

A member of the 'Amigo dos Amigos' drug gang patrols the streets of the Morro do Macaco favela in Rio de Janeiro, August 2003. © Mimi Mollica/Corbis



# Mapping the Divide

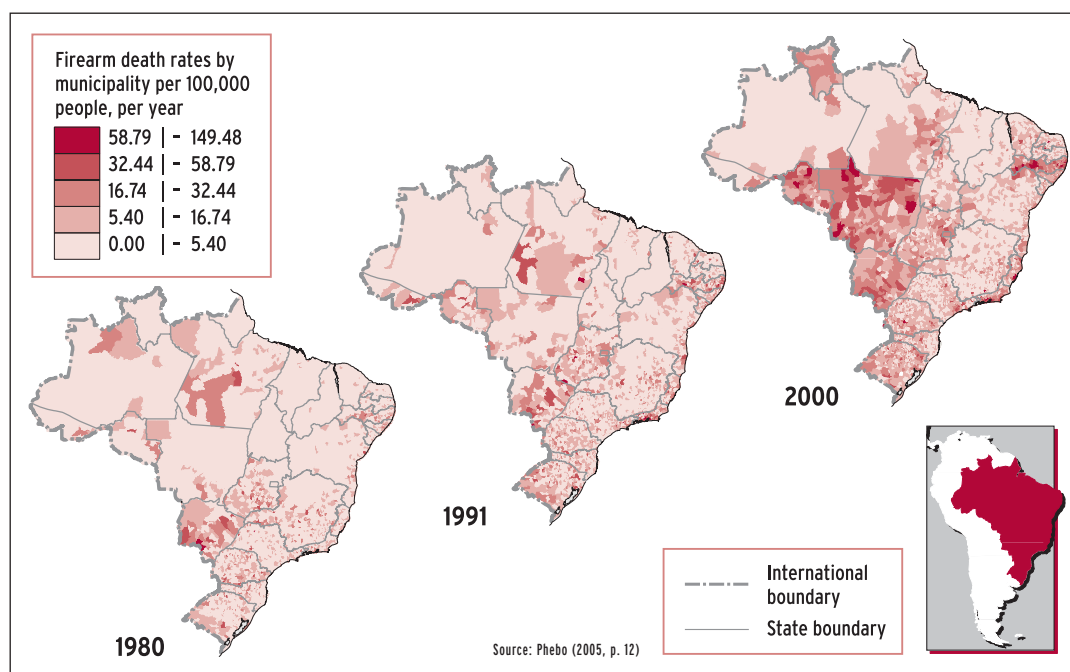
## FIREARM VIOLENCE AND URBANIZATION IN BRAZIL

### INTRODUCTION

Tourists consider Brazil to be a friendly and inviting destination.<sup>1</sup> Sociologists speak of it as a ‘cordial culture’ and a ‘racial democracy’ (Owensby, 2005), while historians describe a gradual and peaceful transformation in politics from pre-independence times onward<sup>2</sup> and the country as having almost no record of violent conflict in its recent history (Skidmore, 1976). Yet, Brazilian society stands out today for its high levels of firearm violence. Firearm victimization has increased steadily from the 1970s to 2004, when the first signs of a tapering off were publicized.<sup>3</sup> The firearm death rate grew threefold from 7 to 21 deaths per 100,000 in the period 1982–2002 (Phebo, 2005, p. 11).

The news media have covered the country’s escalating gun violence extensively, but simplistically. News accounts focus on spectacular actions by organized criminal organizations—such as the 12 simultaneous attacks on random people and on police in particular on 29 December 2006 that left 19 people dead and 12 seriously wounded across Rio de Janeiro (Astor, 2006). Focusing on such events overshadows the deadlier effects of common, routine firearm violence, which is, furthermore, not only an urban phenomenon, but also a rural one. Map 7.1 shows the changes

Map 7.1 **Brazilian firearm death rates per 100,000 people, 1980, 1991, and 2000**



in firearm death rates in Brazil by municipality for a 20-year period, indicating the dramatic increase in such rates across the country.

Brazil is a society with rates of firearm victimization that surpass some countries at war. In the absence of major political conflicts, explaining this phenomenon requires examining other causes; it also means focusing on 'micro' contexts where individuals and small groups interact and act against each other. In the language of public health, it requires focusing on the risk and protection factors at work in firearm violence in Brazilian society.<sup>4</sup>

This chapter reviews the incidence of firearm violence in Brazil's municipalities and rural areas, with special attention to social risk and protection factors. Among its main findings are the following:

- Brazil's firearm victimization rates surpass those of some countries at war.**
- Firearm homicide is correlated to urbanization, but firearm suicide is not.
  - Males are 17 times more likely to be victimized by firearm violence in urban areas than women, but that difference diminishes in rural areas.
  - Handguns and automatic weapons are more common in urban than in rural areas, where shotguns predominate. Particular types of firearm are highly associated with particular kinds of uses and users.
  - Social inequality is correlated with firearm violence, while poverty as such is not.
  - The most significant risk factors for firearm violence are being young (aged 15–29 years), out of school, and out of work.
  - The variable 'single-parent families headed by women with children under the age of 21 years not working' is clearly associated with firearm violence.
  - Risk for firearm homicide victimization varies according to ethnic group, with blacks and those of mixed race more likely to be victims than whites, while whites are more likely to commit suicide than black or mixed race people.<sup>5</sup>
  - The lower the income, the higher the chances of being a victim of firearm homicide. However, the opposite is true for suicides: higher income is associated with self-inflicted injury and death.
  - Participation in religion (the Catholic and Protestant churches) is a protection factor against firearm violence.
  - Although the presence of firearms in the household is a risk factor in all circumstances, both for homicide and suicide, in urban and rural contexts it should not be considered alone. There is a higher prevalence of firearm ownership in rural than in urban contexts, but a lower incidence of firearm deaths in rural areas.

This chapter proceeds by discussing the data sources and methodologies used to analyse firearm violence in Brazil. It then describes the patterns of homicides and suicides by municipality and age, gender, and ethnic group. Thereafter it presents the results of multiple regression analysis applied to a range of key social determinants of urban and rural firearm violence for both firearm homicide and firearm suicide. The chapter ends with a set of conclusions and policy-relevant observations based on the findings.

## FIREARM VIOLENCE BY MUNICIPALITY TYPE: GATHERING THE DATA

### Municipal data

In Brazil, municipal governments deliver annual reports on the number of rural and urban inhabitants in their respective municipalities. This is the official source used by the Brazilian government when it requires information on the divide between urban and rural populations in the country. The official municipal records, however, may be biased



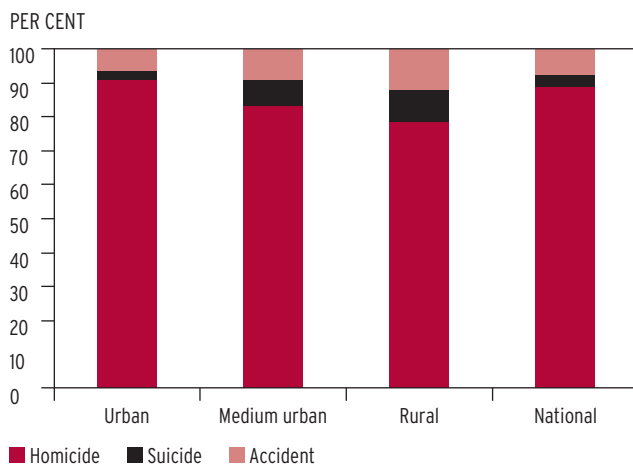
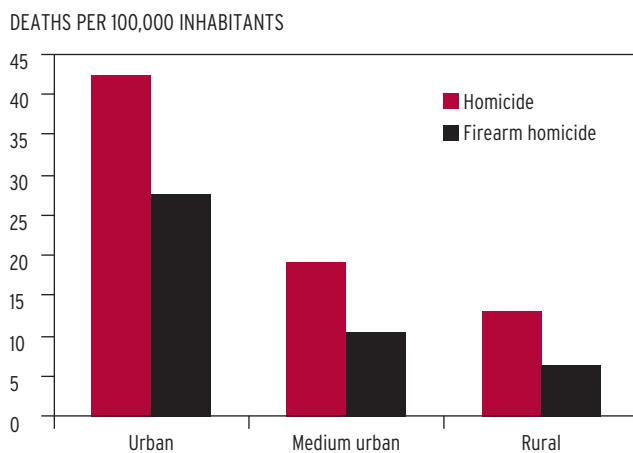
by local interests, such as the property tax value for property and public services, which vary between urban and rural settings. Therefore, to improve on this resource, this chapter has added two other variables widely recognized as essential criteria when differentiating rural areas from urban ones. They are the size of the population in a given municipality and the density of the population per km<sup>2</sup>. By weighting and combining these three criteria (the official classification, population size, and density), municipalities can be divided into three categories: urban, rural, and an intermediary group of urban municipalities with significant rural characteristics, which are called 'medium urban' areas in the chapter (see Table 7.1).<sup>6</sup>

### Box 7.1 Study methodology

The database used for this study integrates information from three different sources. The Unified Database of the Ministry of Health (Datasus) is the dataset of the Brazilian Ministry of Health, which includes data on firearm deaths (Brazil, n.d.). Data from the Instituto Brasileiro de Geografia e Estatística, the official Brazilian Department of Statistics, includes demographic information from the most recent census in 2000 (IBGE, n.d.). The research report *Brazil: The Arms and the Victims* (Fernandes, 2005a) is a study produced by ISER (the Instituto de Estudos da Religião), Viva Rio, and the Small Arms Survey reporting on firearm availability. Data from these three sources was consolidated by municipality, the smallest unit in the Brazilian system of government. By cross-referencing these datasets, the authors of this chapter were able to explore the relationships between numerous social factors, small arms availability, and firearm victimization within the 5,507 municipalities of Brazil.<sup>7</sup> Urban and rural differences in firearm mortality and the influence of social factors were estimated by multiple regression models. Deviations from the identified patterns were submitted to a rapid qualitative assessment.

**Table 7.1 Municipalities in Brazil: urban, medium urban, and rural**

<b>Urban: 455 municipalities</b>			
	Population	Population density per km <sup>2</sup>	Official percentage of urban population
Mean	202,103	840	94%
<b>Medium urban: 996 municipalities</b>			
	Population	Population density per km <sup>2</sup>	Official percentage of urban population
Mean	28,448	66	78%
<b>Rural: 4,056 municipalities</b>			
	Population	Population density per km <sup>2</sup>	Official percentage of urban population
Mean	12,206	22	50%

**Figure 7.1 Firearm deaths in Brazil by cause (%), 2000****Figure 7.2 Homicide and firearm homicide rates per 100,000 inhabitants in urban, medium urban, and rural municipalities**

### Firearm mortality rates for municipalities

Having assigned the 5,507 municipalities into urban, medium urban, and rural categories, firearm mortality rates by municipality type can be compared (see Figure 7.1). Homicide is at the core of the problem in Brazil, which has one of the highest rates in the world. Suicide, on the other hand, remains at a relatively low level compared to other countries, even within Latin America.<sup>8</sup> Unintended firearm deaths (accidents) are more common among children and in rural municipalities (Phebo, 2005). This chapter focuses on firearm homicides and suicides only.

### HOMICIDES AND FIREARM HOMICIDES: URBAN V. RURAL

The pattern for the distribution of homicides across the urban/rural divide is fairly consistent throughout Brazil. Figure 7.2 indicates that urbanization in this country has a strong correlation with homicides of all kinds. The average homicide rate in the urban municipalities of Brazil is more than double the

### Box 7.2 Urban and rural firearms

Previous studies have indicated a higher prevalence of firearms in rural than in urban areas in Brazil (Dreyfus and de Sousa Nascimento, 2005). However, the types of weapons vary according to municipality. In Brazil, hunting shotguns are more common in rural settings, whereas handguns are more prevalent in cities. Inhabitants of some areas of the larger cities favour automatic weapons, often used in turf wars by gangs and organized crime actors.

The type of weapons predominating has a powerful effect on mortality rates. Handguns and automatic weapons are more often associated with lethal events than shotguns, and partly explain why urban homicide rates outpace rural ones, even when firearm ownership is higher in rural areas.<sup>9</sup>

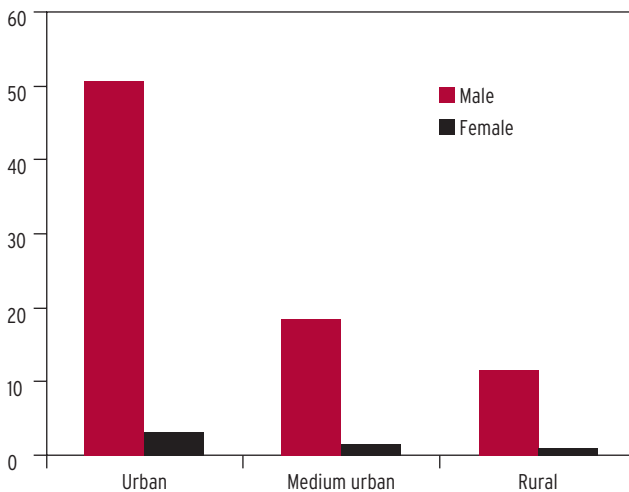
rate found in the medium urban municipalities and more than triple the average rate for rural municipalities. Firearms are an important factor of that equation, as they aggravate the disparities. As shown in Figure 7.2, the use of firearms in homicides increases as one moves from rural to medium urban to urban areas. Thus, the role played by firearms in homicides is larger in the urban municipalities (65 per cent) than in the medium urban municipalities (55 per cent), which in turn is larger than that in the rural municipalities (53 per cent). Urbanization in Brazil is therefore associated with higher rates of lethal violence and also with increased use of firearms.

Gender is one clear, relevant factor. The lethal use of firearms is dominated by males, whether as victims or as perpetrators. The role of men in firearm violence increases with urbanization level in Brazil, as shown in Figure 7.3. Men are ten times more likely than women to be killed by a firearm in rural settings. This huge disparity widens to 17 times at the highest level of urbanization. Similarly, the magnitude of difference in firearm death rates among rural men compared to urban men (4.4 times greater) also far exceeds the difference in death rates among rural women compared to urban women (2.5 times greater).<sup>10</sup>

Ethnic group proves to be another powerful indicator for small arms victimization in Brazil, as shown in Figure 7.4. The figures are clear: the chances of being killed with a firearm in Brazil change according to ethnic group, with whites least likely to die by firearm, mixed race people more likely to die than whites, and black people the most likely to die by firearms.<sup>11</sup> The pattern is well established in the rural context: black people have the highest victimization rates, followed by people of mixed race, and finally by white people. Overall

Figure 7.3 Firearm homicides by gender and area, 2000

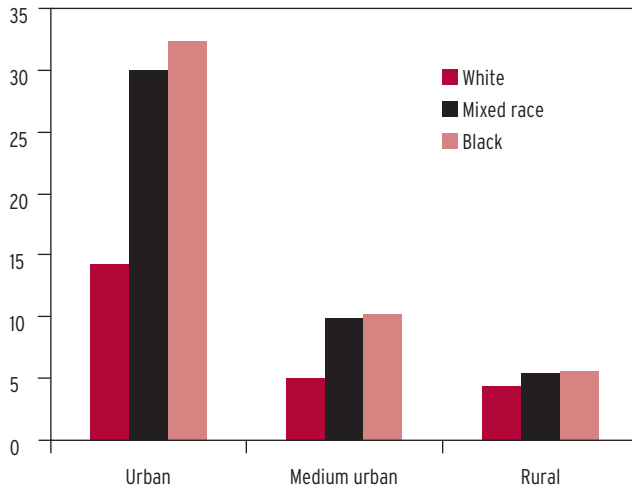
FIREARM HOMICIDES PER 100,000 INHABITANTS



death rates increase dramatically from rural to urban settings, with one important variation: the disparities among ethnic groups change dramatically as one moves from rural to urban settings. For example, in rural settings, the death rate for people of mixed race is 19 per cent higher than the rate for whites. In the medium-urban setting, the difference in rates for these two groups jumps to 47 per cent, then to 108 per cent in an urban setting. Urbanization somehow protects whites while increasing risks for people of mixed race and blacks.

Figure 7.4 **Firearm homicide by ethnic group, 2000**

FIREARM HOMICIDES PER 100,000 INHABITANTS



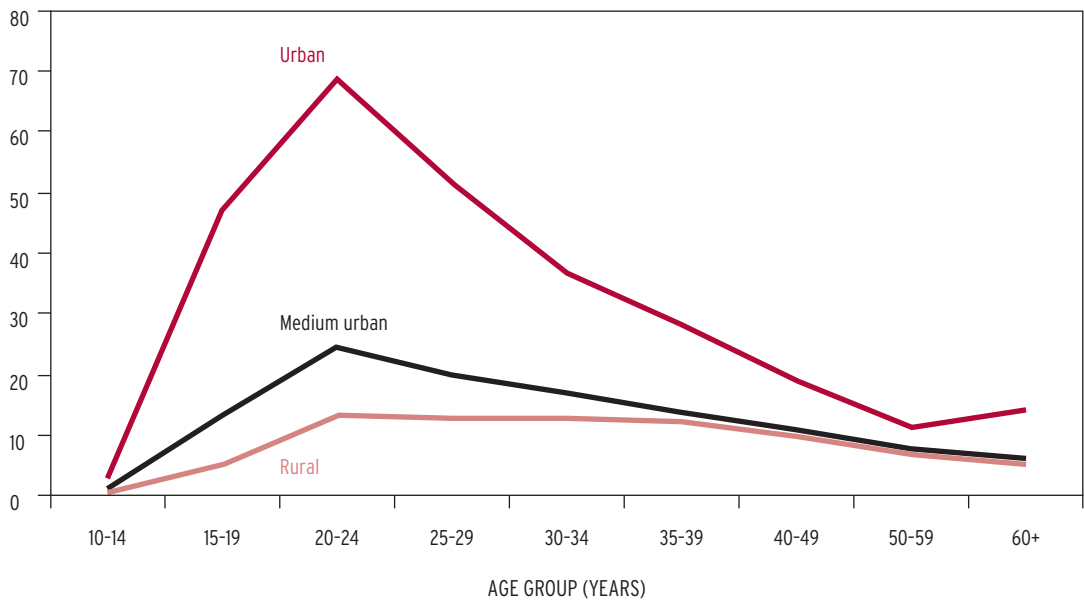
Thus, where firearm violence increases, Brazilian society appears to move from the traditional triad model of ethnic classification (black, mixed race, white) towards a bipolar division between whites, and mixed race people and blacks grouped together. 'Mixed race' as a category, which often indicates a midway point between 'black' and 'white' in terms of social indicators, here no longer can support such a position and gives way to a radical polarization between black and mixed race people combined, and white people, where white signifies protection and black/mixed race signifies risk.

Firearm mortality rates are often sensitive to age variation (WHO, 2002). But separating

Brazilian rates by age *and municipality type* produces a different picture, as shown in Figure 7.5. The firearm homicide rates are relatively low for the 10–14 years age group, then grow and separate significantly to varying degrees. Most noticeably, the urban rate rockets to 70 deaths per 100,000 inhabitants in the 20–24 years age bracket, more than 5 times the rate for the same rural segment. The curve shapes are even more revealing. In rural settings, firearm homicides reach their peak for young males aged 20–24 and then slowly decline through adulthood. In urban settings,

Figure 7.5 **Firearm homicides by age group, 2000**

FIREARM HOMICIDES PER 100,000 INHABITANTS



conversely, the decline is sharper with the onset of adulthood. The intermediate curve has a consistent intermediary shape between the rural slope and the urban peak.<sup>12</sup>

## SOCIAL DETERMINANTS OF URBAN AND RURAL FIREARM HOMICIDES

To explore the various social factors that, together, may substantially affect firearm violence in Brazil, the technique known as *multiple regression model (the OLS method)* was applied.<sup>13</sup> The variables tested were narrowed down from about 100 indicators. Most were excluded because of redundancy or for lack of significance. More details on the modelling exercise for firearm homicides are found in Annexe 3.

In this case, multiple regression analysis was conducted on data for the nation as a whole, and for urban, medium urban, and rural settings. The results are summarized in Table 7.2 and discussed below.

The coefficients of determination by urbanization decline from urban (55 per cent), to medium urban (33 per cent), and to rural (24 per cent) settings. In all cases, however, an acceptable level of evidence was obtained, though the results are better adjusted for urban than for rural municipalities. In other words, these causal factors seem to be more concentrated—i.e. have more explanatory power—in urban settings, where the diversity of experience is limited, than in rural ones, where circumstances are more open. This would suggest that a wider range of variables is needed to explain rural firearm violence. At the same time, it points to the highly concentrated nature of urban

**Table 7.2 Social determinants of firearm homicide in Brazil**

	National	Urban	Medium urban	Rural
<b>Coefficient of determination (R<sup>2</sup>)</b>	33%	55%	33%	24%
<b>Risk factors</b>				
Demographic density				
Inequality				
Percentage of youth (15-29 years) in the population				
Youth (15-29 years) out of school and out of work, with less than 8 years of study				
Average number of years of study				
Vulnerable families (single-parent, headed by women, with children under 21 not working)				
Percentage of migrants in the population				
Firearms per residence				
<b>Protection factors</b>				
Percentage of Catholics				
Percentage of Protestants				
<b>Dependent variable: Firearm homicide rate per 100,000 inhabitants</b>				

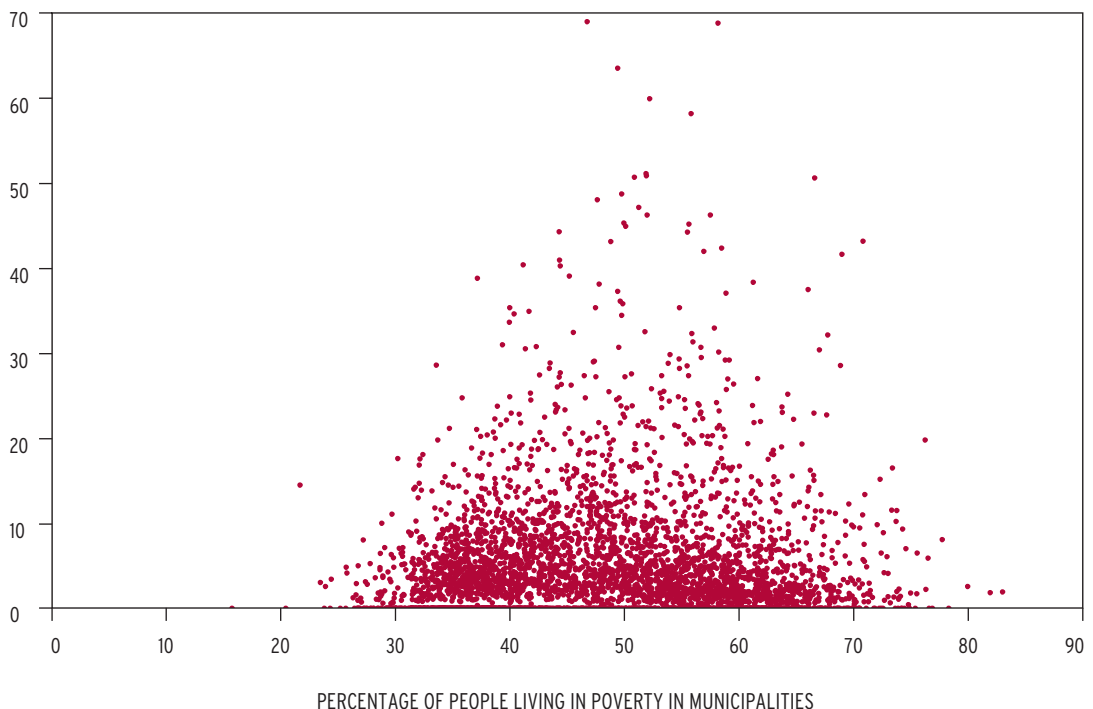


firearm violence: geographically, demographically, and sociologically, a smaller number of variables can account for it. Despite these differences, the factors identified in this model are associated with variations in firearm violence across all settings. A number of the factors that were retained in the model, and some that were excluded, are discussed below.

- **Demographic density** turned out to be the best indicator in the model across all levels of urbanization, and nationwide: as a rule, the higher the number of inhabitants per km<sup>2</sup>, the higher the rate of firearm homicides in a given municipality. Population size, which in many cases is a significant indicator, is not as strong. For this reason, and because density and population share common characteristics, the former was retained and the latter excluded. The official definition of 'urban' and 'rural' populations in Brazil was the weakest indicator concerning the impact of urbanization in the model.
- **Inequality** is also significant in explaining variations in firearm homicides across municipalities. It holds the test for the nation as a whole and for the variations in the urban/rural gradient. The hypothesis that the sharper the inequality, the higher the level of firearm homicides was checked with two well-known techniques, Theill-L and Gini, which are used to compare observed income distributions and their deviation from a standard distribution. Both tests suggested that inequality is indeed a relevant factor for firearm homicide in Brazil.<sup>14</sup>

Figure 7.6 **Firearm homicide rate by percentage of people living in poverty in Brazilian municipalities\***

FIREARM HOMICIDE RATE PER 100,000 INHABITANTS



\* The definition of the term 'people living in poverty' is the 'percentage of persons with a mean per capita family income of less than 50 per cent of the minimum wage (about USD 41.00 in 2000) per month'.

- **Income variation** was significant in some contexts, but quickly lost explanatory value when combined with other variables indicative of social hierarchy, such as years of study. For this reason, income was excluded from the model. Inequality, in turn, proved to have a stronger hold over the data, surviving most combinations.
- The percentage of people living in **poverty**, like income, was not a robust predictor of firearm homicide. Defined as the ‘percentage of persons with a mean per capita family income of less than 50 per cent of the minimum wage (about USD 41.00 in 2000) per month’, it did not alone appear to predict firearm homicide in any setting. Poverty, defined in this way, was therefore excluded from the model. Figure 7.6 illustrates this point.

In Figure 7.6, the horizontal axis describes the percentage of people living in poverty in all 5,507 municipalities. The vertical axis captures the rates of homicide by firearms per 100,000 inhabitants in the same context. The figure shows that even though the percentage of people living in poverty varies widely (25–75 per cent), many municipalities have low firearm homicide rates (below 10 per 100,000 inhabitants). In other words, poverty, as such, shows little association with firearm homicide.

Urbanization and small arms availability contribute to firearm mortality.

- **The proportion of youth within the population** is another significant factor in all types of municipality. When focusing on the ‘percentage of individuals between 15 and 29 years of age in the population’, the proportion of youth and the firearm homicide rate are positively and consistently associated in Brazil. This was true not only for the nation as a whole, but also for urban, medium urban, and rural municipalities.
- **Youth out of school and out of work** is another significant indicator, even when compared with associated variables such as the proportion of youth or years of study. The specific variable, ‘individuals of 15–29 years of age who have not finished elementary education (8<sup>th</sup> grade) and who are neither studying nor working’ could even serve as a practical guide for defining the group of risk factors in situations of firearm violence in Brazil. It has a clear institutional profile (‘out of school and out of work’) that can be useful for the definition of corrective public policies.
- The **vulnerable families** variable passed the empirical test for predicting firearm violence in all settings. The variable was defined as ‘single-parent households headed by women, with children below 21 years of age who are not working’. The results were unequivocal, indicating a family structure that is likely to reproduce the conditions of inequality and to generate children and youth most exposed to firearm violence.
- Together with urbanization, the **presence of firearms in the home** stands out as a significant factor in the model. In rural municipalities, firearm availability among ten different variables shows the highest coefficients in explaining firearm mortality. In medium urban environments, it is the second-strongest factor, and in urban settings it is the third-strongest. Small arms availability alone cannot explain the variations in firearm homicides. However, combined with other key variables, such as population density, vulnerable families, or youth out of school and out of work, small arms availability does stand out consistently as an aggravating condition. Following the patterns revealed by the model, an increase of 1 per cent in arms availability per household implies, on average, increased firearm homicide rates of 2.2 per cent in urban areas, 0.9 per cent in medium urban, and 0.7 per cent in rural contexts.
- The presence of **migrants** appears to be associated with firearm homicide in rural settings, but not in urban municipalities. The variable measured here is the proportion of inhabitants who were not born in that particular municipality, but who have come to be an integral part of its population. When measured in terms of recent migration (less than one year) or a longer time (ten years), the proportion of migrants in the population was



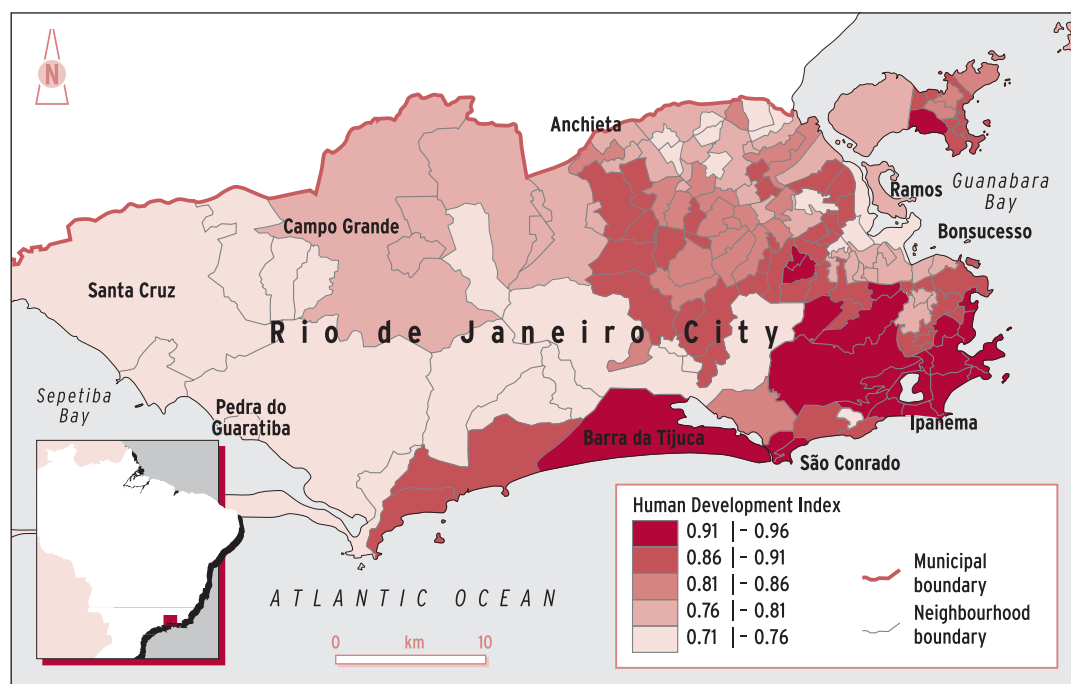
consistently associated with firearm homicide in the rural context, but was not as significant in the urban settings. A history of massive migration into the larger cities in Brazil seems to have diluted the explanatory power of this variable.

- **Religion** is a protection factor for firearm violence in Brazil, specifically participation in either Catholic or Protestant churches. The same holds true when 'Protestants' and 'Pentecostals' are disaggregated. Each is a protection value in every setting. In other words, the results tell us that participation in a Christian church is associated with lower levels of firearm violence in Brazil. The two church traditions might even be said to play complementary protection roles, since the Catholics hold a larger majority in rural settings, while Protestantism is growing faster in urban neighbourhoods generally, and in the poorer urban areas most rapidly of all.<sup>15</sup>

### **Inequality within cities**

The social factors of risk—including population density, income inequality, youth out of school without a job, and vulnerable families—tend to concentrate and reinforce one another in some urban neighbourhoods. Inequality is thus materialized in the human geography of the city. The standard rate measure (X events per 100,000 inhabitants) effectively hides the internal differences that make big cities so much more vulnerable to the expressions of violence. Map 7.2 and Table 7.3 illustrate the point in the case of Rio de Janeiro. The southern portion of the city concentrates resources and protection against the threats of firearm violence. There lies 'the Marvellous Rio', situated between the mountains and the ocean, in contrast to the northern and the western zones of the city, beyond the mountains and on the low plains, seldom seen by foreigners. The homicide rate in São Conrado, a beautiful neighbourhood in the southern region, can be 50 times lower than that found in Bonsucesso, in the northern part of the same city.

Map 7.2 Human Development Index\* per neighbourhood, city of Rio de Janeiro, 2000



\* The Human Development Index is a comparative measure of life expectancy, literacy, education, and standard of living for countries worldwide. It is a standard means of measuring well-being, especially child welfare. It is used to determine and indicate whether a country is developed, developing, or underdeveloped, and also to measure the impact of economic policies on quality of life. The index was developed in 1990 by Pakistani economist Mahbub ul Haq and has been used since 1993 by the United Nations Development Programme in its annual Human Development Report. The closer to 1, the more developed the area/country according to three criteria: a long and healthy life, level of knowledge, and a decent standard of living.

Table 7.3 Rio de Janeiro: homicide in a city's geography

Neighbourhood	Homicides		Population		Homicide rate per 100,000 inhabitants	
	2003	2004	2003	2004	2003	2004
<b>South</b>						
Ipanema	8	5	47,106	47,739	17	11
São Conrado	1	1	11,226	11,377	8	8
Barra da Tijuca	23	15	92,819	94,068	25	16
<b>North</b>						
Anchieta	58	62	54,150	54,879	107	112
Ramos	54	47	37,776	38,284	142	123
Bonsucesso	79	93	19,421	19,682	406	471
<b>West</b>						
Campo Grande	218	232	299,385	303,414	73	76
Santa Cruz	145	159	193,055	195,653	75	81
Pedra de Guaratiba	26	24	9,755	9,886	267	246



Comparative studies across neighbourhoods of Rio de Janeiro show remarkable differences in human development. Growing at current rates, 'Alemão Complex' in Bonsucesso would take almost one hundred years to arrive at São Conrado's present human development level. Within the same city, neighbourhoods can be decades apart in terms of income, health, and education.<sup>16</sup>

## YOUTH AND FIREARM VIOLENCE IN BRAZIL

Figure 7.7 indicates the paramount importance of the age factor for evaluating firearm mortality in Brazil. A seminal essay by Marcos Lisboa and Mônica Viegas Andrade (2000) proposes that age be the basic reference for the calculation of the social causes of urban violence. As these authors note, youth can be sensitive to indicators whose significance is weakened when distributed through the population in general. Taken for the population as a whole, the indicator 'per 100,000 inhabitants' hides the variation of impact of a given social factor over the various age groups. In particular, the behaviour of children, at the one extreme, and of adults and elders, at the other, often dilutes the impact of some social factors on youth. For this reason, calculating rates and respective explanatory models by age groups is a promising approach.

For instance, as noted above, when plotted against the population in general, the percentage of people living in poverty is not significantly associated with firearm violence in Brazil. Aggregating the data by age, however, produces a different result. Poverty does correlate with firearm violence in Brazil for youth. This is an important difference from the previous findings, where this fact was hidden by the 'per 100,000 inhabitants' denominator.

Figure 7.7 Causes of death in Brazil by age group, 2000

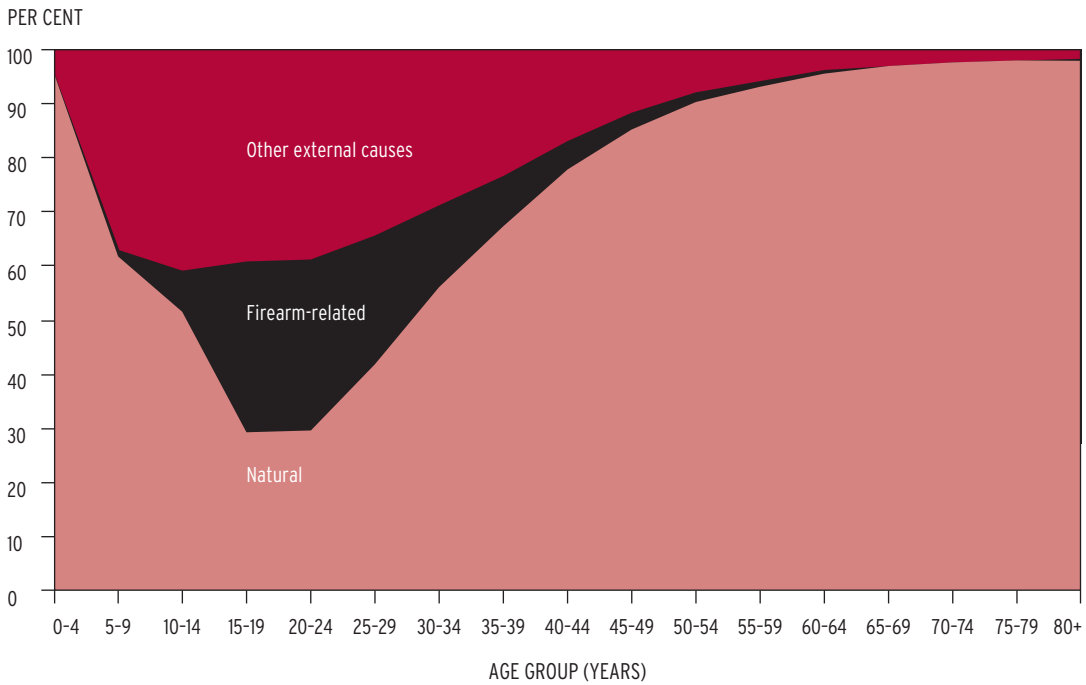
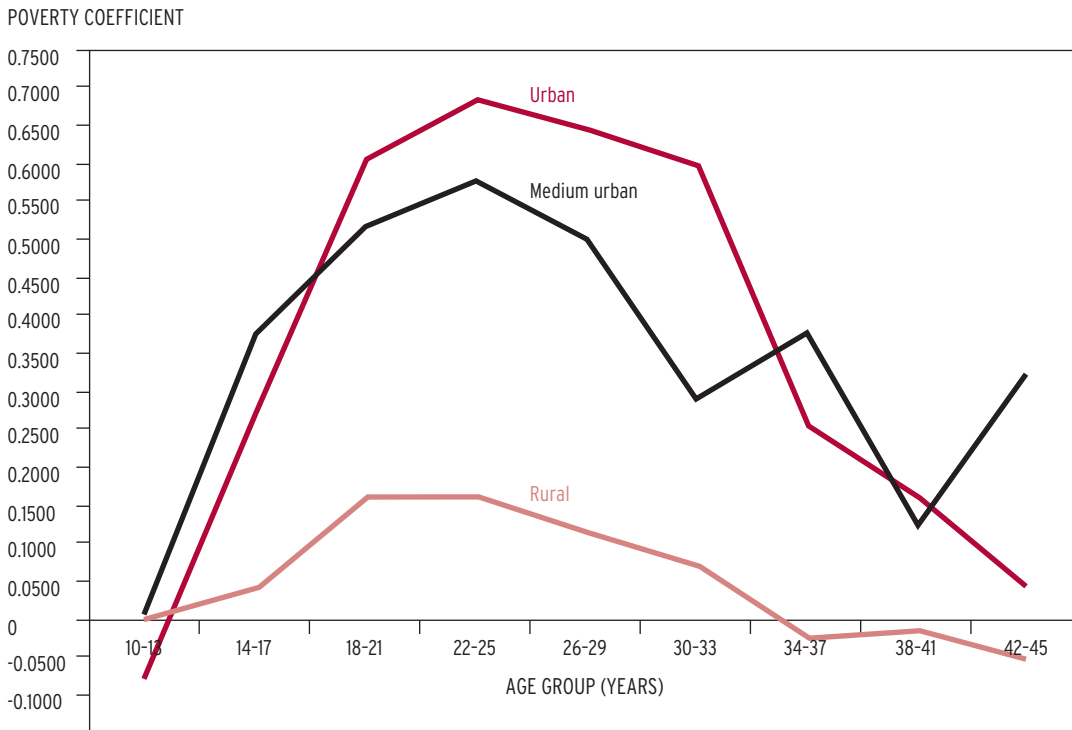


Figure 7.8 Poverty per age group and firearm homicides



In Figure 7.8, the *coefficient* at stake is a measure of the impact of the percentage of people living in poverty on the firearm homicide rate. As the figure shows, the coefficient value varies from -1 to +1, where -1 signifies a negative impact (implying a protection effect) and +1 signifies a positive impact (or risk). Zero, in this scale, means no recognizable impact. Testing the correlation by each age group reveals that poverty is a significant factor for firearm homicide among youth and less so or not at all among adults. Furthermore, this finding is more robust in urban settings; the impact of poverty on youth firearm homicide rates is less pronounced in medium urban settings and much less in rural ones.<sup>17</sup> In subjective terms, one might say that young people are more sensitive than their elders to the social failings in city life.

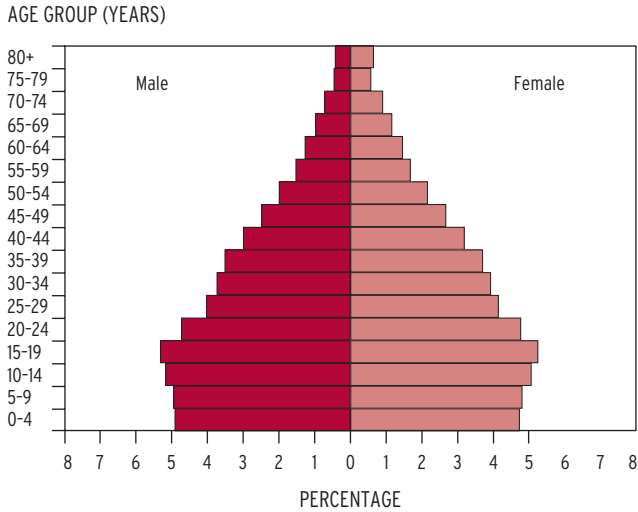
In short, strong correlations can be found between firearm homicides and the impact of social deficiencies on young people. Differences that seem to be disregarded in the opinion of adults are of critical importance to adolescents and young men. Juvenile violence does not translate into an ideological discourse in Brazil, but it is certainly expressive of severe social inequities, which are perceived as such by youth.

The significance of youth in firearm violence in Brazil is further heightened by a particular historical fact. The demographic pyramid of Brazil (see Figure 7.9) reveals a populous generation coming of age. Researchers speak of a 'demographic bonus' in contemporary Brazil: a larger class of teenagers and young adults will soon become economically active, in contrast to gradually reduced numbers of children and elders. The effect of firearm violence on young people has not been factored into this 'bonus', however.



Two young men, one holding a gun, protect their identities as they are filmed about their lives in a favela. © Viva Rio

Figure 7.9 **Brazil’s demographic pyramid: population distribution according to age group and gender, 2000**



**OUTLYING CASES**

A number of municipalities deviated from the patterns described above. Their actual firearm homicide rates were either much higher or much lower than the model would have predicted. These special outlying cases comprised about 4 per cent of the total sample, or 237 out of 5,507 municipalities. Table 7.4 describes how many urban (75), medium urban (41), and rural (105) municipalities had real rates much higher than those estimated by the model, as well as the number of municipalities with rates of firearm homicides much lower than expected for each type of municipality (8, 2, and 6, respectively).

Many of the municipalities with higher than expected rates of firearm homicides are grouped in two states of the federation. Together, Pernambuco state in the north-east and Parana state in the south account for almost half of the special cases on the higher side of the scale. They are also typically located along roads that lead to and from areas with high levels of illicit activities. In Pernambuco, the ‘Marijuana Roads’ leading from the inland areas, where the drug is cultivated, to the coastal centres, where consumption occurs, leaves a trail of unusually violent medium urban and rural municipalities. Turf wars over the opportunities created by the illicit trade, in an otherwise stable, traditional society, are likely to account for the increase in fatal violence.<sup>18</sup> In Parana state, a concentration of more violent than expected municipalities is found along the BR277 road, which leads from Iguaçu, in the Triple Frontier, to Curitiba, the state capital. Besides drugs and arms, various kinds of illicit goods are transported along the same route. From Curitiba, the merchandise follows the flows of the market, mostly towards São Paulo and beyond, with other municipalities being singled out by higher levels of violence along the way. A similar pattern holds for Rio Grande do Sul, the southernmost state in Brazil, whose borders with Uruguay and Argentina seem to account for a number of ‘special cases’.

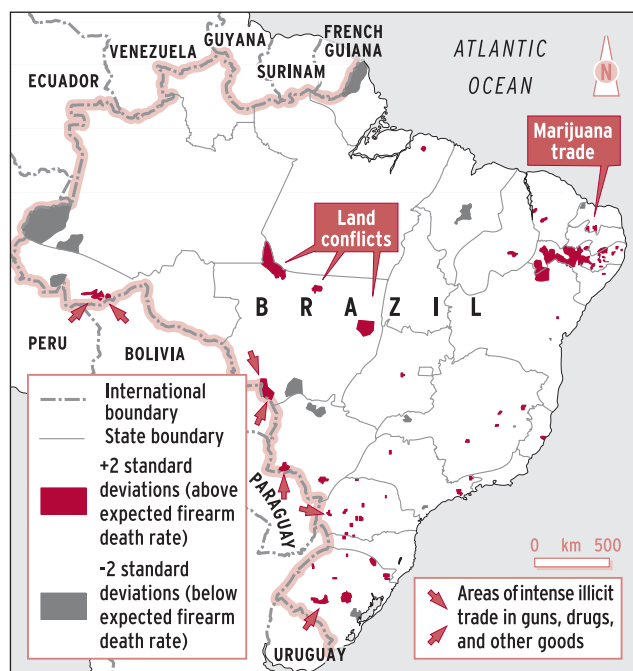
**Table 7.4 Firearm homicide rates: cities out of the pattern**

Estimation error: standardized residual				
Level of urbanization	Less than -2 SD*	Between -2 and 2 SD	More than 2 SD	Total
Urban	8	372	75	455
Medium urban	2	953	41	996
Rural	6	3,945	105	4,056
Total	16	5,270	221	5,507

\* SD = standard deviation



Map 7.3 **Municipalities with firearm homicide rates far above or below expectations**



Source: Research by ISER for this chapter

puzzle, and help explain the good experiences of Atalaia do Norte in the Amazonas, São Caetano do Sul and Santana de Parnaíba in São Paulo, and Timóteo and Coronel Fabriciano in Minas Gerais. Municipalities that have grown around religious or ecological tourism also seem to do better than expected. There are a good number of those, scattered through various regions in Brazil. Cities with religious tourism include Anchieta in Espírito Santo, Barra do Garças in Goiás, and Camutanga in Pernambuco. Ecological tourism destinations appear in every region: a representative location is Navegantes in Santa Catarina, which has grown as one of the most prosperous and peaceful municipalities in the region, thanks to a radical and young kind of tourism. There is yet another category of municipalities distinguished by very low levels of violence: fairly isolated places, subsisting by fishing along the seashore or along the rivers in the Amazon region, which have not yet been touched by the wider circles of social tensions and firearm violence.

## URBAN AND RURAL FIREARM SUICIDE RATES

Self-inflicted injury and death rates in Brazil are among the lowest in the world. The suicide rates for the urban/rural gradient form neither a progressive nor a regressive linear pattern (see Figure 7.10). In contrast to the homicide findings, there is no clear nexus between urbanization and suicide in Brazil. In 2000 the rates for both suicide and firearm suicide were lowest for urban settings, highest for the medium urban areas, and in between for the rural.

Besides the transit of illicit business along strategic roads, land disputes are another likely explanation for higher than expected levels of firearm violence. They are often expressions of chronically unresolved property and power issues (Alston, Libecap, and Mueller, 1999).

Taken together, these outliers reveal particular aspects of the general history of violence in contemporary Brazil. They are more exposed to the externalities that aggravate and multiply firearm violence, such as the drugs and arms trade or the property conflicts over land and mineral riches. These cases are plotted in Map 7.3, where a -2 standard deviation is marked in black and a +2 standard deviation is marked in red.

On the positive side of the deviation, a broader set of explanations is needed. Successful public administration and human development achievements are part of the

Figure 7.10 **Suicide and firearm suicide rates by municipality type, 2000**

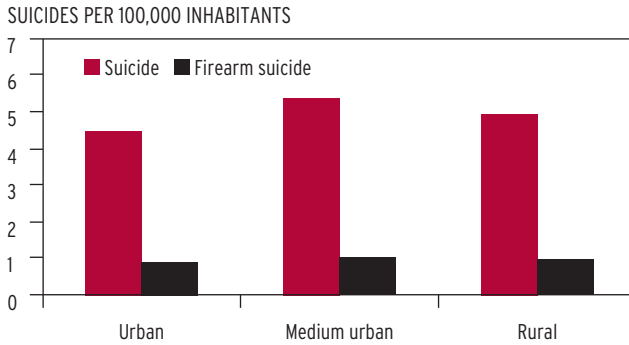


Figure 7.11 **Suicide rates by gender and municipality type, 2000**

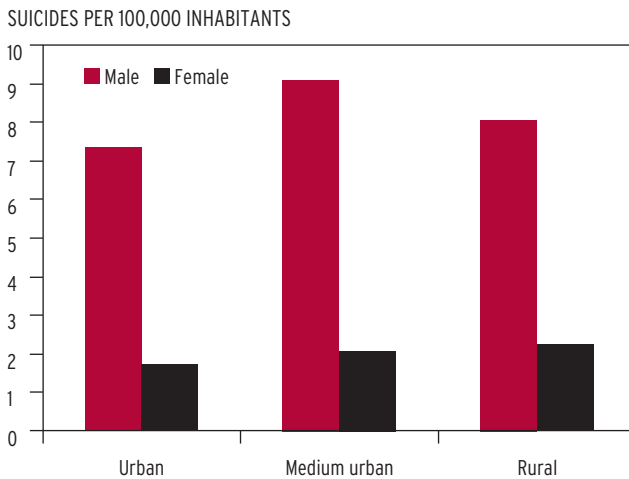
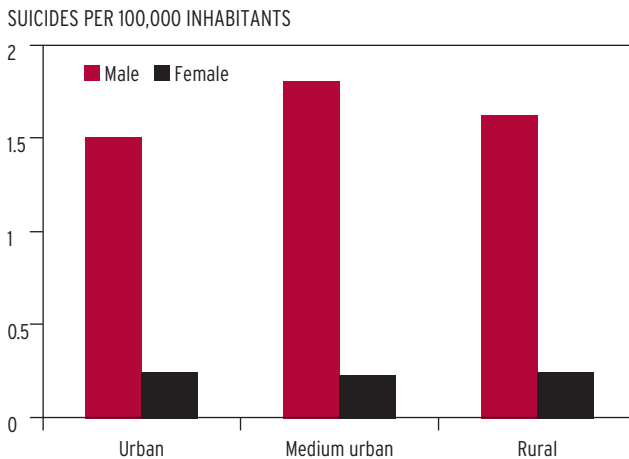


Figure 7.12 **Firearm suicide rates by gender and municipality type, 2000**



Across all municipality types in Brazil, men are more prone to committing suicide than women. As with firearm violence generally, men are also more prone than women to committing suicide with a firearm (see Figures 7.11 and 7.12). In considering the social conditions of firearm violence, the gender association of firearms is unmistakable.

By combining gender and age groups for firearm suicides, a subtle and interesting contrast emerges. The rates for men remain stable throughout adulthood and tend to increase at old age, past the age of 60. This holds true for men in all municipality types, as shown in Figure 7.13. Among women, the opposite trend prevails. Suicide rates diminish with age across all settings, after peaking in adolescence and young adulthood (Figure 7.14). Cultural values associated with gender differences may account for such discrepancies. In contemporary Brazilian culture, and in contrast to men, who tend to be associated with weakening social bonds in old age, the responsibilities of motherhood may reinforce women’s commitment to life as their age increases.

**Social determinants of firearm suicide in Brazil**

In the absence of a pattern distinguishing the rates of suicide in the urban/rural scale, this chapter closes with an overview of social factors that may determine risk of suicide in the country as a whole. Results are consistent with foundational insights from sociology, articulated by Durkheim (1951). Specifically, the indicators of individual isolation and of weakening social bonds were found to be significant in Brazil. They are summarized in Table 7.5 and are discussed below.<sup>19</sup>

Figure 7.13 Male firearm suicide rate by age group, 2000

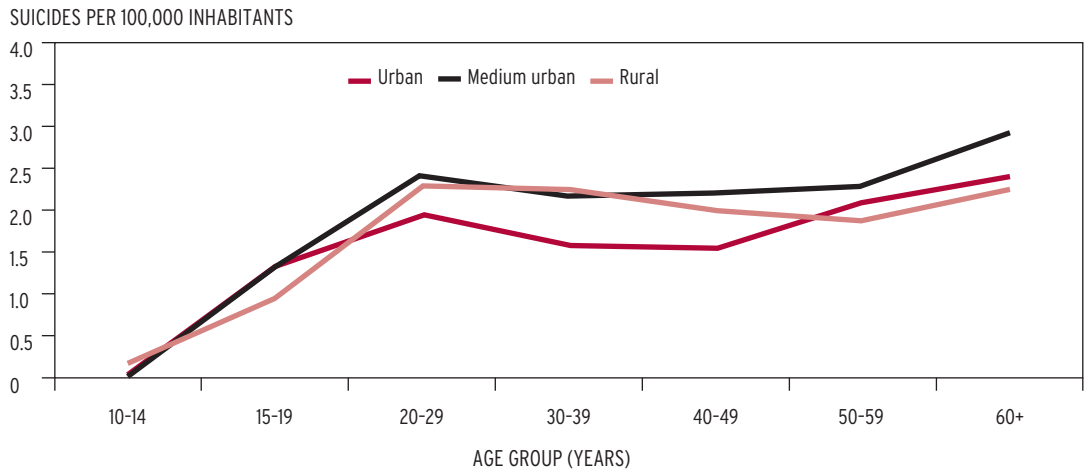
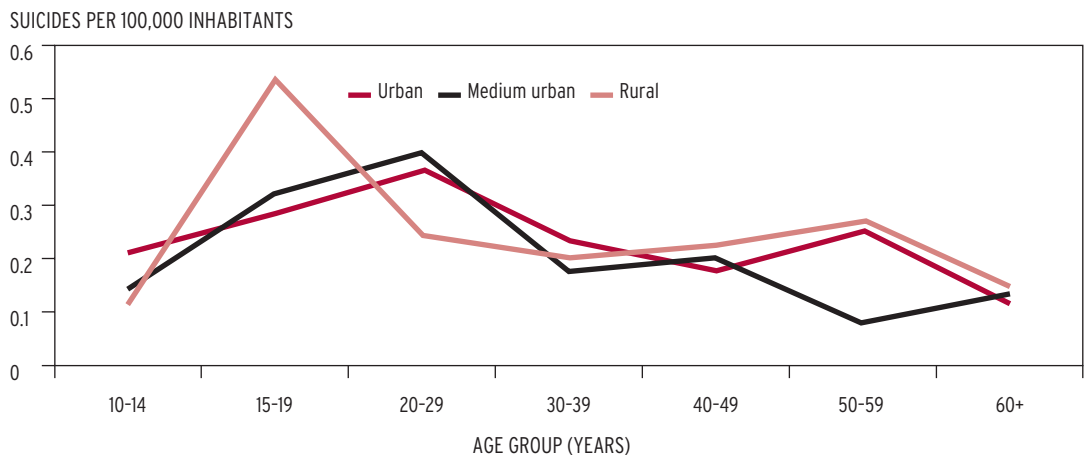


Figure 7.14 Female firearm suicide rate by age group, 2000



Variables in this model not previously discussed above include the following:

- **Persons living alone** involves an array of situations, including, for instance, single people and widows.
- As described in the firearm homicide analysis, **vulnerable families** are defined as the 'single-parent households headed by women, with children below 21 years of age who are not working'. Any particular marital status alone (single, married, separated, divorced, widowed) is not a significant variable in this model. The informal and unstable nature of gender relations in Brazil seems to make marital status a poor reference for the realities of family life. However, families headed by young women, a growing phenomenon in poor communities in Brazil, do form a relevant indicator of risk, not only for homicides, but for suicides as well.
- **'White'** is the ethnic category with the highest coefficient regarding firearm suicide. It contrasts with 'black' and 'mixed race', as noted above. In a reversal of the situation found in firearm homicide, 'black' and 'mixed race' correlate with *protection* from the risks of suicide in contemporary Brazil—'white', instead, is associated with

Table 7.5 Social conditions of firearm suicide in Brazil

According to the Multivariate Linear Model, the coefficient of determination ( $R^2$ ) = 31%**Risk factors***Persons living alone*, over population in general*Vulnerable families* ('single-parent households headed by women, with children below 21 years of age who are not working')*White people*, over population in general*Inequality**Households with firearms*, over total of households**Protection factors***Poverty* ('percentage of persons with a mean per capita family income of less than 50 per cent of the minimum wage (about USD 41.00 in 2000) per month')*Women aged 40 or older*, over population in general*Pentecostals*, over population in general*Protestants*, over population in general**Dependent variable: Firearm suicide rate**

higher suicide rates. It was decided to keep the category 'white' in the model because of other interesting connotations. Omitting it from tests gives the Human Development Index greater significance as a risk factor. The more developed a municipality is (in terms of income, education and health conditions), the higher the suicide rate becomes. When the category 'white' is brought back into the equation, the Human Development Index fades out of the picture. These two factors overlap too much to co-exist in the same model. The explanation may be found in the growing individualistic culture in Brazil. If you are white, richer, and more educated, you are more likely to bear the marks of an 'autonomous individual' and hence, according to received sociological ideas, run a higher risk of suicide.

- Interestingly, **inequality** is also a risk factor for firearm suicide. Here the effect is mostly felt in the higher classes. Inequality in Brazil is consistent with enhanced modernization and individualism among the middle class and upwards.
- **Households with firearms** is similarly an important risk factor. This variable holds solid coefficients in every combination of factors it is run with, which confirms observations on the subject held in other cultural contexts, such as in Kellermann and Mercy (1992) and Lester (1995).
- Conceptually, **poverty**, as previously defined, stands out as a protection: the poorer the municipality, the lower the suicide rate. Unfortunately, it was not possible to combine poverty with the categories of 'black' and 'mixed race' people, also protection variables, because the overlap is too high. In the opinion of the chapter's authors, the explanation lies in the fact that the poor in Brazil socialize in complex relational and hierarchical forms, around the family and the immediate community. Although affected by individualism, much like anyone else, the poor are often imbedded in solidarity and loyalty ties and are therefore less exposed to the isolationist side of individualization.

- **Women over 40 years of age** is a significant category of protection. This is not so with women in general, but only in adulthood, when responsibilities associated with motherhood in Brazilian culture make them key agents of social solidarity.
- A large segment of people self-identifying as **Pentacostals** in Brazil have the second-strongest coefficient, just after the category 'white', but now as a protective indicator. The numbers of Pentecostals grow most quickly among the poor, and these people form strong community ties. 'Healing,' often a weekly ritual practice, deals with the psyche and its interventions in group interactions and in the internal processes of body and self. Pentacostals have a language to address the uncertainties of life and death.
- The **Protestant or Reformed faiths** are also significant as a protection factor. These so-called 'historical' Protestant churches in Latin America were introduced by missionaries in the 19<sup>th</sup> century, before the Pentecostal revival, and include Lutherans, Episcopalians, Methodists, Baptists, Presbyterians, and Congregationalists. These churches are closer to the individualistic culture of modern society. However, in the Brazilian context, their strong **congregational** aspect, which contrasts with the traditional devotions of popular Catholicism, may create a difference that can count as protection in regard to troubled individuals. The **Catholic** faith did not work as a significant component of this ensemble. The authors were forced to leave it out of this particular exercise and thus to suspend judgement on its impact in suicidal practices in Brazil.

## CONCLUSION

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This chapter suggests that it is possible at the outset to understand the primary risk factors underlying firearm violence in the country. Urbanization is an important variable in the constellation of factors, along with ethnic group, age, and gender differences. In terms of firearm homicides, the contrasts conditioned by those variables are severely aggravated in urban society. The tensions underlying lethal aggression grow with cities and do so in a selective manner. Risks are concentrated among young males who are black or of mixed race.

Inequality, rather than poverty, increases the likelihood of firearm violence, which is reinforced and reproduced by the growing presence of vulnerable families, headed by single mothers with unemployed children. Teenagers and young adults are the main risk groups, particularly those who have dropped out of school before finishing elementary education and have not found a stable position in the labour market. Protection from those risks, on a wide societal scale, is found mainly in religious participation, whether in Catholic or Protestant churches.

Given those conditions and the epidemic proportions of small arms violence in Brazil, the availability of firearms has proven to be a severe risk factor for homicides.

A rapid assessment of outlying cases in the model led to a number of hypotheses. Municipalities that had higher than expected rates of firearm homicides included those on roads leading to and from international borders loaded with illicit practices; roads leading from the 'Marijuana Polygon' in the state of Pernambuco and the coast; and those near or on the site of chronic land conflicts. Municipalities that had lower than expected rates of firearm homicides suggest special protective circumstances such as best practices in human development and religious or environmentally oriented tourism.

Conversely, firearm suicides produced no clear pattern of association with the urbanization process. The main sociological finding here was the correlation of suicide rates with an 'individualistic culture', which is more expressive

among the middle class and the wealthy in Brazil, people distinguished by higher income and education, in all municipality types. Individual isolation, as signified by the variable ‘living alone’, stands out as a risk factor. On the other hand, ‘poverty’ and being ‘black’ or of ‘mixed race’ count as protection factors, indicative of more complex primary relations in the family and in the community. Here again, the availability of firearms proved to be a significant factor in increasing the risk of self-inflicted death.

In addition to these findings, the study has a number of policy implications:

- Firstly, firearm violence in Brazil, while a complex phenomenon, is broadly explicable using social science and public health methodologies. These findings, and the findings of similar studies, are worthy of being raised, addressed, and debated by policy-makers at all levels who have a stake in reducing firearm violence.
- Secondly, it is clear that no single factor is responsible for firearm violence in Brazil, but rather several significant factors are at work. Accordingly, interventions and public policy will clearly benefit from integrating several approaches, agencies, and specialties in a multisector and multilevel effort.
- Thirdly, young people are at highest risk in Brazil, particularly unemployed school drop-outs. Fresh approaches are needed for educational inclusion, geared specifically to drop-outs, which take their experience, language, and social networks into account. Income generation, work opportunities, and cultural activities for young people are also promising components of a well-rounded approach to protecting young people from firearm violence.
- Fourthly, certain realities of family life in Brazil, including early pregnancy and single parenthood, need to be faced squarely. Health-based prevention strategies for addressing these crucial issues in schools and through civil society efforts can have positive ‘ripple’ effects in the area of firearm violence reduction.
- Fifthly, at the macro level, this study confirms that inequality is a core factor that brings all the other variables into play. No firearm violence-prevention and -reduction approach can long ignore the centrality that this deep, societal phenomenon plays. Similarly, policy initiatives to reverse—or at least manage—urban sprawl should acknowledge the potential positive changes that could accrue in the area of violence prevention.
- Sixthly, reducing both the supply of and the demand for firearms—both legal and illicit—should remain an essential policy goal.
- Finally, maintaining focus on populations at highest risk requires law enforcement capacity that is well integrated with all of the social and development efforts discussed above. ■

## ANNEXES

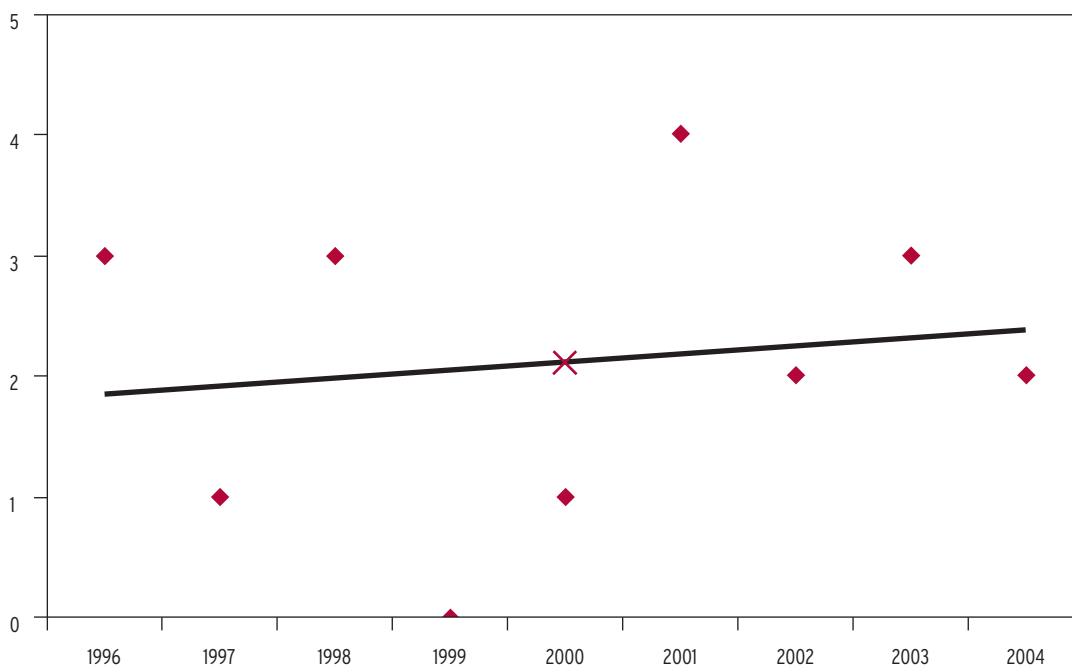
### Annexe 1. Estimating mortality rates for small municipalities

In 2000 the population of 4,018 municipalities in Brazil was less than 20,000 inhabitants, a condition that exposes death rates to great variations: small oscillations in the number of deaths cause great variation in the death rates. The example in Figure 7.15 illustrates the problem.

This pattern of deaths (a variation between 0 and 4 deaths) for a city of 100,000 inhabitants would give us a rate variation of 0–4 deaths per 100,000 people. However, in a township of 16,000 inhabitants, the same numbers (0–4 deaths) would lead to a rate variation of 0–25 per 100,000 people. To reduce such extreme results and to have a more robust estimate than a mean of the nine points in Figure 7.15, the researchers chose to adjust a simple linear regression for the nine years in question. The model thus obtained was the source for an estimated value for the year 2000. This methodology was applied to all 5,507 Brazilian municipalities. This exercise was carried out with different time spans. In this particular case, however, where the year of interest (2000) happens to be at the symmetrical centre of the time range, the result is equal to the arithmetical average.

Figure 7.15 **Hypothetical death rate for a city of 100,000 inhabitants**

DEATHS PER 100,000 INHABITANTS



## Annexe 2. The distinction between 'urban' and 'rural'

### The criteria

Several criteria can be used to distinguish urban and rural areas: population size, occupied area, dominant economic activity, infrastructure, access to public facilities and services, etc. In Brazil, as in other Latin American countries, an administrative distinction is applied. Diversity in these criteria poses comparative problems. In this chapter a combination of three indicators is applied: (i) the official administrative division; (ii) population size; and (iii) population density (inhabitants per km<sup>2</sup>); each of which, on its own, produces different results.

(i) The *official administrative division* of the country is produced for administrative purposes every year based on reports by all municipalities in the country. It gives the following result in Brazil:

% of population living in urban areas	Number of municipalities	% of municipalities (rounded)
Less than 60%	2,811	51.0
60-80%	1,464	26.6
More than 80%	1,232	22.4
<b>Total</b>	<b>5,507</b>	<b>100.0</b>

### (ii) Population size

Population size is the sole criterion for distinguishing between 'urban' and 'rural' areas for several countries, such as Spain, Portugal, Italy, and Greece. In this chapter, the following three categories are distinguished: (a) up to 19,999 inhabitants; (b) from 20,000 to 99,999 inhabitants; and (c) 100,000 or more inhabitants. This indicator presents extreme variation. In 2000 the municipality with the smallest population had 795 inhabitants, while the biggest (São Paulo) had 10.4 million. The tripartite division per size of population is the following:

Population	Number of municipalities	% of municipalities (rounded)
Up to 19,999 inhabitants	4,018	73.0
From 20,000 to 99,999 inhabitants	1,265	23.0
100,000 inhabitants or more	224	4.1
<b>Total</b>	<b>5,507</b>	<b>100.0*</b>

\* The individual percentages do not exactly total 100, due to rounding.

### (iii) Density: inhabitants per km<sup>2</sup>

This is another interesting indicator, with great variation. In 2000 the most densely populated municipality in Brazil had 12,900 inhabitants per km<sup>2</sup>, while the least dense had less than one inhabitant per km<sup>2</sup>. The result is the following:

Demographic density	Number of municipalities	% of municipalities (rounded)
Less than 30 inhabitants/km <sup>2</sup>	3,263	59.3
30-100 inhabitants/km <sup>2</sup>	1,605	29.1
Over 100 inhabitants/km <sup>2</sup>	639	11.6
<b>Total</b>	<b>5,507</b>	<b>100.0</b>



### Combining the criteria

Each category received a value of 1 to 3 on an ascending scale. After classifying all municipalities according to each criterion and weighting them accordingly, final classification comes from the formula:

$$\text{Rank} = \text{Class official division} + \text{Class population size} + \text{Class population density}$$

The results indicate the category of each municipality. These are the categories used in this study.

Categories	Rank
Urban	7-9 points
Medium urban	4-6 points
Rural	3 points or less

Thus the final classification adopted by this chapter has the following breakdown:

Urbanization	Number of municipalities	% of municipalities (rounded)
Rural	4,056	74.0
Medium urban	996	18.0
Urban	455	8.0
<b>Total</b>	<b>5,507</b>	<b>100.0</b>

**Annexe 3. Modelling social conditions for firearm homicides in Brazil**

<b>Modelling firearm homicides in Brazil</b>	<b>National</b>		<b>Urban</b>		<b>Medium urban</b>		<b>Rural</b>	
R <sup>2</sup> =	0.325		0.551		0.325		0.239	
Coefficients	St. beta	Sig.	St. beta	Sig.	St. beta	Sig.	St. beta	Sig.
Demographic density	0.276	0.000	0.280	0.000	0.171	0.000	0.082	0.000
Inequality (Theill-L)	0.092	0.000	0.048	0.146	0.120	0.000	0.153	0.000
% of population aged 15-29 years	0.124	0.000	0.099	0.014	0.178	0.000	0.051	0.002
% of youth (15-29 years) out of school and out of work	0.075	0.000	0.104	0.023	0.058	0.110	0.068	0.001
% of vulnerable families	0.043	0.005	0.085	0.010	0.056	0.038	0.020	0.147
% of firearms per household	0.253	0.000	0.244	0.000	0.316	0.000	0.317	0.000
% of Catholics	-0.321	0.000	-0.595	0.000	-0.393	0.000	-0.154	0.000
% of Protestants	-0.175	0.000	-0.233	0.000	-0.225	0.000	-0.081	0.000
% of migrants	0.061	0.014			-0.085	0.005	0.206	0.000
Average years of study	0.074	0.000					-0.030	0.163
<b>Dependent variable: Rate of death by firearms</b>								

Significance: Student's T-test

The parameters of regression were estimated in accordance with the OLS (multiple regression model) methodology. Other methods, using weights for proximity, level, or similarity, were tested against OLS, but did not show different results.

**Annexe 4. Modelling social conditions for firearm suicides in Brazil**

<b>Modelling firearm suicides in Brazil</b>	<b>National</b>		<b>Urban</b>		<b>Medium urban</b>		<b>Rural</b>	
R <sup>2</sup> =	0.160		0.375		0.152		0.172	
Coefficients	St. beta	Sig.	St. beta	Sig.	St. beta	Sig.	St. beta	Sig.
(Constant)		0.108		0.025		0.461		0.661
Prevalence of firearms in household	0.167	0.000	0.259	0.000	0.152	0.000	0.146	0.000
Life expectancy at birth	-0.143	0.000			-0.365	0.000	-0.207	0.000
% of population aged 15-29 years	-0.123	0.000			-0.129	0.000	-0.167	0.000
Human Development Index	0.520	0.000			0.971	0.000	0.551	
Index of informal labour in labour force	-0.037	0.031	-0.189	0.000	-0.125	0.000		
Inequality (Theil-L)	0.077	0.000	0.106	0.008				
% of economically active persons in total population	0.083	0.002					0.086	0.003
% persons not working	-0.031	0.098	-0.295	0.000				
Family income per capita in minimum salaries in year 2000	-0.094	0.008			-0.146	0.081		
% of households headed by women, without a partner, with children younger than 24 years who do not work	0.043	0.003	0.290	0.000				
Average years of study	-0.187	0.000			-0.319	0.003		
% of undetermined religion	0.025	0.078					0.032	0.057
Total population in year 2000					0.114	0.001	0.085	0.000
Demographic density	-0.035	0.021					-0.063	0.000

## ENDNOTES

- 1 Market research by the tourism industry has identified 'joy' (*alegria*) as the most important characteristic of Brazil for foreigners; see Bignami (2002).
- 2 Brazil became independent in 1822.
- 3 After a two-decade rise in firearm deaths in Brazil, from 2003 to 2004 the number dropped from 39,325 to 36,091. The reduction was sustained in 2005, and results from some key populous states, such as São Paulo, Minas Gerais, and Rio de Janeiro, suggest that numbers should continue to fall in 2006. Together with other factors, the new firearm legislation, the December 2003 Disarmament Statute, has probably contributed to these results; see Ministério da Saúde (2005) and Fernandes (2005b).
- 4 Ramos and Lemgruber (2004); Cano and Santos (2001); Beato Filho (2000); Luiz Soares (1996); Soares (2006).
- 5 See endnote 11.
- 6 A description of criteria and methods applied when establishing the distinction between urban and rural areas is found in Annexe 2. A discussion of the urban–rural distinctions in Brazil is found in IPEA, IBGE, and UNICAMP (2002).
- 7 On the methodological problems of estimating the death rate in small municipalities, see Annexe 1.
- 8 WHO (2002, pp. 186–87) reports the following suicide rates for Latin American and Caribbean countries per 100,000 inhabitants: Argentina, 8.7; Brazil, 6.3; Chile, 8.1; Colombia, 4.5; Costa Rica, 8.8; Cuba, 23.0; Ecuador, 7.2; El Salvador, 11.2; Mexico, 5.1; Nicaragua, 7.6; Paraguay, 4.2; Puerto Rico, 10.8; Uruguay, 12.8; Venezuela, 8.1.
- 9 Carrying a gun is common practice among men in some rural sub-regions of Brazil, such as the 'Gaúcho' country in the south, the savanna in the mid-west, or the forest in the Amazon. Hunting is a regular activity in these regions, which explains the preference for long-barrelled hunting arms. Most handguns and even shotguns used in Brazil are Brazilian-made, while automatic weapons found among civilians are typically foreign-made—and in principle illegal. For a detailed discussion of small arms supply, stocks, and demand in Brazil, see Dreyfus and de Sousa Nascimento (2005), Lessing (2005), Phebo (2005), and Rivero (2005).
- 10 On gender and violence in Brazil, see Barbara Soares (1996), Jordão (2006), and Moura (2007).
- 11 Terminology for ethnic groups varies throughout the world. Official Brazilian statistics use categories such as 'black', 'brown', 'white', and 'yellow' (see <<http://www.ibge.gov.br/home/estatistica/populacao/censo2000/metodologia/metodologiacenso2000.pdf>>, and especially pp. 213–14). This chapter applies the categories used by the UK Office of National Statistics, namely 'black', 'mixed race', and 'white' (see <<http://www.statistics.gov.uk/CCI/nugget.asp?ID=467&Pos=&ColRank=2&Rank=1000>>). On race and violence in Brazil see Batista, Escuder, and Pereira (2004) and Ramos and Musumeci (2006).
- 12 On youth and violence in Brazil, see Novaes and Vannuchi (2004), Waiselfisz (2006), and Dowdney (2003).
- 13 Multiple regression analysis measures the relationship between a dependent (or criterion) variable (here, the firearm homicide rate) and several independent (or predictor) variables. The  $R^2$  (the *coefficient of determination*) value is an indicator of how well the model fits the data.
- 14 A thorough discussion of social inequalities in Brazil is found in Hasenbalg and Silva (2003).
- 15 Other religious traditions are not well enough represented in the census across the municipalities to be included in the discussion here. Afro-American beliefs (Candomblé, Umbanda, etc.) in particular, widespread as they are, tend to be under-notified in the census. Most people will simply respond 'Catholic', not bothering to register their double or even multiple religious practices. However, the protective aspect found here suggests that further research should be carried out concerning the relationships between religion and armed violence in Brazil. Children under ten years of age were attributed with the religion of their parents. To follow research on religions and the social facts in Brazil, see the journal *Religião e Sociedade*, published by ISER since 1977.
- 16 See the report on human development for the city of Rio de Janeiro, 2001, data from which is available at <[http://www.pnud.org.br/pdf/Tabela%206.2.22%20IDH%20bairro%2091\\_00-15\\_12\\_03.xls](http://www.pnud.org.br/pdf/Tabela%206.2.22%20IDH%20bairro%2091_00-15_12_03.xls)>. On the uneven distribution of crime within the city of Belo Horizonte, see also Beato et al. (2001).
- 17 Figure 7.8 follows a different modelling procedure: (i) rates of firearm homicides were calculated for each age group; and (ii) social and economic indicators were equally established for each age group; so that (iii) the numbers shown in Figure 7.8 are the standardized coefficients for the multivariate models adjusted for each age group.
- 18 The Federal Police have made progress in reducing illicit drug production in the interior of Pernambuco, the so called 'Marijuana Polygon'. The impact of these actions for the rates of violence in the region should become clearer in the coming years.
- 19 On the modelling of the social conditions of firearm suicides, see Annexe 4.

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