

FEMALE EDUCATION AND HOMICIDE RATES ACROSS COUNTRIES:
EVIDENCE AND SOME EXPLANATIONS

by Julio H. Cole and Andrés Marroquín Gramajo

Abstract:

This paper attempts to explain the cross-country variation in homicide rates (per 100,000 population) for a large sample of countries. One major finding is a curious and unexpected statistical relationship between the level of education and homicide rates: while an increase in male education tends to reduce homicide rates, an increase in female education tends to increase homicides. The paper reviews the evidence regarding this phenomenon, and suggests some possible explanations.

1. INTRODUCTION.

Violent death has been declared a leading public health problem worldwide (Krug, Powell and Dahlberg, 1998, p. 214), and the country we live in has one of the highest murder rates in the world. The TV news and newspapers are full of murder reports. Our interest on this topic comes therefore from our interaction with a situation that affects us directly and that we want to understand.

We began by testing previous theories that each of us considered plausible and had initially thought about, heard about, or read about. In a sense we wanted to test our intuition. As we tested our theories through regression analysis and different data sources we realized that the evidence was not supportive of most of these theories, and this was disappointing. However, by serendipity, so to speak, we also found unexpected and puzzling results that were intellectually intriguing.

2. HOMICIDE RATES AROUND THE WORLD.

2.1. Some Descriptive Statistics.

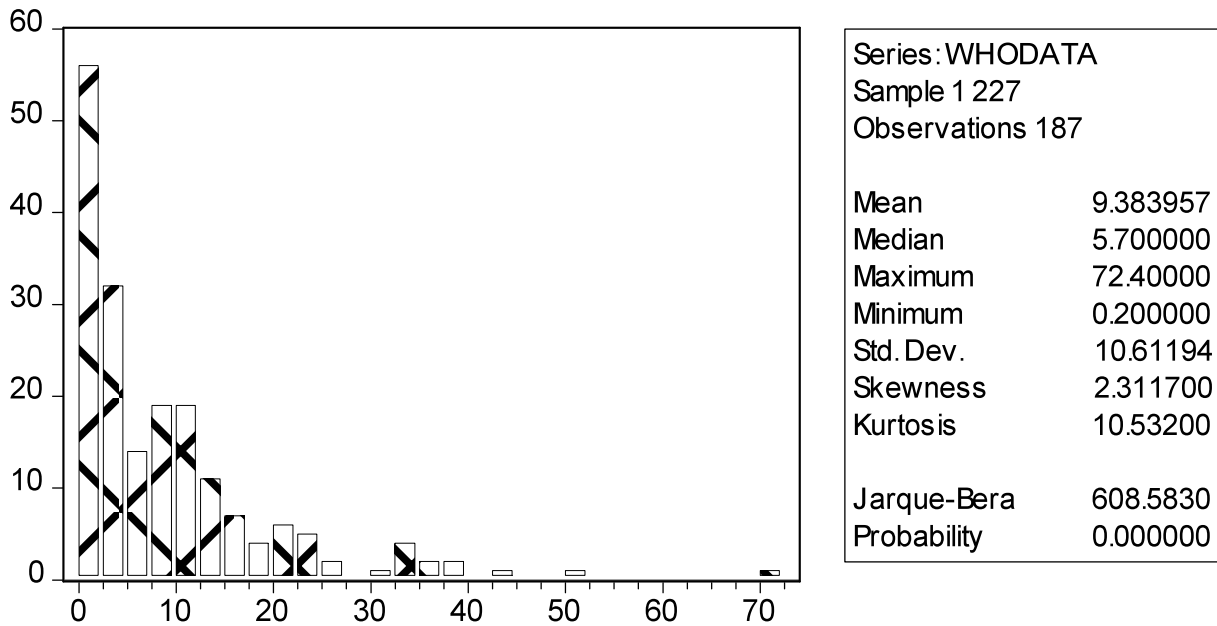
Homicide rates vary greatly across countries. Moreover, the distribution of countries by homicide rates is highly skewed: a few countries have relatively high homicide rates, while most countries have relatively low rates. Countries such as Colombia and Sierra Leone can have above 50 homicides per 100,000 people per year, while other countries, such as Austria and Iceland, can have less than 1. The variation is indeed high. High variation also exists regarding the way in which homicide is perpetrated (e.g., whether a firearm was or was not used, see Krug, Powell and Dahlberg, 1998, pp. 217-18). Murders also vary across time and by gender of victims (see Gartner, 1990, p. 98). As Gartner indicates in her study of homicides in developed democracies:

Homicide rates in western societies appear to have declined over the last several hundred years, but more recently, they experienced sharp, short-term upsurges in the early 19th century and in the last two decades (Gurr, 1981, cited in Gartner, 1990, p. 92). Even over relatively brief periods, the risk of violent death can vary greatly: homicide rates in developed democracies averaged 60 per cent higher in the late 1970s than in the late 1950s (World Health Organization, various years, cited in Gartner, 1990, p. 92).

Following Reza, Mercy and Krug (2001), we define homicides as fatal injuries inflicted by another person with intent to injure or kill, by any means. This includes unintended firearms-related deaths. However, the proportion of unintended firearms-related deaths is small compared with the total of homicides (Reza, Mercy and Krug, 2001, p. 105). We do not analyze intended and unintended deaths separately because the data sources usually present them together. In addition, we consider suicide deaths as a different category, and in this study they are therefore left out the analysis. Our definition of homicide also excludes deaths resulting from civil wars. More specifically our study focuses on the W-158 category, “deaths caused by violence,” in the *World Health Report 2004*.¹

The latest available WHO tabulation of “Death Rates by Cause of Death” (for 2002) covers 187 countries, with a mid-2002 population of 6,179 millions (i.e., 99.2 % of the estimated world total). Thus, these data provide essentially complete coverage of cause-of-death data around the world. The following figure shows the frequency distribution of countries according to their rates of “violent deaths (per 100,000 pop.)”:

¹The basic dataset is from “Table 3. Estimated deaths per 100,000 population by cause, and Member State, 2002 (a),” Dec 2004 (<http://www.who.int/healthinfo/statistics/bodgbddeathdalyestimates.xls>).



As noted above, most countries have relatively low rates (half have under 5.7/100,000), but the world average is boosted upwards by a relatively few, very high homicide rate countries. The unweighted mean for 187 countries circa 2002 is 9.38/100,000. (Weighting by population yields an essentially similar number: 9.08/100,000.) For comparison, Reza, Mercy and Krug (2001, p. 106) found that for 1990 there were an estimated of 10.5 homicides per 100,000 in the world.

However, just over half of all murders in the world (52.6 per cent) are accounted for by the 25 countries with murder rates above 20 per 100,000 (i.e., over twice the world average). The (weighted) average murder rate for these 25 countries is 30.3 per 100,000, over three times the world average.²

2.2. Homicides by Gender.

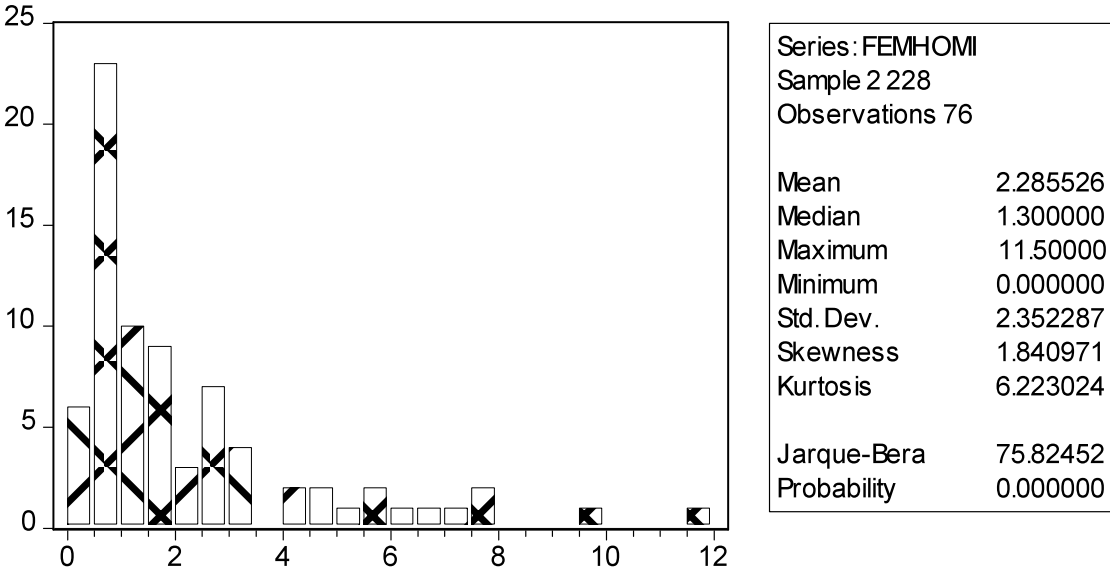
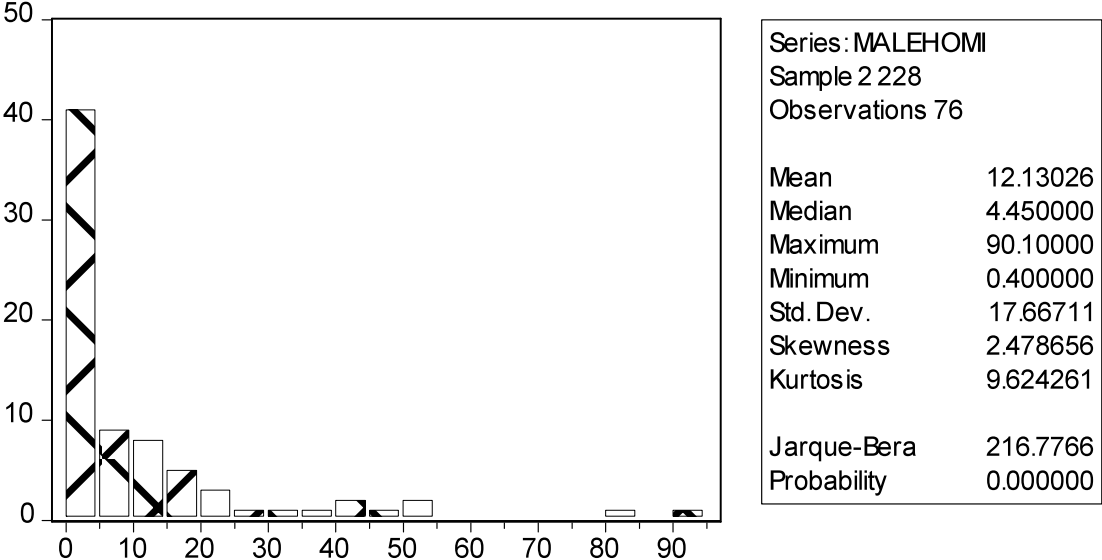
Our data coverage for the breakdown of murder rates by gender is not as full (only 76 countries). Even for this limited sample of countries, however, comparisons are useful. Homicide rates are much higher for males than for females. Depending on how this proportion is estimated, there are,

²For the record, the 25 most homicide-prone countries (and their homicide rates) as of 2002 were:

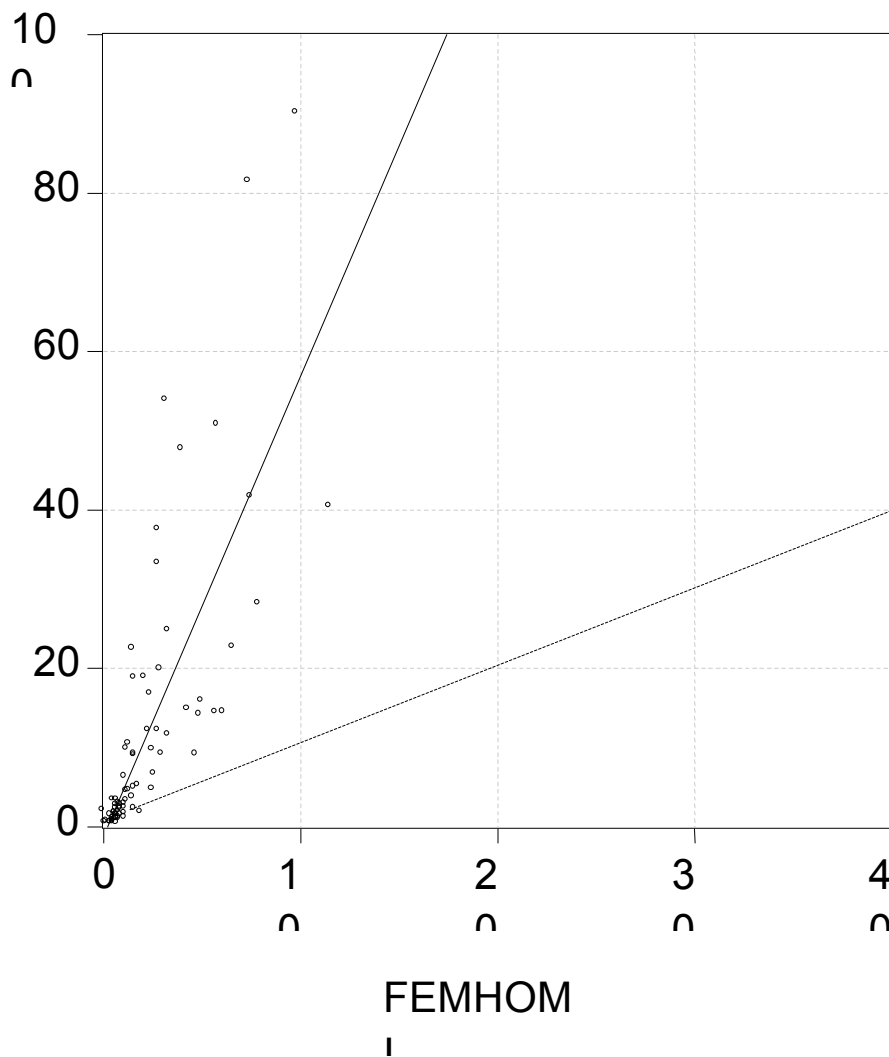
Colombia	72.4	Guatemala	37.1	Brazil	32.6	Guinea	23.8	Bahamas	21.2
Sierra Leone	50.3	Venezuela	35.2	Sudan	30.4	Centrl Afr. Rep.	23.5	Philippines	21.1
South Africa	43.2	Somalia	33.1	Cote d'Ivoire	27.4	Ecuador	23.1	Uganda	20.8
Angola	39.6	Russia	32.9	Namibia	27.0	Nigeria	23.1	Ethiopia	20.5
El Salvador	38.4	Liberia	32.8	Tanzania	24.0	Congo, Dem.	21.3	Rwanda	20.0

These countries represented only 15.6 per cent of world population.

on average, between 5.3 and 5.6 male homicides for every female homicide in the 76 country sample.³ This is consistent with the stylized facts in the literature (see Rossow, 2001, p. S79). Gartner (1992, p. 92) notes, for example: “[F]or the case of the the United States, where most models of variation in homicide rates have been tested, young adult males are substantially more likely to be murdered than females or children.”



³5.3 is the ratio of the (unweighted) country averages. 5.6 is the slope of the regression line in the scatter diagram on the following page.



In this scatter plot, the vertical axis is the male homicide rate. Note that practically all of the points lie above the (dashed) 45 degree line, showing that male rates are almost always higher (and often much higher) than female rates. In most countries, the victims of murder tend to be predominantly men.⁴

2.3. Regional Variation.

There is a very marked degree of regional variation in world-wide homicide rates. This can be appreciated by comparing averages for countries grouped along regional and/or socio-economic lines. For this, we will follow the regional groupings used by Reza, Mercy and Krug (2001), who classified countries into six categories:

1. Established Market Economies (EME)
2. Formerly Socialist Economies (FSE)

⁴Another stylized fact: it is well known from the criminological literature that most perpetrators of murders also tend to be men (and predominantly young men).

3. Middle East Crescent (MEC)
4. Other Asia and Islands (OAI)
5. Sub-Saharan Africa (SSA)
6. Latin America and the Caribbean (LAC)

This is a useful classification, though we found it convenient to disaggregate the LAC countries into two distinct categories:

- 6a. Spanish- and Portuguese-speaking countries of the Western Hemisphere (LA)
- 6b. English-, French- and Dutch-speaking islands of the Caribbean (CAR)

The reason for this separation is that, as will be seen below, these two groups of countries, though geographically close, have markedly different homicide rates.

Table 1. Worldwide Homicide Rates by Region.

	N	Mean	Median	Standard Deviation	Max	Min
EME	25	1.3400	1.1	0.9916	5.4	0.6
FSE	19	7.4842	3.0	8.1072	32.9	0.8
MEC	31	3.8129	2.9	4.0037	19.7	0.2
OAI	33	6.8424	4.4	6.2463	21.1	0.7
SSA	46	16.4761	12.75	10.8958	50.3	2.2
LA	19	18.4158	10.2	17.6700	72.4	3.6
CAR	14	9.0929	9.35	4.9707	21.2	0.5
World	187	9.3839	5.7	10.6119	72.4	0.2

(For the full list of countries in each regional category, see Appendix 1.)

Clearly, homicide rates in Latin American and Sub-saharan African countries tend to be much higher than in the rest of the world (note that most of the countries in the Top 25 list are from these two regions). Another way to summarize these results is to compute a regression using regional dummies:

Dependent Variable: WHODATA
 Method: Least Squares
 Date: 01/29/09 Time: 09:59
 Sample(adjusted): 1 227
 Included observations: 187
 Excluded observations: 40 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EMEDUM	1.340000	1.777623	0.753816	0.4519
FSEDUM	7.484211	2.039073	3.670399	0.0003
OAIDUM	6.842424	1.547222	4.422394	0.0000
SSADUM	16.47609	1.310481	12.57255	0.0000
LADUM	18.41579	2.039073	9.031452	0.0000
CARDUM	9.092857	2.375448	3.827849	0.0002
MECDUM	3.812903	1.596352	2.388510	0.0180
R-squared	0.321126	Mean dependent var		9.383957
Adjusted R-squared	0.298496	S.D. dependent var		10.61194
S.E. of regression	8.888113	Akaike info criterion		7.244021
Sum squared resid	14219.74	Schwarz criterion		7.364972
Log likelihood	-670.3160	F-statistic		14.19079
Durbin-Watson stat	2.273860	Prob(F-statistic)		0.000000

As noted, SSA and LA are above the world average, while EME and MEC are lower than the world average. FSE, OAI and CAR are not significantly different.⁵

Of course, there is no numerical difference between measuring the regional effects this way, or computing the regional averages directly as in Table 1. The point to note about the regression, however, is that it explains about 32 per cent of the cross-country variation in homicide rates, using only the regional dummies. One major purpose of this study, then, will be to examine to what extent this “region-effect” can be explained in terms of variation in underlying socio-economic variables (i.e., how much of the region-effect persists after controlling for other, more fundamental variables).

3. EMPIRICAL CORRELATES OF VIOLENCE – LITERATURE REVIEW.

There is a vast social science literature on factors affecting levels of violence. Theories of homicide have been classified in different categories (see, for instance, Gartner, 1992, p. 93) for traditional sociological approaches. We divide up the causes of homicide in six broad categories: age structure, urbanization, income inequality, population density, cultural and ethnic diversity, education and governance:

3.1. Age Structure.

It is a well-known fact that young males, in a range of age between 15 and 29, are more likely to be engaged in crime in general, and in violent activities in particular (Wilson and Herrnstein, 1985, pp. 126-47; Hirschi and Gottfredson, 1983; Wolfgang, 1968). The *victims* of homicide are also predominantly young male adults (Fingerhut and Kleinman, 1990; Gartner, 1990). Therefore the larger the proportion of young males in the population, the larger the amount of homicides expected. Some empirical studies, however, find that the share of young males in the population

⁵The equality of the coefficients for FSE, OAI and CAR was tested by means of a Wald test. The hypothesis of equal coefficients was not rejected.

does not have a statistically significant effect on either homicide or robbery rates (Fajnzylber, Lederman and Loayza, 2002).

3.2. Urbanization.

Urbanization has also been linked with criminality (Wilson and Herrnstein, pp. 411, 430-31, 444-46; Fajnzylber, Lederman and Loayza, 2002), though it is not clear that it necessarily has a strong effect on homicide *per se* (with the exception, perhaps, of homicides that are incidental to property crimes). It is expected that high urbanization which goes hand in hand with rural-urban migration, especially in developing countries, brings a relatively more intense competition for resources in overcrowded cities, high unemployment and urban poverty. Rising criminality within the context of the greater anonymity provided by urban settings might result from such social changes. As Wilson and Herrnstein put it: “A migrant from the countryside with any preexisting tendency to commit crime will find the tendency strengthened when the risk of recognition is slight, and where he finds property owned by people he does not know” (1985, p. 445). These latter considerations also suggest the possibility that it might not be urbanization itself, but *rising* urbanization, that is the active factor. Thus, in our regression analysis we will consider both the level and the change in urbanization as possible explanatory variables. Again, however, it remains to be seen whether this factor is significantly related to homicides, as opposed to other types of crime.

3.3. Income Inequality.

Income inequality has received a lot of attention in the literature on crime and homicide. Some important studies find a positive correlation between income inequality (as measured by the Gini coefficient) and violent crime rates (Fajnzylber, Lederman and Loayza, 2002; Krohn, 1976), although others do not find a strong correlation (Neumayer 2005). Blau and Blau (1982, p. 126, cited in Gartner, 1992, p. 93) found that:

[E]conomic inequality, both between and within races, is a significant predictor of homicide rates across metropolitan areas. They suggest that economic inequality “[...] engenders alienation, despair, and pent-up aggression, which finds expression in frequent conflicts, including a high incidence of criminal violence.”

Gartner (1990, p. 92) also found that economic inequality is associated with higher homicide of adults. This has often been explained in terms of the so-called “relative deprivation theory of homicide,” according to which “aggression is held to be spurred by a sense of frustration and relative poverty” (MacKellar, 2003, p. 498). Wilson and Herrnstein (1985) note that this effect may be enhanced by urbanization: “Wealth tends to be accumulated unequally, and to those not possessing it, it may seem ... inequitable as well as unequal. The contrast between the haves and have-nots becomes more, not less, palpable, the theory says, as affluence grows, if people are separated by wider gaps in wealth, especially if they live side by side in cities” (p. 446). (See Gartner, 1990, for an informative review of the sociological literature.)

3.4. Population density.

High population density has also been suggested as a possible cause of higher rates of homicides and crime in general. For example, some social scientists claim that high population density has been the cause of conflict and a large number of homicides in countries such as Haiti and Rwanda (Diamond, 2005). Gartner (1990, p. 93) claims that high population density “[. . .] facilitates the convergence between motivated offenders and suitable targets in the absence of capable guardians.” Population density is therefore also included in our analysis.

3.5. Ethno-linguistic fractionalization.

Ethno-linguistic fractionalization, as measured by the ELF (Ethno Linguistic Fractionalization) index (Roeder, 1985), is a proxy of cultural diversity in society. Some studies find a positive correlation between a highly fractionalized (diverse) society and the likelihood of civil wars. Gartner (1990, p. 92) found that cultural heterogeneity is associated with higher homicide of adults. Cultural diversity can bring conflict especially because of political competition. In a fragmented society it might be particularly difficult to agree on the amount and kind of public goods the government should provide (Easterly and Levine, 1997). Ethnic differences can also lead to conflict and homicides when public policies benefit some groups at the expense of others.

3.6. Education.

Education can be related with homicides in several ways. Specifically, low education among relatively poorer sectors of the society might lead to high unemployment and to poverty-related crimes and homicides.

3.7. Governance indicators.

Governance indicators are related to a working social system and to an efficient institutional mechanism that prevents and prosecutes crime effectively. Over the past several years, a major research project at the World Bank has been developing an internationally comparable “World Governance Indicator,” several components of which—such as the rule of law, political stability, levels of corruption—might be correlated with the level of crime and homicides. For example, one would expect that an effective judiciary system (which includes effective criminal prosecution and certainty in punishment) might contribute to a low rate of homicides. As a consequence, countries with weak justice systems would be expected, other things equal, to have relatively higher homicide rates.

Other factors often mentioned in the empirical literature are the prevalence of firearms possession, and the consumption of alcohol (Krug, Powell and Dahlberg, 1998; Killias, 1993; Rossow, 2001; Parker and Cartmill, 1998). Rossow, for instance indicates that “[. . .] [t]ime series studies have generally demonstrated that an increase in population drinking level (or indicators of that) is followed by an increase in rates of violence in that population” (Rossow, 2001, p. S78). It is worth noting that not all alcoholic beverages have a statistically significant positive effect on violence and homicides. It would be difficult to incorporate these factors in this study, due to lack of reliable and comparable data for a large enough sample of countries. The same happens with important theories of “social control” and “social disorganization,” which have received a lot of attention in the sociological literature (see Gartner, 1990, for a brief review of the literature). Divorce has been also linked to homicides. Williams and Flewelling (1988, cited in Gartner 1990, p. 95), for instance, found that cities with high divorce rates have significantly higher rates of both family and non-family homicides. Gartner (1990) found that divorce is correlated with homicide rate, but for only a certain age-range of victims. The lack of reliable data for a large enough sample of countries complicates the examination of these theories during the period of our study, though we will revisit some of these factors when we interpret the empirical results obtained.

3. REGRESSION ANALYSIS.

[List of variables, description, sources]

(1) Add social variables to regional dummies:

Dependent Variable: WHODATA

Method: Least Squares

Date: 01/29/09 Time: 10:09

Sample(adjusted): 3 227

Included observations: 92

Excluded observations: 133 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	31.72742	16.90794	1.876481	0.0643
EMEDUM	1.300427	4.547725	0.285951	0.7757
SSADUM	1.457305	3.699787	0.393889	0.6947
LADUM	6.401895	4.418373	1.448926	0.1514
MECDUM	-1.341381	5.234447	-0.256260	0.7984
HOMBRES1529	-1.921347	1.144725	-1.678436	0.0973
GINI	0.002448	0.183336	0.013350	0.9894
URBAN2002	0.054656	0.094074	0.580994	0.5629
DELTAURB	0.047498	0.165349	0.287261	0.7747
DENSITY	0.000131	0.001697	0.077019	0.9388
ELF	9.950256	4.320752	2.302899	0.0240
BLHOM	-4.256605	1.576376	-2.700248	0.0085
BLMUJ	3.860999	1.469580	2.627281	0.0104
WGI2002	-9.106673	2.347822	-3.878775	0.0002
R-squared	0.492685	Mean dependent var		9.802174
Adjusted R-squared	0.408133	S.D. dependent var		12.24417
S.E. of regression	9.419797	Akaike info criterion		7.462772
Sum squared resid	6921.141	Schwarz criterion		7.846523
Log likelihood	-329.2875	F-statistic		5.826981
Durbin-Watson stat	1.594249	Prob(F-statistic)		0.000000

This regression shows that by including socio-economic variables, most of the effect of the regional dummies disappears. The regression includes most of the variables that capture the main determinants of homicides, as suggested by past studies and described in our literature review. On the one hand, the results are quite elucidating since most of the variables that were expected to have an important and significant effect (percentage of urbanization, the change in urbanization, population density, proportion of young males, and the Gini index) are not in fact statistically significant. Regarding the proportion of young males, our results are consistent with those of past studies (for instance, Gartner, 1990). On the other hand, variables that were not expected to have much of an effect are indeed important and statistically significant, which is the case of the Barro-Lee years of schooling variable. With the exception of the Latin America dummy, after the addition of social variables the rest of regional dummies are no longer statistically significant. Two other variables, ELF and the WGI, are statistically significant as expected.

The most surprising finding in this regression is the direction of the effect of female schooling. The regression indicates that the higher the average amount of years of schooling for males, the lower the amount of total homicides per 100,000 inhabitants. However, both surprising and puzzling is the effect of female years of schooling, which is positive. This means that the higher the average amount of years of schooling for women, the higher the amount of total homicides (male

and female) per 100,000 inhabitants.⁶ The variables in this regression explain almost 49 per cent of the variation of total homicides per 100,000 inhabitants in the sample of 92 countries. This is a relatively high R-square considering the complex nature of the dependent variable.

(2) Delete non-significant variables:

After eliminating the non-significant socio-economic variables, but keeping the regional dummies, we obtained this regression:

Dependent Variable: WHODATA

Method: Least Squares

Date: 01/29/09 Time: 16:48

Sample(adjusted): 1 227

Included observations: 109

Excluded observations: 118 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.721658	4.888300	1.784190	0.0774
EMEDUM	3.311436	3.366213	0.983727	0.3276
SSADUM	2.746011	3.092788	0.887876	0.3767
MECDUM	-5.406405	3.096890	-1.745753	0.0839
LADUM	7.282525	2.856704	2.549276	0.0123
ELF	6.680167	3.814079	1.751449	0.0829
BLHOM	-3.154074	1.282752	-2.458834	0.0157
BLMUJ	2.952727	1.176863	2.508981	0.0137
WGI2002	-5.860392	1.684586	-3.478832	0.0007
R-squared	0.453168	Mean dependent var		9.723853
Adjusted R-squared	0.409421	S.D. dependent var		11.95068
S.E. of regression	9.183994	Akaike info criterion		7.351761
Sum squared resid	8434.575	Schwarz criterion		7.573983
Log likelihood	-391.6710	F-statistic		10.35894
Durbin-Watson stat	1.704051	Prob(F-statistic)		0.000000

The significance of two dummy variables, EME (Established Market Economies) and SSA (Sub-Saharan Africa) disappears. We therefore eliminate these two variables and obtained the following regression:

⁶We should mention that the opposite direction of the effects of female education and male education is not restricted only to the Barro and Lee data, since we find the same effect (although less statistically significant) using literacy rates from the World Development Indicators (World Bank). Thus, both female literacy rates and female schooling-years are positively correlated with homicide rates, but schooling-years has a stronger effect.

(3) Delete non-significant EME and SSA dummies:

Dependent Variable: WHODATA

Method: Least Squares

Date: 01/29/09 Time: 16:49

Sample(adjusted): 1 227

Included observations: 109

Excluded observations: 118 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.11686	4.342788	2.559844	0.0119
MECDUM	-6.916932	2.821328	-2.451658	0.0159
LADUM	5.732218	2.537162	2.259303	0.0260
ELF	7.310669	3.683377	1.984773	0.0499
BLHOM	-3.201616	1.252691	-2.555790	0.0121
BLMUJ	2.844214	1.170085	2.430775	0.0168
WGI2002	-5.144728	1.460727	-3.522031	0.0006
R-squared	0.443839	Mean dependent var		9.723853
Adjusted R-squared	0.411123	S.D. dependent var		11.95068
S.E. of regression	9.170752	Akaike info criterion		7.331981
Sum squared resid	8578.475	Schwarz criterion		7.504820
Log likelihood	-392.5930	F-statistic		13.56667
Durbin-Watson stat	1.751373	Prob(F-statistic)		0.000000

In this regression all of the variables are statistically significant at the 5% level of confidence. The regression indicates that six variables, MECDUM (Middle East Crescent dummy), LADUM (Latin America dummy), ELF (Ethno Linguistic Fractionalization Index), BLHOM (average years of male schooling), BLMUJ (average years of female schooling) and WGI (the World Bank Governance Index) explain 44% of the variation of homicides rates in the sample of 109 countries.

[need to re-write this:]

The following result stand out: 1% increase in the ELF Index implies a 7% increase in the average murder rate; an *increase* of 1% in the average level of male schooling *reduces* the average murder rate in 3.2%; an *increase* in 1% in the level female schooling *increases* the average murder rate in almost 3%; an increase in 1% in the World Bank Governance Index reduces the average murder rate in 5%. Two dummy variables remain statistically significant: MEC (a negative effects on the dependent variable) and LA (a positive effect on the dependent variable). This means that countries located in the Middle East Crescent tend to have lower murder rates, on average; and countries located in the Latin American Region (Spanish and Portuguese speaking) have higher murder rates, on average. The effect of female schooling remains, meaning that increases on the years of women education (as defined by Barro and Lee) increases murder rates, on average.

(4) Experiment with alternative components of WGI:

(a) Corruption component

Dependent Variable: WHODATA
 Method: Least Squares
 Date: 01/29/09 Time: 16:50
 Sample(adjusted): 1 227
 Included observations: 109
 Excluded observations: 118 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.76016	4.487329	2.843597	0.0054
MECDUM	-5.106993	2.847356	-1.793591	0.0758
LADUM	6.302621	2.633426	2.393316	0.0185
ELF	8.658789	3.763501	2.300727	0.0234
BLHOM	-3.280795	1.291593	-2.540116	0.0126
BLMUJ	2.494509	1.205701	2.068929	0.0411
WGICORR2002	-2.989317	1.268307	-2.356935	0.0203
R-squared	0.408420	Mean dependent var		9.723853
Adjusted R-squared	0.373621	S.D. dependent var		11.95068
S.E. of regression	9.458261	Akaike info criterion		7.393719
Sum squared resid	9124.788	Schwarz criterion		7.566558
Log likelihood	-395.9577	F-statistic		11.73661
Durbin-Watson stat	1.685502	Prob(F-statistic)		0.000000

Regression (4a) includes only one of the components of the World Bank Governance Index: the corruption component, which is statistically significant. An increase of 1% in this index (less corruption) reduces the expected average murder rate in almost 3%. The explanatory power of the regression decreases to almost 41%. The rest of the variables remain statistically significant

(b) Rule of law component

Dependent Variable: WHODATA
 Method: Least Squares
 Date: 01/29/09 Time: 16:51
 Sample(adjusted): 1 227
 Included observations: 109
 Excluded observations: 118 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.92440	4.409397	2.477527	0.0149
MECDUM	-5.524780	2.779425	-1.987742	0.0495
LADUM	5.220099	2.601836	2.006313	0.0475
ELF	7.578339	3.692958	2.052105	0.0427
BLHOM	-2.969700	1.262680	-2.351902	0.0206
BLMUJ	2.548654	1.158070	2.200777	0.0300
WGIRULE2002	-4.563584	1.356976	-3.363054	0.0011
R-squared	0.438466	Mean dependent var		9.723853
Adjusted R-squared	0.405435	S.D. dependent var		11.95068
S.E. of regression	9.214940	Akaike info criterion		7.341595

Sum squared resid	8661.343	Schwarz criterion	7.514433
Log likelihood	-393.1169	F-statistic	13.27422
Durbin-Watson stat	1.699922	Prob(F-statistic)	0.000000

Regression (4b) includes only one of the components of the World Bank Governance Index: rule of law component, which is statistically significant. An increase of 1% in this index (an improvement in the rule of law) reduces the expected average murder rate in almost 4%. The explanatory power of the regression decreases is almost 44%. The rest of the variables remain statistically significant

Dependent Variable: WHODATA

Method: Least Squares

Date: 01/29/09 Time: 16:52

Sample(adjusted): 1 227

Included observations: 109

Excluded observations: 118 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.18044	3.831041	3.440433	0.0008
MECDUM	-9.568124	2.714431	-3.524910	0.0006
LADUM	5.864314	2.319269	2.528519	0.0130
ELF	4.230727	3.518378	1.202465	0.2320
BLHOM	-3.203808	1.167453	-2.744272	0.0072
BLMUJ	2.639501	1.063988	2.480762	0.0147
WGIPOL2002	-5.976844	1.097373		-5.446503
R-squared	0.516745	Mean dependent var		
Adjusted R-squared	0.488318	S.D. dependent var		
S.E. of regression	8.548556	Akaike info criterion		
Sum squared resid	7453.936	Schwarz criterion		
Log likelihood	-384.9349	F-statistic		

Political stability?

4. SUMMARY OF MAIN RESULTS.

■ Relative Unimportance of Conventional Social Variables

Some social variables that the economics literature, such as the Gini Index; or the sociological literature, such as the population proportion of young males, urbanization, change in urbanization, and population density, are not statistically significant in our study. This suggests that past cross country studies might have left out important explanatory variables which have a strong effect on murders, such as the cultural and ethnic diversity of countries, the *separated* effect of male and female education, and some cultural effects which are particularly related with two main regions, Latin America and The Middle East Crescent.

■ Importance of Institutions

From the work of Douglass North (1990) and Vernon Smith (1992; 1993) economists have learned that “institutions matter” for prosperity and economic development. Political scientists have also learned that institutions matter for the management and allocation of resources (Ostrom 1990). It is therefore not surprising that “institutions matter” as well for

the intensity of murders in the world. In our study we conceptualized institutions mainly by the degree of good governance as defined by the World Bank Governance index. When we split up this index into its components we reach a deeper level of institutional specificity. This happens for example when we include the corruption component, the political stability component, and the rule of law component of the Governance Index. All of them are statistically significant and help explain the regional and country variation in murder rates. Quality of the government and the law, law enforcement, and the stability in the political arena are therefore fundamental elements if one wants to understand murder rates around the world.

■ Unexpected results for Female Education – Possible Interpretations

The most important finding of this study is the unexpected result for female education, which is counterintuitive. At first sight, the positive effect of females' years of schooling is quite unexpected; nevertheless, once one starts thinking about it, it is plausible to come up with theories or interpretations that can explain this result. We divide this interpretation into different categories: sociologic, economic, demographic, and psychological.

Sociological

First, one can claim that a higher level of female years of schooling have a positive effect on homicide rates because as females become more educated they leave home for work and, as a consequence put less attention on the children's early education. This gap in early education might manifest itself as psychological and / or personal disorders that can lead, later in life, to violent activities such as crime and murders.

The positive effect of female education and homicide rates can also be explained in a different way: higher female education leads to more women participating in the labor market, and therefore more children left vulnerable to violence at home; Gartner (1990, p. 101) indicates:

[s]trongest effects of the shift away from nuclear family-based activities appears among children. The greater the ratio of women in the labor force to households, the greater the rates of child homicide, a result also found by Fiala and LaFree (1988, cited in Gartner, 1990, p. 101).

It has been argued in the literature (Becker and Gregg 1973; Becker and Tomes 1976; Becker 1981) that as male and female education increases average fertility decreases, and parents focus more on the *quality* of children as oppose to the *quantity* of children. We argue however that even though this is true, there could be still certain aspects of the children personality that are still left out from these quality considerations when the mother left home to become part of the active job market. According to this sociological interpretation it is precisely these particular aspects that might manifest themselves into psychological and personal disorders.

Economic

Another plausible interpretation of the positive effect of the level of female schooling years over homicides is an economic one. This hypothesis suggests that the higher the level of female schooling years, the higher their capacity to find jobs. Women become more competitive in the job market. As a consequence, higher levels of female schooling lead to male unemployment, which might lead to crime, violent crime, and homicides.⁷

⁷Our colleague, Joseph Cole, suggested this hypothesis.

Demographic

This hypothesis suggests that a higher level of female schooling years, relatively speaking, delays the average age at which females get married. Accordingly, this delays the average age at which *males* get married. One would expect that, keeping other factors constant, a higher proportion of single and relatively young male population increases the likelihood of the occurrence of illegal activities that might lead to crime and homicides.⁸ Colloquially one could say that marriage *domesticates* males and makes them less violent, as if their energies were directed towards more productive ends; in the absence of this *domestication*, so to speak, males tend to be more violent and murders are more likely to occur.⁹

Psychological

5. CONCLUSIONS.

Our initial goal was to explain the cross-country variation of murder rates in a large sample of countries. We showed that regional dummies can explain a surprisingly high proportion of this variation (32%), and our challenge became to include socio-economic theories that have been proposed in the literature, to possibly account for the regional effects. We have partially succeeded in this attempt. Our sociological variables do indeed explain most of the regional effects, with the exception of the Latin American dummy (Spanish and Portuguese speaking), and the Middle East Crescent dummy. Past studies (Reza, Mercy and Krug, 2001) are consistent with this result. Latin American countries tend to have higher than average homicide rates, and countries located in the Middle East Crescent region tend to have lower than average homicide rates. For the Latin American case this result might be explained by the large availability of guns after several countries experienced long-lasting and intense civil wars during the second half of the 20th century. For example Colombia, since *La Violencia* in 1948; El Salvador, from 1979 to 1992; Guatemala from 1968 to 1996; Nicaragua, from 1981 to 1988; and Peru, from 1981 to 1995 (Fearon and Laitin, 2003).¹⁰ Indeed, criminals nowadays own arms used during the civil wars (Reza, Mercy and Krug, 2001, p. 109). The importance of fire-arms related deaths can not be minimized; Krug, Powell, and Dahlberg (1998, p. 214) indicate that firearms injuries were the seventh cause of death in the USA in 1993. In one of their studies they found that approximately half of violent deaths were perpetrated using guns, for a sample of 36 high income and middle income countries (Krug, Powell, and Dahlberg, 1998, p. 216-7). Similarly, Killias (1993, 1721) in his study for 14 developed countries suggests that the presence of a gun in the home increases the likelihood of homicide or suicide; Killias also found there was not a negative correlation between homicides perpetrated by guns and homicides perpetrated by other means; which means that more guns did not “compensate” the use of other means; the sole presence of guns increased the likelihood of homicides and suicides (p. 1723).

⁸ Joseph Cole also suggested this hypothesis.

⁹ This theory has been suggested by several of our colleagues: Enrique Gersi, Nikolai Wentzel, among them.

¹⁰ Note that 3 of these countries were among the top 6 countries with the highest homicide rates, and Colombia had by far the highest rate in the world.

There is indeed a large literature asserting that homicide rates increase after periods of civil wars.¹¹ Gartner (1990, p. 102), for instance, indicates: “Nations with a high number of wartime battle deaths tend to have higher homicide rates for infants, young children, and adults of both sexes. The prevalence of civil wars in Latin America might have created a “gun culture,” similar to the old American west (see Killias, 1993, p. 1724), where people in society accept and approves the ownership and possession of guns to defend themselves and to solve disputes. This is very apparent in certain regions of Colombia, Guatemala, Mexico, and other countries.

Another element that might contribute to the Latin American dummy is the “alcohol culture.” Rossow (2001) suggest the possibility of the existence of cultural differences in alcohol consumption and also in the behavioral reactions to such consumptions. The differences he found on the effects of alcohol consumption on violence and aggressive behavior, between northern, central, and southern Europe, made Rossow talk about different “alcohol cultures.” Rossow indicates that in northern Europe (Nordic countries) drinking patterns lead to relatively higher levels of “explosive” behavior that result in violence (p. S87); he concludes: “ [the results in my study] support the idea that beverage-specific effects on homicide tend to differ across various drinking cultures” (p. S89). Latin America is the region with the second highest alcohol consumption per capita, after Europe (WHO, 2004). One can reasonably think that in Europe institutional factors might help mitigate the negative effect of high alcohol consumption. As a corollary, the absence of an “alcohol culture” in Muslim countries might help explain why the Middle East Crescent region has statistically significant lower homicide rates.

To our knowledge, ours is the first study that separates male and female education as explanatory variables. Our most important, and unexpected finding, was that female education (years of schooling) increases the expected murder rate. It is interesting that lower levels of female schooling are found among countries in the Middle East Crescent region, which is consistent with our findings. This finding, discovered by serendipity, so to speak, can be explain through sociological, economic, and psychological theories. Gartner (1990) found that proportion of females in the labor market vs. household work was linked to female homicides rates; this finding is consistent with ours. There are substantial differences however between Gartner’s study and ours: first, he looks at a small sample of developed countries; second, he does not take into account data on education; and third, we claim that high levels of female schooling affect total homicide rates.

Our study also show that countries with high quality institutions tend to have relatively lower murder rates, and also that countries with relatively low levels of cultural and ethnic diversity tend to have relatively lower murder rates. Our research opens a new path on homicide studies and generates explanatory theories that demand urgent scrutiny.

It is important to notice that there might be some path dependence trajectories in homicide rates in certain highly violent countries. This might be due to habituation of desensitization (see Bandura, 1973), which means that societies might simple become accustomed to high homicide rates.

REFERENCES

Bandura, Albert. 1973. *Aggression: A Social Learning Analysis*. Englewood Cliffs, NJ: Prentice Hall.

¹¹ Gartner (1990, p. 96) cites several studies.

Barro and Lee ...

Becker, Gary and H. Gregg Lewis. 1973. On the Interaction between the Quantity and Quality of Children, *Journal of Political Economy*, 81(Supplement): S279-88.

Becker, Gary and Nigel Tomes. 1976. Child Endowments, and the Quantity of Children. *Journal of Political Economy*, 84(Supplement): S143-62.

Becker, Gary. 1981. *A Treatise on the Family*. Cambridge, MA: Harvard University Press.

Blau, Judith R. and Peter M. Blau. 1982. Metropolitan Structure and Violent Crime. *American Sociological Review* 47:114-28.

Diamond, Jared. 2005. *Collapse*.

Easterly, William and Ross Levine. 1997. Africa's Growth Tragedy: Policies and Ethnic Divisions. *Quarterly Journal of Economics*, 112: 1203-50.

ELF reference (Roeder, 1985)

Fajnzylber, Pablo, Daniel Lederman, and Norman Loayza. 2002. Inequality and Violent Crime. *Journal of Law and Economics*, 45 (April 2002): 1-40.

Fearon, James, and David D. Laitin. 2003. Additional Tables for Ethnicity, Insurgency, and Civil War. Department of Political Science. Stanford University, working paper. Available at [<http://www.stanford.edu/group/ethnic/workingpapers/addtabs.pdf>]. Accessed on February 9, 2009.

Fiala, Robert and Gary LaFree. 1988. Cross-National Determinants of Child Homicide. *American Sociological Review*, 53: 432-45.

Fingerhut, L. A. and J. C. Kleinman. 1990. International and Interstate Comparisons of Homicide Among Young Males. *Journal of the American Medical Association*, 263 (June 27): 3292-95.

Gartner, Rosemary. 1990. The Victims of Homicide: A Temporal and Cross-National Comparison. *American Sociological Review*, 55 (Feb): 92-106.

Governance literature ...

Gurr, Ted Robert. 1981. Historical Trends in Violent Crime: A Critical Review of the Evidence. In Michael Tonry and Norval Morris, eds., *Crime and Justice: An Annual Review of Research*, vol. 3, pp. 295-353. Chicago: University of Chicago Press.

Hirschi, Travis and Michael Gottfredson. 1983. Age and the Explanation of Crime. *American Journal of Sociology*, 89 (Nov): 552-84.

- Killias, M. 1993. International Correlations between Gun Ownership and Rates of Homicide and Suicide. *Canadian Medical Association Journal*, 148: 1721-25.
- Krohn, Marvin. 1976. Inequality, Unemployment and Crime: A Cross-National Analysis. *The Sociological Quarterly*, 17: 303-13.
- Krug, E. G., K. E. Powell, and L. L. Dahlberg. 1998. Firearm-related Deaths in the United States and 35 Other High- and Upper-middle-income Countries. *International Journal of Epidemiology*, 27: 214-21.
- Krug, E., K. E. Powell and L. L. Dahlberg. 1998. Firearm-related Deaths in the United States and 35 Other High- and Upper-middle-income Countries. *International Journal of Epidemiology*, 27 (April): 214-21.
- MacKellar, F. Landis. 2003. Homicide and Suicide. In Paul Demeny and Geoffrey McNicoll, eds., *Encyclopedia of Population*, vol. 1, pp. 496-99. New York: Thomson Gale.
- Neumayer, Eric. 2005. Inequality and Violent Crime: Evidence from Data on Robbery and Violent Theft. *Journal of Peace Research*, 42: 101-12.
- North, Douglass. 1990. *Institutions, Institutional Change and Economic Performance*. New York: Cambridge University Press.
- Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action* Ostrom, Elinor. New York: Cambridge University Press.
- Parker, Robert N. and Randi S. Cartmill. 1998. Alcohol and Homicide in the United States, 1934-1995. *Journal of Criminal Law and Criminology*, 88 (Summer): 1369-98.
- Reza, A., J. A. Mercy and E. Krug. 2001. Epidemiology of Violent Deaths in the World. *Injury Prevention*, 7: 104-11.
- Philip G. Roeder. 2001. "Ethnolinguistic Fractionalization (ELF) Indices, 1961 and 1985." February 16. Available at: [<http://weber.ucsd.edu/~proeder/elf.htm>]. Accessed on August 10, 2008.
- Rossow, Ingeborg. 2001. Alcohol and Homicide: A Cross-Cultural Comparison of the Relationship in 14 European Countries. *Addiction*, 96 (Supplement): 77-92.
- Smith, V., K. McCabe S. and Rasseni. 1992. Designing Call Auction Institutions: Is Double Dutch the Best? *Economic Journal*, 102 (January): 9-23.
- Smith, Vernon. 1993. Humankind in Prehistory: Economy, Ecology and Institutions. In Terry Anderson and Randy Simmons, eds., *The Political Economy of Customs and Culture*, pp. 157-84. [place?]: Rowman and Littlefield.

UN Demographic Yearbook

US Census Bureau ... International Data Base (Population stats)

WHO. (2004). *Global Status Report on Alcohol 2004*. Available at [http://www.who.int/substance_abuse/publications/global_status_report_2004_overview.pdf]. Accessed on February, 09, 2009.

WHO ... Health stats

Wilson, James Q. and Richard J. Herrnstein. 1985. *Crime and Human Nature*. New York: Simon & Schuster.

Wolfgang, Marvin E. 1968. Crime: IV. Homicide. *International Encyclopedia of the Social Sciences*, vol. 3, pp. 490-95. New York: Macmillan.

Philip G. Roeder. 2001. "Ethnolinguistic Fractionalization (ELF) Indices, 1961 and 1985." February 16. <<http://weber.ucsd.edu/~proeder/elf.htm>>. (Date you consulted web-site).