	0.27	2 1.00	0.00	0.04	-0.09	0.05	0.52	0.07	-0.12	0.19	0.55	-0.11	0.27	-0.34		0.16	0.72	0.57	-0.42	0.04	0.00	0.35
Porcept per bousehold 2007 2011	0.33	0.20	0.00	0.20	0.20	0.25	0.25	0.08		0.41	0.41	0.03	5 1.00	0.00	0.05	-0.00	0.15	0.10	0.14	0.23	0.10	0.11	0.20	0.30	0.57		0.10	0.00	0.57	0.26	0.04	0.30	0.40
Persons per nousehold, 2007-2011	0.23	0.01	0.00	-0.10	0.01	-0.18	0.11	0.13		0.41	0.41	0.16	0.41	0.54	0.00	-0.44	-0.25	-0.31	-0.05	0.02	0.51	0.43	0.39	0.49	-0.52		-0.07	0.50	0.56	-0.26	-0.15	0.35	0.24
Per capita money income in the past 12 months (2011 dollars), 2007-2011	-0.10	-0.31	0.75	-0.27	-0.31	-0.48	-0.08	-0.56		0.05	0.05	0.25	0.05	-0.33	5 -0.48	-0.21	0.21	-0.30	0.20	-0.10	0.30	0.06	0.12	0.10	-0.28		0.15	0.52	0.36	0.36	0.90	0.00	0.51
Median household income, 2007-2011	-0.15	-0.42	0.54	-0.19	-0.42	-0.52	0.09	-0.61		0.08	0.08	0.21	L 0.08	-0.12	2 -0.15	-0.34	-0.09	-0.28	-0.05	-0.01	0.51	0.28	0.33	0.17	-0.30		0.15	0.59	0.47	0.45	0.75	0.01	0.43
Persons below poverty level, percent, 2007-2011	0.42	0.69	-0.10	-0.09	0.69	0.34	-0.18	0.67		0.13	0.13	0.02	2 0.13	0.18	3 0.10	0.05	0.33	-0.17	0.44	0.01	-0.30	0.19	-0.23	0.11	-0.22		-0.18	-0.21	-0.11	-0.76	-0.47	0.16	-0.01
Business QuickFacts																																	
Private nonfarm establishments, 2011	0.29	0.15	0.33	-0.25	0.15	-0.25	-0.24	0.03		0.99	0.99	0.05	5 0.99	-0.01	0.07	-0.09	0.16	-0.10	0.12	-0.21	0.20	0.10	-0.09	0.52	-0.38		0.16	0.64	0.60	-0.38	0.08	0.96	0.47
Private nonfarm employment, 2011	0.31	0.16	0.31	-0.26	0.16	-0.25	-0.25	0.06		1.00	1.00	0.04	1.00	0.00	0.09	-0.11	0.18	-0.10	0.13	-0.23	0.19	0.11	-0.10	0.51	-0.38		0.17	0.62	0.59	-0.40	0.08	0.97	0.47
Private nonfarm employment, percent change, 2010-2011	0.16	0.06	0.19	0.07	0.06	0.08	-0.34	0.25		0.25	0.25	0.26	5 0.25	0.04	-0.11	-0.05	0.15	-0.20	0.25	-0.15	0.06	0.03	0.01	0.02	-0.17		-0.04	0.11	0.05	-0.14	0.06	0.27	0.12
Nonemployer establishments, 2011	0.30	0.18	0.31	-0.26	0.18	-0.21	-0.21	0.06		0.99	0.99	0.09	0.99	0.02	0.09	-0.11	0.15	-0.12	0.13	-0.20	0.20	0.09	-0.09	0.54	-0.41		0.12	0.64	0.61	-0.42	0.06	0.96	0.45
Total number of firms, 2007	0.30	0.17	0.32	-0.26	0.17	-0.23	-0.22	0.04		0.99	0.99	0.08	0.99	0.01	0.08	-0.10	0.15	0.11	0.12	-0.20	0.20	0.09	-0.09	0.53	-0.40		0.14	0.64	0.61	-0.41	0.07	0.96	0.46
Black-owned firms, percent, 2007	0.73	0.67	0.53	-0.34	0.67	-0.08	-0.34	0.46		0.18	0.18	0.20	0.18	-0.03	-0.16	-0.23	0.67	-0.67	0.98	-0.31	-0.05	0.14	-0.17	-0.05	-0.51		0.07	0.16	0.01	-0.47	0.23	0.20	0.58
American Indian- and Alaska Native-owned firms, percent, 2007	0.02	0.03	-0.09	0.13	0.03	0.18	0.38	-0.08		-0.13	-0.14	0.25	5 -0.14	0.35	0.24	-0.37	-0.51	-0.12	-0.21	0.92	0.04	0.11	0.29	0.18	-0.20		-0.41	-0.04	0.16	0.10	-0.09	-0.15	-0.33
Asian-owned firms, percent, 2007	-0.06	-0.05	0.32	-0.21	-0.05	-0.20	0.19	-0.17		0.19	0.19	0.18	3 0.19	0.01	-0.10	-0.04	-0.10	-0.69	0.00	-0.13	0.99	0.92	0.89	0.20	-0.63		0.07	0.55	0.46	0.00	0.20	0.15	0.37
Native Hawaiian and Other Pacific Islander-owned firms, percent, 2007	-0.18	-0.10	0.06	-0.09	-0.10	-0.05	0.31	-0.11		-0.07	-0.07	0.12	2 -0.07	0.04	-0.07	0.06	i -0.21	-0.58	-0.13	-0.06	0.90	0.99	0.95	0.01	-0.44		0.02	0.25	0.20	0.12	0.04	-0.09	0.10
Hispanic-owned firms, percent, 2007	0.24	0.26	0.38	-0.26	0.26	-0.09	-0.09	-0.04		0.60	0.59	0.28	3 0.59	0.11	0.09	-0.06	0.06	-0.12	0.03	0.10	0.17	0.00	0.00	0.91	-0.62		-0.10	0.69	0.84	-0.40	0.12	0.60	0.32
Women-owned firms, percent, 2007	0.34	0.35	0.71	-0.58	0.35	-0.38	-0.26	-0.09		0.35	0.35	0.19	9 0.35	-0.19	-0.31	-0.17	0.41	-0.58	0.48	-0.23	0.40	0.19	0.21	0.42	-0.69		0.06	0.60	0.54	-0.25	0.50	0.35	0.73
Manufacturers shipments, 2007 (\$1000)	0.35	0.23	0.09	-0.20	0.23	-0.12	-0.23	0.25		0.86	0.86	-0.04	1 0.86	0.12	0.23	-0.20	0.15	-0.05	0.15	-0.26	0.07	0.13	-0.15	0.35	-0.25		0.13	0.31	0.35	-0.45	-0.12	0.83	0.28
Merchant wholesaler sales, 2007 (\$1000)	0.25	0.11	0.33	-0.23	0.11	-0.23	-0.24	0.02		0.97	0.97	0.03	0.97	0.03	0.12	-0.16	0.14	0.09	0.09	-0.19	0.22	0.09	-0.09	0.54	-0.39		0.20	0.65	0.63	-0.40	0.10	0.89	0.45
Retail sales, 2007 (\$1000)	0.31	0.17	0.30	-0.25	0.17	-0.23	-0.23	0.05		1.00	1.00	0.06	5 1.00	0.01	0.10	-0.09	0.16	-0.10	0.12	-0.22	0.20	0.10	-0.10	0.53	-0.39		0.14	0.63	0.61	-0.41	0.06	0.97	0.46
Retail sales per capita, 2007	-0.40	-0.52	-0.35	0.33	-0.52	0.16	0.29	-0.42		-0.19	-0.19	-0.04	4 -0.19	-0.11	0.05	0.19	-0.47	0.41	-0.54	0.12	0.01	0.03	0.02	-0.07	0.37		0.08	-0.09	-0.05	0.51	-0.04	-0.18	-0.29
Accommodation and food services sales, 2007 (\$1000)	0.30	0.18	0.38	-0.30	0.18	-0.27	-0.20	-0.03		0.95	0.95	0.11	L 0.95	0.01	0.07	-0.12	0.11	-0.17	0.12	-0.20	0.30	0.02	-0.01	0.60	-0.48		0.06	0.74	0.69	-0.42	0.08	0.91	0.48
Building permits, 2012	0.24	0.18	0.14	-0.08	0.18	-0.01	-0.10	0.22		0.78	0.77	0.34	0.77	0.19	0.22	-0.19	0.05	-0.07	0.13	-0.15	0.07	0.09	-0.10	0.53	-0.37		0.12	0.44	0.49	-0.42	-0.02	0.81	0.26
Geography QuickFacts																																	
Land area in square miles, 2010	0.01	-0.07	-0.15	0.09	-0.07	0.10	0.42	-0.09		0.14	0.14	0.34	4 0.14	0.48	0.43	-0.56	-0.66	0.03	-0.25	0.69	-0.01	0.00	0.12	0.26	-0.14		0.52	0.04	0.22	0.06	-0.14	0.12	-0.35
Persons per square mile, 2010 (excluding D.C.)	0.15	0.08	0.70	-0.28	0.08	-0.25	-0.15	-0.09		-0.08	-0.08	0.39	9 -0.08	-0.13	-0.46	-0.18	0.45	-0.42	0.53	-0.12	0.03	0.02	-0.01	0.00	-0.34		0.11	0.20	0.07	-0.01	0.63	-0.11	0.34

	iousing units, 2011	iomeownership rate, 2007-2011, fraction	iousing units in multi-unit structures, fraction, 2007-2011	Aedian value of owner-occupied housing units, 2007-2011	iouseholds, 2007-2011	ersons per household, 2007-2011	er capita money income in the past 12 months (2011 dollars), 2007-2011	Aedian household income, 2007-2011	ersons below poverty level, percent, 2007-2011	.00	usiness QuickFacts	rivate nonfarm establishments, 2011	rivate nonfarm employment, 2011	rivate nonfarm employment, percent change, 2010-2011	ionemployer establishments, 2011	001	otal number of firms. 2007	Hack-owned firms, percent, 2007	rmerican Indian- and Alaska Native-owned firms, percent, 2007	sian-owned firms, percent, 2007	tative Hawaiian and Other Pacific Islander-owned firms, percent, 2007	ilspanic-owned firms, percent, 2007	Vomen-owned firms, percent, 2007	.00	Aanufacturers shipments, 2007 (\$1000)	/lerchant wholesaler sales. 2007 (\$1000)	etail sies. 2007 (\$1000)	tetail sales per capita, 2007	ccommodation and food services sales, 2007 (\$1000)	uilding permits, 2012	.00	ieography QuickFacts	and area in square miles, 2010	'ersons per square mile, 2010 (excluding D.C.)
Housing units 2011	1 00	I	I	2	I	ā	ď.	2	ď.	o	ä	ā	ā	ā	z	o	Ĕ	8	۲	∢	z	I	5	Ö	2	2	œ	, œ	4	ā	Ö	U	<u> </u>	م
Homeownership rate 2007-2011 fraction	-0.22	1.00																																
Housing units in multi-unit structures, fraction, 2007-2011	0.21	-0.81	1.00																															
Median value of owner-occupied housing units, 2007-2011	0.13	-0.66	0.77	1.00																														
Households, 2007-2011	1.00	-0.24	0.22	0.15	1.00																													
Persons per household, 2007-2011	0.37	-0.05	-0.03	0.27	0.38	1.00																												
Per capita money income in the past 12 months (2011 dollars), 2007-2011	0.03	-0.53	0.78	0.76	0.05	-0.15	1.00																											
Median household income, 2007-2011	0.05	-0.35	0.62	0.80	0.07	0.26	0.86	1.00																										
Persons below poverty level, percent, 2007-2011	0.15	-0.09	-0.26	-0.45	0.14	-0.07	-0.57	-0.79	1.00																									
Business QuickFacts																																		
Private nonfarm establishments, 2011	0.99	-0.27	0.26	0.20	0.99	0.38	0.09	0.11	0.09			1.00																						
Private nonfarm employment, 2011	0.99	-0.26	0.25	0.18	1.00	0.38	0.09	0.11	0.10			0.99	1.00																					
Private nonfarm employment, percent change, 2010-2011	0.27	-0.25	0.24	0.01	0.26	-0.11	0.11	-0.02	0.14			0.23	0.26	1.00	C																			
Nonemployer establishments, 2011	0.99	-0.27	0.24	0.19	0.99	0.41	0.06	0.09	0.13			0.99	0.99	0.23	3 1.00)																		
Total number of firms, 2007	0.99	-0.27	0.25	0.20	0.99	0.40	0.07	0.10	0.11			1.00	0.99	0.23	3 1.00)	1.00)																
Black-owned firms, percent, 2007	0.20	-0.34	0.28	0.12	0.19	-0.02	0.25	0.01	0.40			0.17	0.18	0.24	4 0.19)	0.18	3 1.00																
American Indian- and Alaska Native-owned firms, percent, 2007	-0.15	-0.12	-0.10	-0.02	-0.15	0.12	-0.02	0.07	0.01			-0.14	-0.15	-0.13	3 -0.12	2	-0.13	3 -0.19	1.00															
Asian-owned firms, percent, 2007	0.17	-0.45	0.42	0.71	0.18	0.50	0.25	0.43	-0.20			0.20	0.19	0.09	9 0.20)	0.20	0.03	-0.01	1.00														
Native Hawaiian and Other Pacific Islander-owned firms, percent, 2007	-0.09	-0.25	0.23	0.51	-0.09	0.39	0.05	0.25	-0.18			-0.08	-0.08	0.04	4 -0.07	7	-0.07	7 -0.11	0.03	0.92	1.00													
Hispanic-owned firms, percent, 2007	0.60	-0.32	0.27	0.23	0.58	0.39	0.10	0.10	0.18			0.59	0.58	0.09	9 0.63	3	0.62	0.08	0.11	0.18	0.00	1.00												
Women-owned firms, percent, 2007	0.35	-0.54	0.54	0.55	0.36	0.15	0.50	0.36	0.10			0.36	0.36	0.23	3 0.35	5	0.35	6 0.55	-0.07	0.43	0.22	0.45	1.00											
Manufacturers shipments, 2007 (\$1000)	0.85	-0.08	0.02	-0.07	0.86	0.32	-0.11	-0.08	0.23			0.81	0.86	0.29	9 0.82	2	0.81	0.18	-0.17	0.07	-0.10	0.37	0.21		1.00									
Merchant wholesaler sales, 2007 (\$1000)	0.95	-0.28	0.28	0.23	0.96	0.42	0.12	0.16	0.07			0.96	0.97	0.19	0.96	5	0.96	5 0.14	-0.13	0.21	-0.07	0.58	0.31		0.84	1.0	D							
Retail sales, 2007 (\$1000)	0.99	-0.24	0.22	0.18	1.00	0.40	0.07	0.11	0.10			0.99	1.00	0.24	4 0.99)	0.99	0.17	-0.14	0.19	-0.08	0.61	0.34		0.84	0.9	7 1.0	נ						
Retail sales per capita, 2007	-0.20	0.42	-0.24	-0.01	-0.20	0.05	0.03	0.27	-0.64			-0.17	-0.19	-0.34	4 -0.16	5	-0.16	5 -0.54	-0.03	-0.04	0.03	-0.10	-0.47		-0.25	-0.14	4 -0.1	5 1.00	·					
Accommodation and food services sales, 2007 (\$1000)	0.94	-0.37	0.31	0.30	0.95	0.44	0.12	0.17	0.08			0.96	0.95	0.18	3 0.96	5	0.96	0.17	-0.13	0.29	-0.01	0.63	0.40		0.74	0.9	3 0.9	5 -0.14	1.00					
Building permits, 2012	0.79	-0.15	0.06	-0.02	0.77	0.34	-0.05	-0.02	0.19			0.74	0.76	0.27	0.78	5	0.76	0.16	-0.10	0.08	-0.07	0.63	0.21		0.77	0.74	4 0.7	3 -0.09	0.70	1.00	-			
Geography QuickFacts																																		
Land area in square miles, 2010	0.12	-0.10	-0.14	-0.09	0.12	0.26	-0.07	0.09	-0.04			0.12	0.12	-0.09	9 0.15	5	0.13	3 -0.22	0.75	-0.07	-0.07	0.17	-0.13		0.16	0.1	5 0.1	3 0.05	, 0.13	0.24		7	1.00	
Persons per square mile, 2010 (excluding D.C.)	-0.09	-0.67	0.65	0.45	-0.08	-0.35	0.61	0.24	0.14			-0.07	-0.06	0.27	7 -0.07	7	-0.07	0.54	-0.06	0.07	-0.03	0.08	0.45		-0.11	-0.0	5 -0.0	8 -0.52	2 -0.04	-0.08		-(0.18	1.00

Appendix C: Results of a Multiple Linear Regression

One of my reviewers objected that the first-order analysis presented in the body of this report over-emphasizes the importance of some of the independent variables. Except for the "over", I agree with the reviewer's criticism. In the following, I try to put the importance in perspective by computing the R-squared of various combinations of independent variables. R-squared is the ratio of the residual variance to the variance computed by assuming the gun-murder rate to be equal to the average (2.5). The latter might be called the zero-order variance. The variance is the square of the difference between the measured (reported) value and the value obtained from the regression equation. The reviewer liked to use the term "partial correlation coefficient", which is the correlation coefficient after subtracting from the measured value the value computed from a regression equation for the other variables. For example, we could compute the regression equation for the gun murders as a function of fatherlessness and high-school graduation, then compute the difference between the measured value and the value computed from this regression equation. The (partial) correlation coefficient is the correlation between this difference and, for example, the percent of the state population that is black. Such a procedure depends on which variables are used to generate the regression equation. For example, if percent black and fatherlessness were correlated one-to-one and we used the steps just described, the procedure would show that there was no effect of the percent black.

A better method of evaluation would consider the R-squared of various combinations such as done in the following table. The strong correlation coefficient between fatherlessness and percent black makes small the difference between fatherlessness alone (0.547) and percent black alone (0.585). It also makes small the difference between either of these alone and both combined (0.657).

Fatherlessness	High-school grad	Blackness	R-squared
	included		0.361
included			0.547
included	included		0.550
		included	0.585
	included	included	0.619
included		included	0.657
included	included	included	0.658

The differences between the R-squared values can be seen on a graph of the value as calculated from the regression equation (on the x axis) and the measured value (on the y axis) (Figure C-1). To compute R-squared, we first compute the sum of the squares of the horizontal differences between the data points and the 45-degree line. We subtract this sum from the zero-order variance and divide the difference by the zero-order variance. The result is the fraction of the zero-order variance that has been "explained" by the regression equation.



Figure C-1: An Illustration of the Differences in R-Squared