Missing Men: The Direct Mortality Impacts Of Firearm Violence In Colombia, 1979-2005

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1. Introduction

Colombia has been characterized by extreme levels of civil violence throughout the latter part of the twentieth century, and the country continues to be one of the most dangerous in the world in terms of deaths due to injuries. While injury deaths among adolescents and young adults generally declined in Latin America over the period 1980-2000, Colombia is one of a handful of countries that show an opposite trend (Yunes and Zubarew 1999). In fact, Colombia led El Salvador, Venezuela, Brazil, and Puerto Rico with the highest injury death rate among men aged 15 to 19 years old, reaching a peak of 122 per 100,000 inhabitants in 1991-1992 (see Figure 1).

One of the distinguishing characteristics of these injury mortality trends is the increasing role that firearms play. Firearms are overwhelmingly the weapon most associated with homicides in both Brazil (Martin, Melki et al. 1999) and in Colombia (Villaveces, Cummings et al. 2000). Official vital records indicate that some 477,273 deaths due to firearms occurred in Colombia between 1979 and 2005, or approximately 525,000 deaths assuming that 10% went unregistered. During this same period, over one-fifth of all deaths were attributed to external causes, and firearms were involved in one-half of deaths due to external causes. Most deaths involving firearms are intentional: in Colombia, homicides by firearm account for at least 91% of all deaths by firearms.

Deaths by firearm in Colombia increased eight-fold over the period 1979-2002, from only 3,617 in 1979 to 28,989 in 2002. Deaths due to external causes and deaths by firearm show a similar trend between 1979 and 2005, increasing constantly until 1993, then decreasing between 1994 and 1997, and finally sharply increasing until peaking in 2002 (see Figure 2). From 2002 onward, vital records indicate a substantial reduction in deaths by firearms, which has been attributed to violence prevention programs in major cities as well as security iniatives by the national government.

A second distinguishing characteristic of injury mortality is the manner in which it disproportionately affects men over women. A study in Connecticut by Bretsky and colleagues found that 85% of firearm injuries occurred among men (Bretsky, Blanc et al. 1996). Similarly, mortality rates in Colombia are higher among men than women at most ages. Figure 3 plots the natural logarithm of the central mortality rates ($_nM_x$) for ages 0 through 75 for Colombia in 1985 and 2002. Men clearly have much higher mortality than women for both years. What is most striking about the male mortality, however, is the pronounced accident hump starting around age 15 and lasting until about age 35. At age 20, male mortality is approximately 40% greater than female mortality at the same age.

While a variety of forces could conceivably account for the pronounced differences in both the level of mortality and the male accident hump, the most likely candidate is the burden of violence on young men. Figure 4 shows a clear consistency between the age distribution of deaths due to external causes and, more specifically, deaths due to firearms and the all-cause mortality hump evident in Figure 3. These patterns are consistent with ample research demonstrating the link between male sex hormones and intensity of aggression (Bradford and McLean 1984; Christiansen and Knussmann 1987; Dabbs and Morris 1990). Males not only inflict more serious injuries than women, but are also responsible for the vast majority of violent deaths. In the U.S., men are about nine times as likely as women to commit murder, seventy-eight times as likely to commit forcible rape, ten times as likely to commit armed robbery, and over six times as likely to commit aggravated assault. Altogether, men are almost eight times as likely as women to commit violent crime (Wrangham and Peterson 1996).

Furthermore, younger males exhibit more antisocial behavior than older males. Studies suggest that the ages of greatest commission of violence are 15 to 35, with violent criminal behavior peaking in late adolescence before declining to a low plateau around age 40 (Hirschi and Gottfredson 1983). Younger males are also far more responsible for crimes that result in violent death (Olweus, Mattson et al. 1988; Cheatwood and Block 1990; Mesquida and Wiener 1996). In their study of Chicago homicides, Wilson and Daly find that males between 20 and 29 commit most of the homicides (Wilson and Daly 1985). In their analyses of interstate and intrastate episodes of collective aggression since the 1960s, Mesquida and Wiener note a consistent correlation between the ratio of males 15 to

29 years of age per 100 males 30 years of age and older, and the level of coalitional aggression as measured by the number of reported conflict-related deaths (Mesquida and Wiener 1996).

In this paper, we explore the impact of differential male mortality, specifically homicides attributable to firearms, on patterns of life expectancy in Colombia in the context of substantial demographic changes occurring throughout the country. We use age and sex-specific mortality data to measure the excess of male mortality in individual Colombian departments. We then calculate cause-eliminated life tables for firearm-related mortality and estimate the average loss of life attributable to homicides perpetrated with firearms. Finally, we discuss some of social factors associated with excess male mortality and their implications in Colombia.

2. Data

Data for this study are derived from two sources: national censuses conducted among Colombian households and records of vital events which are compiled at the municipal level. Colombia is divided into 32 administrative departments and one capital district (Bogota). Annual departmental populations disaggregated by age and sex are projected from the censuses of 1973, 1985, 1993, and 2005. Data on deaths by age, sex, and cause of death (ICD9 and ICD 10) by department of residence of the deceased are available for the period 1979-2005. In this paper, we are concerned with deaths due to external causes (which consist of accidental injuries, intentional injuries, and suicides), as well as the subset of deaths due to intentional injuries that are associated with firearms.

This mortality data will be supplemented by a dataset on political killings in Colombia from 1988-2005 (Restrepo, Spagat et al. 2004). This dataset is the only time-series dataset for the Colombian civil conflict with sufficient detail (approximately 21,000 events) to permit analysis of the actions of the various armed actors in the Colombian conflict over the past 16 years. The methodology it employs for measuring conflict activity is based on the event as the unit of data inclusion. For each event, a set of characteristics is recorded which include date, geographical location, whether or not there was an attack or clash and the groups involved, number of deaths, and number of injuries. In theory, deaths included in this dataset will have been captured by the government vital registration system, allowing a distinction to be made between deaths of a political nature (i.e., associated with the internal armed conflict) versus deaths of a more criminal nature (i.e. less organized and more associated with a culture of violence). In practice, however, those departments of Colombia with the highest levels of armed conflict are often in remote, underdeveloped regions more likely to have weaker institutional presence and lower levels of vital registration coverage.

3. Methods

While coverage of vital registration in Colombia is good compared with other developing countries, gaps in coverage do exist and the extent of underreporting varies by location. In order to calculate unbiased departmental life tables, we estimate the completeness of death registration relative to population recording and adjust the differential in completeness. All of the methods available to do so assume that coverage completeness is invariant with age, and evaluate completeness of death recording by comparison of the age pattern of deaths with the age pattern of those alive. When two or more census enumerations are available, the growth rate of each segment can be calculated from the census counts, and the assumption of population stability is no longer needed.

Bennett and Horiuchi propose a method which requires two censuses in addition to the total intercensal deaths by age (Bennett and Horiuchi 1981). Age-specific growth rates for the intercensal period are used to expand the observed distribution of deaths by age to a stationary population or life table distribution. Since the life table deaths above age x are equal to the life table population of exact age x (assuming no net migration), the ratio of expanded deaths above age x to an estimate of the population aged x derived from the two age distributions estimates the completeness of death recording relative to census coverage. After adjusting for bias in mortality reporting, we extend survivorship from the terminal 80+ age group to a 100+ hypothetical age group using the method proposed by Coale and Guo (Coale and Guo 1989).

We employ a multiple-decrement life table to measure the extent to which firearm violence produces excess male death in Colombia. Multiple decrement life table analysis allows "removal" of deaths due to a particular cause (cause attribution), such as deaths attributable to external injuries, intentional external injuries, and firearms in particular. We denote the probability of dying of cause i in the interval $[x,x+n)$ as ${}_nq_x^i$. The probability of mortality from the ith cause can be calculated directly from the master life

table simply by multiplying this master probability by the ratio of the observed number of deaths in cause *i* to the total number of deaths for the age interval:
d_x^i

$$ {}_nq_x^i = {}_nq_x \frac{{}_nD_x^i}{{}_nD_x}, \tag{1.1} $$

assuming the period mortality rate, ${}_nM_x$ is a reasonable approximation of the cohort mortality rate ${}_nm_x$.

While these probabilities are interesting in and of themselves, interest generally focuses on the more tangible quantity of l_x^i, the number of individuals of exact age *x* who will ultimately exit the population via cause *i*. This value is simply the sum of the number of exits from cause *i* at all ages greater than *x*:

$$ l_x^i = \sum_{y=x}^{\infty} {}_nd_x^i, \tag{1.2} $$

where ${}_nd_x^i = l_x \, {}_nq_x^i$.

From a multiple-decrement life table, we can also calculate the associated single-decrement life table (ASDLT), where cause of death *i* is removed. The ASDLT allows us to calculate the difference in life expectancy that would arise in the hypothetical situation of entirely removing cause of death *i*.

We employ Chiang's proportional hazards method for calculating the ASDLT (Chiang 1984). Following this approach, the key calculation converts ${}_np_x$, the overall probability of surviving from age *x* to age $x + n$ to ${}_n^*p_x^{-i}$ the (hypothetical) probability of surviving the interval if cause *i* were eliminated. To make this conversion in the proportional hazards framework we raise ${}_np_x$ to the power of R^{-i}, where R^{-i} is the complement of the proportion of deaths arising from cause *i*:

$$ {}_n^*p_x^{-i} = {}_np_x^{R^{-i}}, \tag{1.3} $$

$$R^{-i} = \frac{{}_nD_x - {}_nD_x^i}{{}_nD_x}. \tag{1.4}$$

Calculation of the ASDLT also requires an assumption for the ${}_na_x$ schedule, the average number of years lived by people dying in the interval x to $x + n$. When a force of decrement in an interval is high, the age distribution of deaths in that interval will be young, so care must be exercised in specifying this schedule. The ${}_na_x$ schedule is the linchpin that allows us to move from the observed rates to the probabilities that comprise the life table. We employ a mixed strategy for specifying ${}_na_x$. For departments where violent death is relatively rare, for ages below 15 and above 75, and for women more generally, we simply use the ${}_na_x$ schedule of the master life table. For all other ages and classes we use the quadratic graduation suggested by Preston et al. (Preston, Heuveline et al. 2001).

Attempting to graduate the ${}_na_x$ schedule for populations experiencing very low levels of violent death or in age classes where the number of deaths is changing very rapidly causes the values of ${}_n^*a_x^i$ to be very unstable because of the very small numbers in the denominator of Equation 1. When the number of decrements from cause i is a very small fraction of the total observed deaths, the assumption that cause i has the same within-age-class age pattern is not unreasonable.

4. Results

4.1 Multiple Decrement Life Table Analysis

We calculate all mortality measures for each of the 33 Colombian Departments for each year in the interval 1985-2004. The mortality pattern of the department of Antioquia is particularly striking. Medellin, the department's principal city and one of Colombia's industrial centers, holds considerable notoriety in the United States and Europe because of the powerful eponymous drug cartel which flourished there until the early 1990's. Antioquia has suffered a tremendous burden of the sectarian violence that has characterized the rural areas on Colombia in the latter part of the twentieth century. The mortality experience of Antioquia over the interval is similar to other high-violence departments (see Putumayo, Arauca, Casanare, and Caquetá in Figure 5) and contrasts strongly with the coastal Caribbean departments of Atlántico, Bolívar, and Sucre as well as the capital, Bogotá.

Table 1 presents the results of the multiple decrement life tables for the department of Antioquia in 1991, using death from firearms and death from all other causes as the decrements for 1985-2004. ${}_nD_x$ is the total observed number of deaths to people age *x* in the interval, while ${}_nD_x^i$ is the number of deaths from firearms to individuals age *x*. The columns l_x and ${}_nq_x$ are the standard life table functions for the fraction of survivors to exact age *x* and the probability of dying in the interval from age *x* to age *x* + *n*. The last three columns of Table 1 represent the interval probability of dying of cause *i*, ${}_nq_x^i$, the proportion of all deaths due to firearms happening in age *x*, ${}_nd_x$ and the fraction of individuals age *x* who will eventually die of firearm-related injuries, l_x^i.

Figure X plots the male l_x function for firearm deaths in Antioquia over the period 1985-2004. The colors correspond to years, with xxxx being the earliest (1985) and xxxx being the latest (2004). At the height of the violence (1991), more than 23% of male newborns would succumb to firearm-related mortality in the demographic regime of that period. In the most recent year, still 16% of newborns will die of firearm related mortality. The risk of death increased markedly from 1979 through the mid-nineties and has declined somewhat since. A comparison of the plot of Figure X to that of Figure X, which plots the female l_x function for firearm deaths in Antioquia 1985-2004, demonstrates that the great burden of firearm-related mortality is suffered by men.

4.2 Associated Single-Decrement Life Tables for Firearm-Related Deaths

Table 2 presents the corresponding ASDLT for firearm-related mortality in Antioquia in 1991. R^{-i} is the complement of the proportion of deaths arising from firearm-related violence. The other columns are: ${}_np_{xl}$, the probability of surviving from age *x* to age *x* + *n* with firearm-related deaths eliminated, l_x^{-i}, the fraction of the cohort alive at age *x* in the cause-eliminated population, ${}_n a_x^i$, the number of person-years lived by those dying in the interval, and e_x^i , the life expectancy at age x in the cause-eliminated population.

The Graphical Annex contains plots of the difference between the ASDLT cause-eliminated life expectancy e_x^{-i} and the life expectancy for the actual population e_x for Antioquia as well as the remaining 32 departments of Colombia. At the peak of violence in Antioquia, for example, the difference in life expectancy at birth for men was over 9 years. That is, men lost an average of 9 years of life to firearm-related violence in 1991. The change in life expectancy accelerates markedly between ages 15 and 20, the ages when violence begins to take its toll on men's lives. In the department of Putumayo along the country's southern border, men lost well over 10 years of life at the end of the last decade as violence associated with the illicit cultivation of coca surged in the region. In the year 2000, men in the department lost nearly 14 years of life to firearm-related injuries.

5. Discussion

Firearm-related mortality, concentrated largely among adolescent and young adult men, was responsible for the loss of anywhere between one month and 14 years of life expectancy at birth in Colombia over the past two decades. In some departments, particularly La Guajira and Casanare, male life expectancy was actually worse at the end of the period than nearly twenty years prior, as improvements in the availability of health services failed to compensate for the devastating effect of firearm violence. Preliminary exploration of political versus criminal homicides, not yet included in this analysis, suggests that as little as 20% of homicides associated with firearms occurred in the context of attacks by or clashes between any of the country's several armed groups. Formidable criminal networks, such as that headed by Pablo Escobar in Medellin until his death in 1993, are likely to play an equal or greater role in this burden.

In fact, the escalation in violence during the decade of the 1990's occurs nearly parallel to the rise in illicit cultivation of coca and poppy in remote departments of the country, such as Putumayo and Caquetá. Violence tends to be more pronounced in Colombia's border regions, such as Putumayo and Nariño along the border with Ecuador, and La Guajira, Cesar, Norte de Santander, and Arauca on the Venezuelan side. There is a clear peak in violent injuries during the end of the 1990's and early part of this decade, followed by improvements in many areas from 2002 onward. This shift could be related to a number of diverse factors, such as the implementation of the U.S.-backed Plan Colombia, the gradual recovery of the coffee market and other sectors of the Colombian economy following the 1999 recession, and an aggressive new security plan by the Uribe Administration (2002-2010).

In populations characterized by high male mortality, we expect strong implications for (1) marriage markets, (2) the dynamics of family formation and dissolution, and (3) patterns of parental investment in offspring. Anthropological evidence suggests that aggression associated with mating and marriage can be an important determinant of violence between men as well as against women in societies around the world (Daly and Wilson 1988; Barber 2003). Symons notes that in relatively peaceful subsistence societies, such as the !Kung of the Kalahari Desert and the Siriono of Bolivia, the primary motive for homicide is sexual jealousy among men (Symons 1979). Ember and Ember (Ember and Ember 1994) report that homicide and assault rates of pre-industrial societies correlate with frequency of warfare and the training of boys for aggression, indicating that interpersonal violence may partly be a side effect of the need to produce warriors.

Analysis in Detroit has also found that many homicides are categorized as products of “trivial altercations” between young men. Such arguments often have consequences for social status and are far from trivial because men who lose face may then be less attractive as potential mates (Barber 2003). A similar logic may explain why rates of violent crime are higher in countries that have low sex ratios (i.e., where women outnumber men) (Barber 2000). By contrast, when there is a scarcity of women, premarital chastity is common, and men are more likely to compete indirectly via resource acquisition (Guttentag and Secord 1983). Thus, it has been argued that societies with high levels of direct mating competition are more likely to have high levels of violent crime (Barber 2003).

Hudson and den Boer refer to such men in high sex-ratio societies as "surplus males" (Hudson and den Boer 2004). Surplus males belong predominantly to the lowest socioeconomic class and have little or no bargaining power in the marriage market. In market economies such as Colombia, surplus males are more likely to be underemployed or unemployed, as well as more likely to be chosen for low-status jobs that are dangerous, menial, labor intensive, or seasonal (Courtwright 1996). Poor economic outlook and restricted social mobility lead such men to engage in risky ventures (such as joining a criminal gang or other armed group) to acquire the resources and status they lack. This sort of engagement in high-risk occupations raises their mortality rates through occupational hazards and unhealthful conditions (Boone 1986).

Since the vital registration data available for this study includes information on marital status of the deceased, a key area of investigation should be to assess whether men, after controlling for age and educational attainment, may expose themselves to greater mortality risk when they are single. Conclusive findings in this regard promise to open up a new dimension of analysis in terms of the demography of armed conflict, based on a better understanding of its relationship to the male life course.

6. Figures

Figure 1: External Cause Mortality Rates for Selected Countries, 1985-1995.

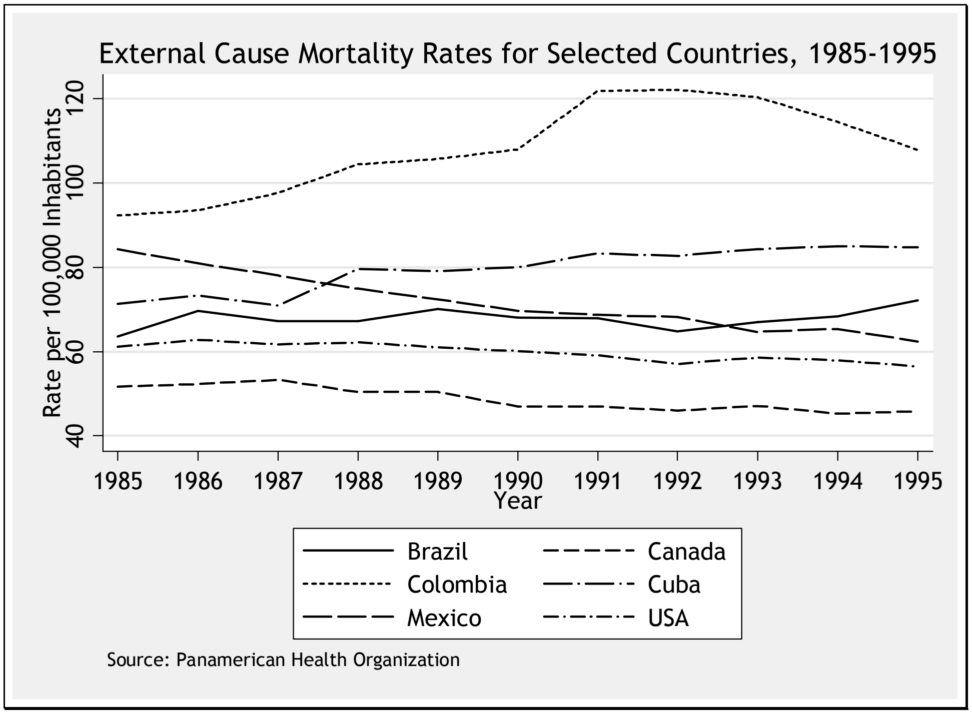


Figure 2: Proportion of Total Deaths Attributable to (1) External Causes and (2) Firearms in Colombia, 1979-2002.

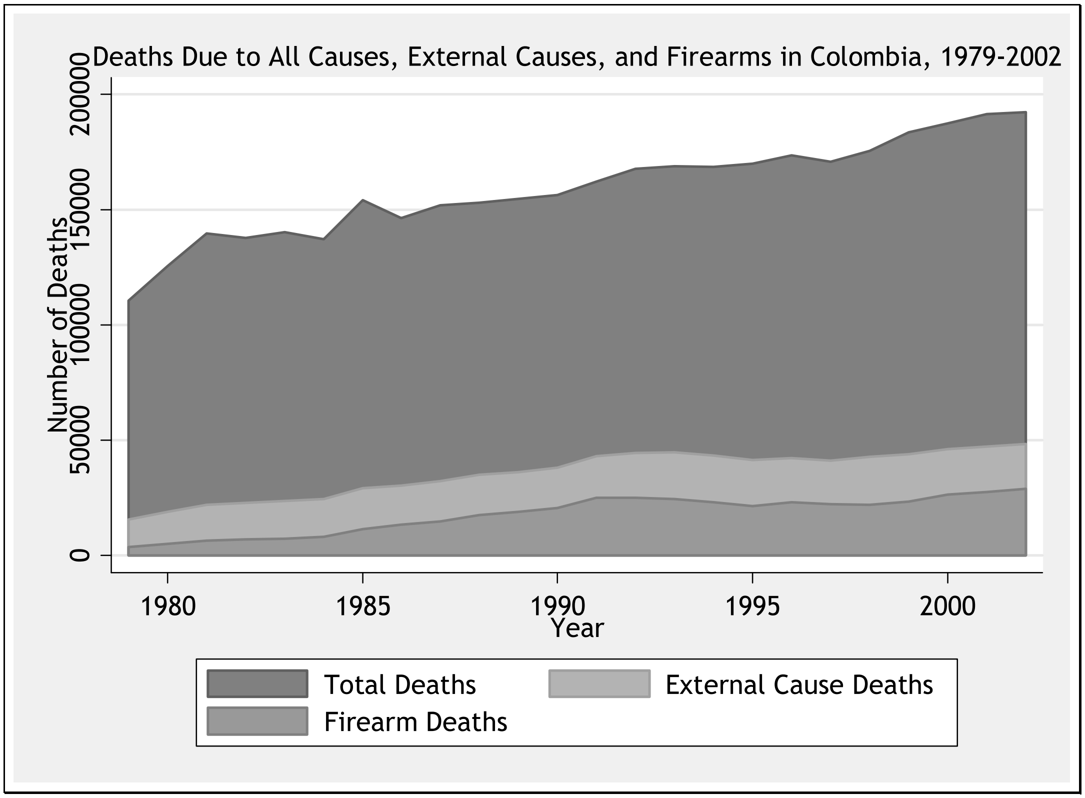


Figure 3: Log $_nM_x$ by Age for Males and Females in Colombia, 1985 and 2002.

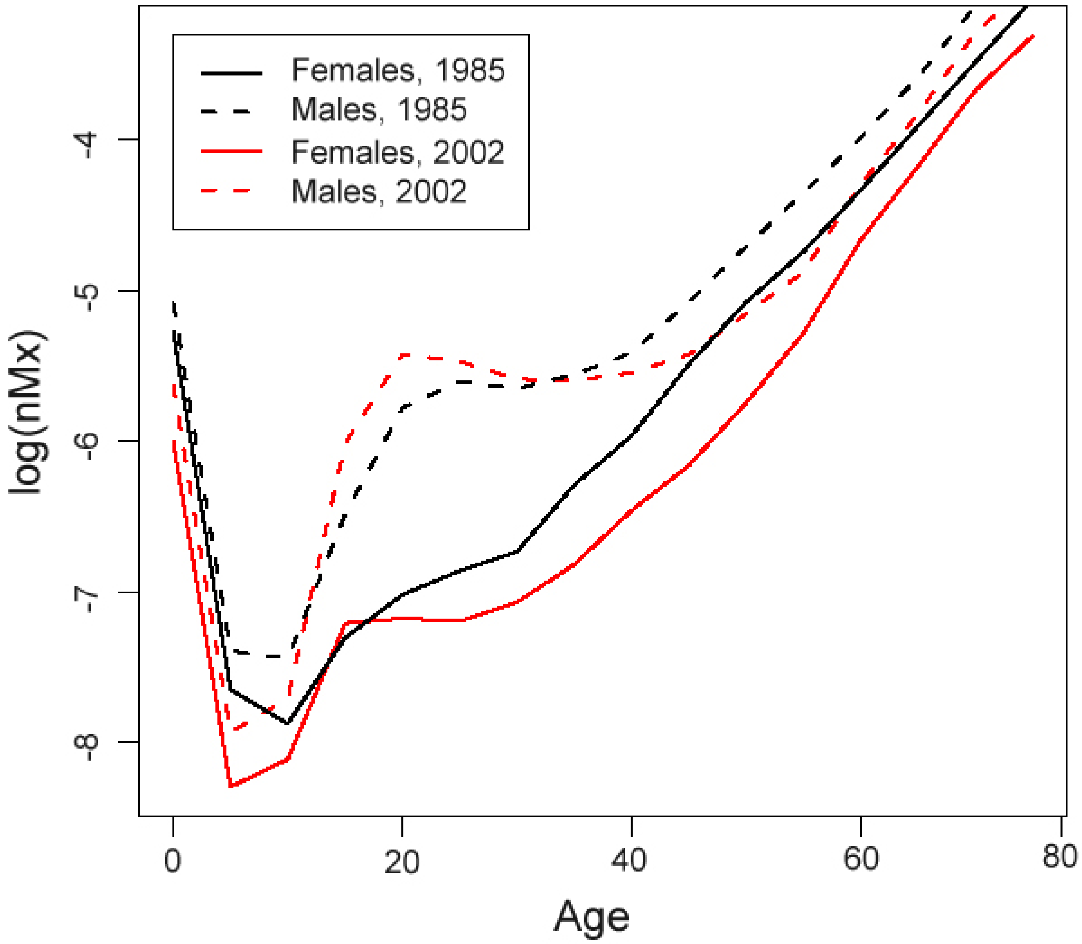


Figure 4: Proportion of Total Deaths Attributable to (1) External Causes and (2) Firearms by Age Group in Colombia, 1979-2002.

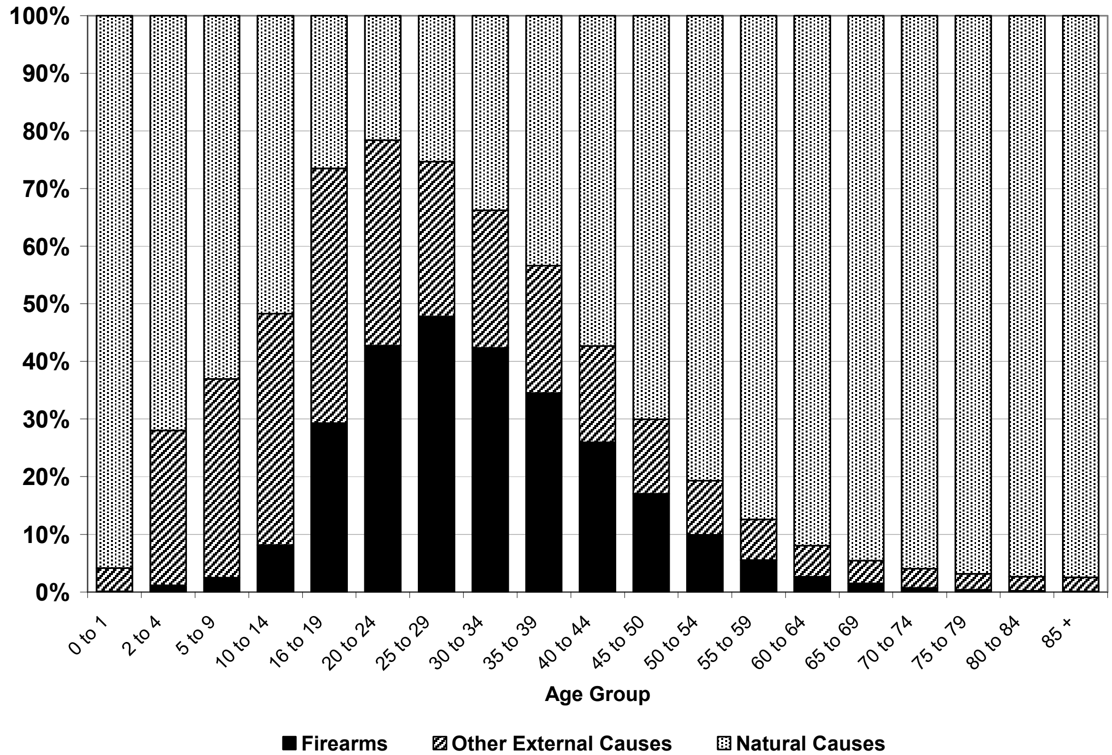


Figure 5: Male Years of Life Expectancy at Birth Lost to Firearms for Selected Departments and Years

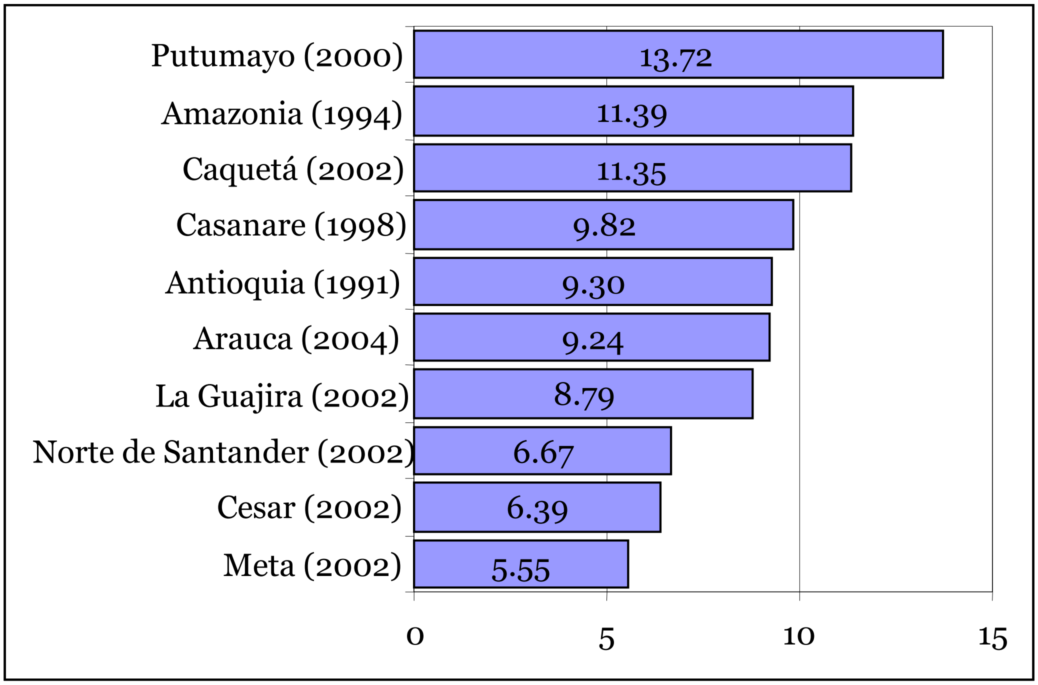


Table 1: Multiple Decrement Life Table, Antioquia Department, 1991

Males

Age x	${}_nP_x$	${}_nD_x$	${}_nD_x^i$	${}_nm_x$	${}_nq_x$	l_x	d_x	L_x	T_x	E_x
0	284,952	1,244	7		0.0501	1.0000	0.0501	4.87	57.28	57.28
5	266,648	224	11	0.0009	0.0044	0.9499	0.0042	4.74	52.41	55.17
10	251,380	264	108	0.0011	0.0055	0.9457	0.0052	4.72	47.67	50.41
15	235,390	2,157	1,767	0.0096	0.0470	0.9405	0.0442	4.59	42.95	45.67
20	240,937	3,155	2,497	0.0138	0.0665	0.8963	0.0596	4.33	38.36	42.80
25	223,528	2,614	1,936	0.0123	0.0596	0.8367	0.0499	4.06	34.03	40.67
30	186,468	1,797	1,225	0.0101	0.0494	0.7868	0.0388	3.84	29.97	38.09
35	147,490	1,367	869	0.0097	0.0475	0.7479	0.0356	3.65	26.13	34.94
40	112,194	972	520	0.0091	0.0445	0.7124	0.0317	3.48	22.48	31.56
45	82,973	761	303	0.0096	0.0470	0.6807	0.0320	3.32	19.00	27.91
50	63,930	784	234	0.0129	0.0624	0.6487	0.0405	3.14	15.68	24.17
55	52,947	770	111	0.0153	0.0736	0.6082	0.0448	2.93	12.53	20.61
60	42,235	1,077	94	0.0268	0.1256	0.5634	0.0707	2.64	9.60	17.05
65	34,475	961	45	0.0293	0.1364	0.4927	0.0672	2.30	6.96	14.14
70	23,694	1,047	22	0.0464	0.2080	0.4255	0.0885	1.91	4.67	10.97
75	15,571	1,014	7	0.0684	0.2921	0.3370	0.0984	1.44	2.76	8.20
80	13,613	1,777	6	0.1371	0.5107	0.2385	0.1218	0.89	1.32	5.55
85	-	-	-	0.2437	0.7572	0.1167	0.0884	0.36	0.44	3.74
90	-	-	-	0.3839	0.9795	0.0283	0.0278	0.07	0.07	2.59
95	-	-	-	0.5361	1.1454	0.0006	0.0007	0.00	0.00	1.92
100+	-	-	-	0.6637	1.0000	0.0000	0.0000	0.00	0.00	1.51

Females

Age x	${}_nP_x$	${}_nD_x$	${}_nD_x^i$	${}_nm_x$	${}_nq_x$	l_x	d_x	L_x	T_x	E_x
0	276,162	1,042	8		0.0405	1.0000	0.0405	4.90	70.67	70.67
5	259,358	203	3	0.0009	0.0045	0.9595	0.0043	4.79	65.77	68.55
10	245,867	126	28	0.0006	0.0029	0.9552	0.0028	4.77	60.98	63.84
15	236,684	282	139	0.0014	0.0068	0.9524	0.0065	4.75	56.22	59.02
20	247,775	335	150	0.0015	0.0077	0.9459	0.0073	4.71	51.47	54.41
25	232,421	305	122	0.0015	0.0075	0.9386	0.0070	4.68	46.76	49.81
30	199,860	260	75	0.0015	0.0074	0.9316	0.0069	4.64	42.08	45.17
35	162,431	333	81	0.0023	0.0117	0.9247	0.0108	4.60	37.44	40.49
40	126,940	310	47	0.0028	0.0139	0.9139	0.0127	4.54	32.85	35.94
45	93,531	333	31	0.0041	0.0202	0.9012	0.0182	4.46	28.31	31.41
50	74,953	431	18	0.0066	0.0324	0.8830	0.0286	4.34	23.85	27.01
55	64,560	649	13	0.0115	0.0560	0.8544	0.0478	4.15	19.50	22.83
60	53,740	803	6	0.0171	0.0821	0.8065	0.0662	3.87	15.35	19.03
65	44,320	830	6	0.0215	0.1019	0.7403	0.0754	3.51	11.48	15.51
70	31,725	1,070	4	0.0387	0.1762	0.6649	0.1172	3.03	7.97	11.99
75	22,194	984	3	0.0508	0.2254	0.5477	0.1235	2.43	4.94	9.02
80	22,671	2,348	0	0.1187	0.4577	0.4242	0.1942	1.64	2.51	5.92
85	-	-	-	0.2355	0.7411	0.2301	0.1705	0.72	0.87	3.80
90	-	-	-	0.3966	0.9958	0.0596	0.0593	0.15	0.15	2.52
95	-	-	-	0.5673	1.1730	0.0003	0.0003	0.00	0.00	1.82
100+	-	-	-	0.6891	1.0000	0.0000	0.0000	0.00	0.00	1.45

Table 2: Associated Single Decrement Life Table, Antioquia Department, 1991

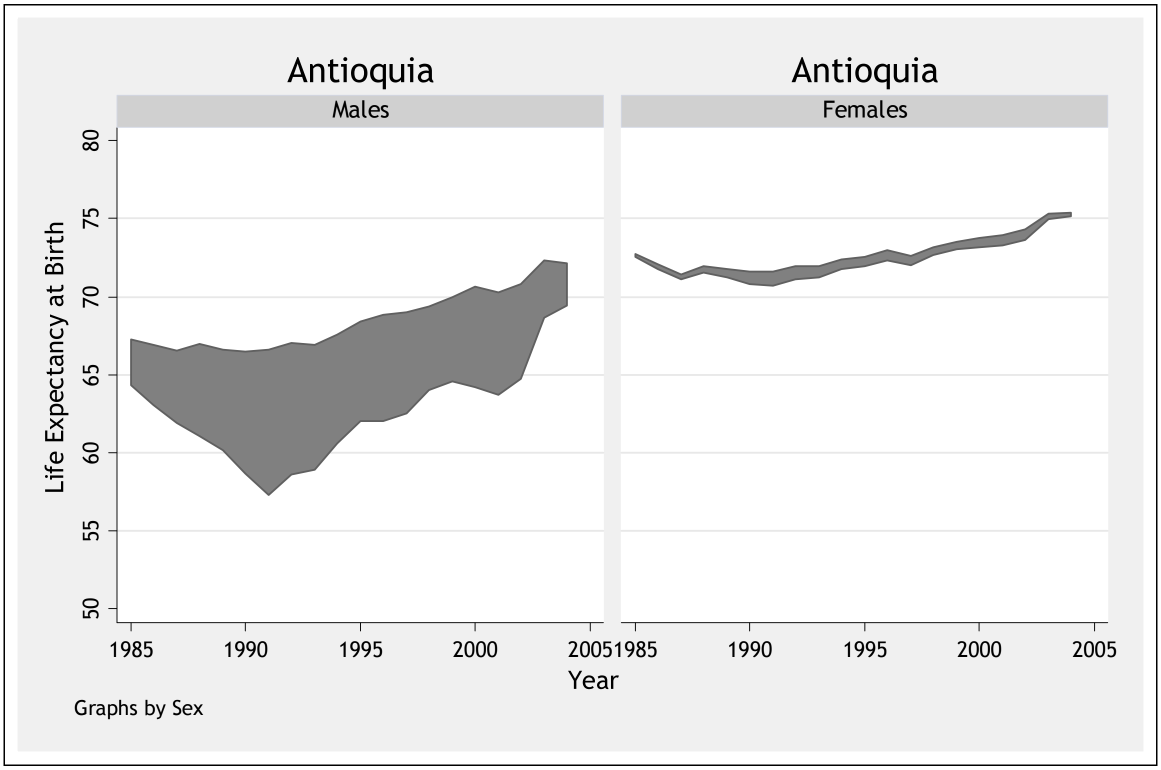
Males

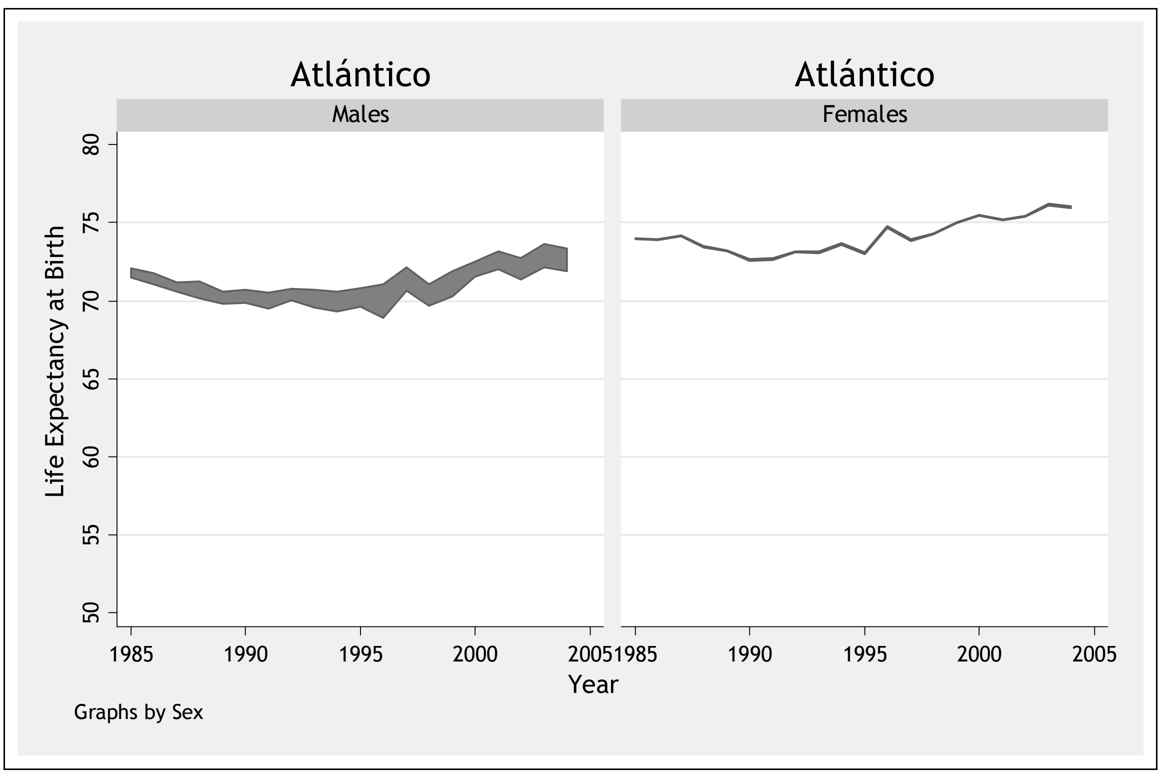
Age x	R^{-i}	${}_np_x$	${}_n^*p_x^{-i}$	l_x	l_x^i	d_x	$d_x{}^i$	e_x	e_x^{-i}
0	0.9944	0.9499	0.9499	1.0000	1.0000	0.0501	0.0501	57.28	66.58
5	0.9509	0.9956	0.9958	0.9499	0.9499	0.0042	0.0040	55.17	64.96
10	0.5909	0.9945	0.9967	0.9457	0.9459	0.0052	0.0031	50.41	60.22
15	0.1808	0.9530	0.9913	0.9405	0.9428	0.0442	0.0082	45.67	55.41
20	0.2086	0.9335	0.9857	0.8963	0.9346	0.0596	0.0133	42.80	50.88
25	0.2594	0.9404	0.9842	0.8367	0.9213	0.0499	0.0146	40.67	46.58
30	0.3183	0.9506	0.9840	0.7868	0.9067	0.0388	0.0145	38.09	42.29
35	0.3643	0.9525	0.9824	0.7479	0.8922	0.0356	0.0157	34.94	37.93
40	0.4650	0.9555	0.9790	0.7124	0.8764	0.0317	0.0184	31.56	33.57
45	0.6018	0.9530	0.9714	0.6807	0.8580	0.0320	0.0246	27.91	29.24
50	0.7015	0.9376	0.9557	0.6487	0.8335	0.0405	0.0369	24.17	25.02
55	0.8558	0.9264	0.9366	0.6082	0.7965	0.0448	0.0505	20.61	21.07
60	0.9127	0.8744	0.8846	0.5634	0.7460	0.0707	0.0861	17.05	17.33
65	0.9532	0.8636	0.8694	0.4927	0.6599	0.0672	0.0862	14.14	14.26
70	0.9790	0.7920	0.7958	0.4255	0.5737	0.0885	0.1172	10.97	11.03
75	0.9931	0.7079	0.7095	0.3370	0.4565	0.0984	0.1326	8.20	8.22
80	0.9966	0.4893	0.4905	0.2385	0.3239	0.1218	0.1650	5.55	5.56
85	-	0.2428	0.2430	0.1167	0.1589	0.0884	0.1203	3.74	3.74
90	-	0.0205	0.0200	0.0283	0.0386	0.0278	0.0378	2.59	2.59
95	-	0.0100	0.0100	0.0006	0.0008	0.0007	0.0009	1.92	1.91
100+	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.51	1.51

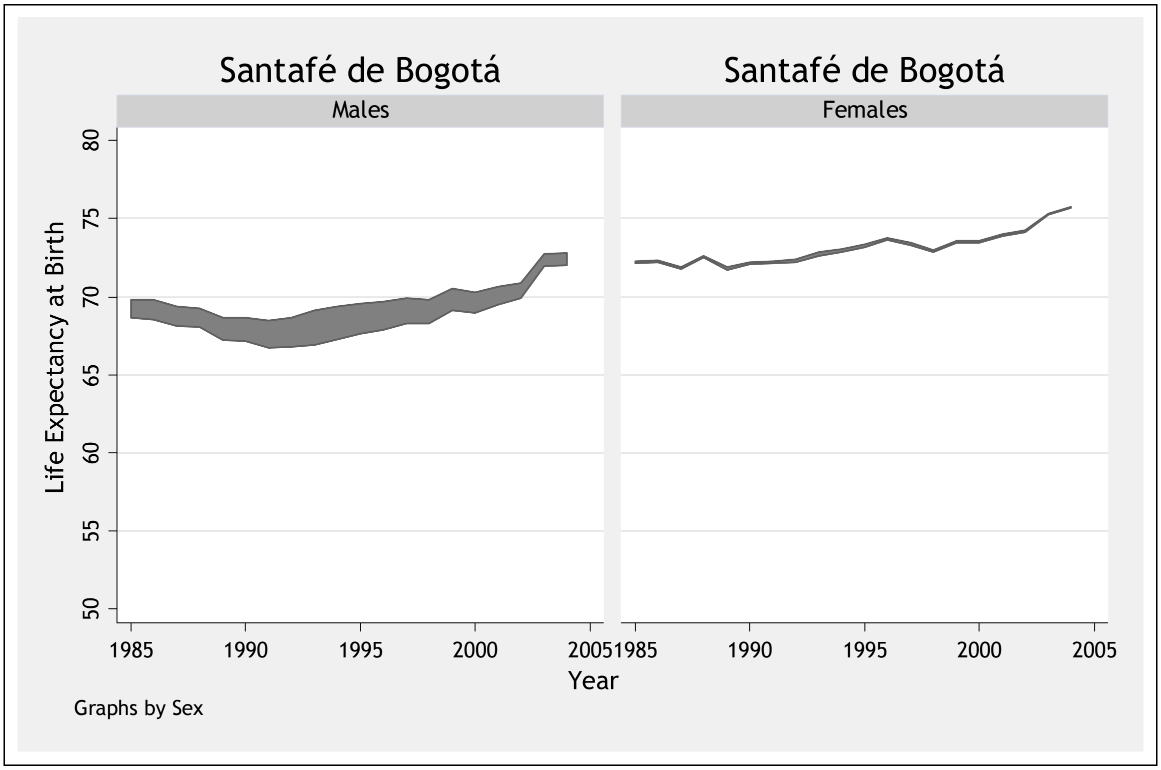
Females

Age x	R^{-i}	${}_np_x$	${}_n^*p_x^{-i}$	l_x	l_x^i	d_x	$d_x{}^i$	e_x	e_x^{-i}
0	0.9923	0.9595	0.9595	1.0000	1.0000	0.0405	0.0405	70.67	71.58
5	0.9852	0.9955	0.9956	0.9595	0.9595	0.0043	0.0042	68.55	69.49
10	0.7778	0.9971	0.9977	0.9552	0.9553	0.0028	0.0022	63.84	64.79
15	0.5071	0.9932	0.9965	0.9524	0.9531	0.0065	0.0033	59.02	59.93
20	0.5522	0.9923	0.9957	0.9459	0.9498	0.0073	0.0041	54.41	55.13
25	0.6000	0.9925	0.9955	0.9386	0.9458	0.0070	0.0043	49.81	50.36
30	0.7115	0.9926	0.9947	0.9316	0.9415	0.0069	0.0050	45.17	45.57
35	0.7568	0.9883	0.9911	0.9247	0.9365	0.0108	0.0083	40.49	40.80
40	0.8484	0.9861	0.9882	0.9139	0.9282	0.0127	0.0110	35.94	36.14
45	0.9069	0.9798	0.9817	0.9012	0.9173	0.0182	0.0168	31.41	31.55
50	0.9582	0.9676	0.9689	0.8830	0.9004	0.0286	0.0280	27.01	27.09
55	0.9800	0.9440	0.9451	0.8544	0.8724	0.0478	0.0479	22.83	22.88
60	0.9925	0.9179	0.9185	0.8065	0.8245	0.0662	0.0672	19.03	19.06
65	0.9928	0.8981	0.8988	0.7403	0.7573	0.0754	0.0766	15.51	15.53
70	0.9963	0.8238	0.8243	0.6649	0.6807	0.1172	0.1196	11.99	12.00
75	0.9970	0.7746	0.7752	0.5477	0.5611	0.1235	0.1262	9.02	9.02
80	1.0000	0.5423	0.5423	0.4242	0.4350	0.1942	0.1991	5.92	5.91
85	-	0.2589	0.2580	0.2301	0.2359	0.1705	0.1750	3.80	3.79
90	-	0.0042	0.0028	0.0596	0.0609	0.0593	0.0607	2.52	2.51
95	-	0.0020	0.0014	0.0003	0.0002	0.0003	0.0002	1.82	1.81
100+	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.45	1.45

Graphical Annex







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Santafé de Bogotá
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Females
Life Expectancy at Birth
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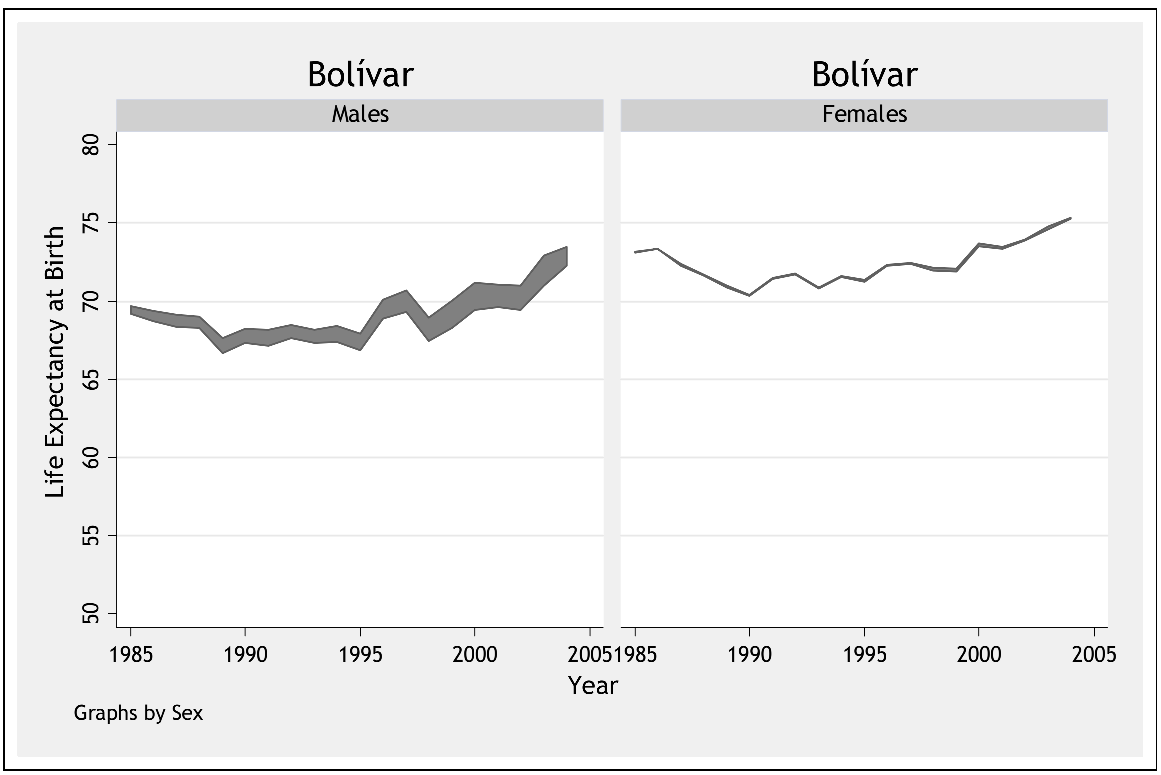
Year
Graphs by Sex



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Bolívar
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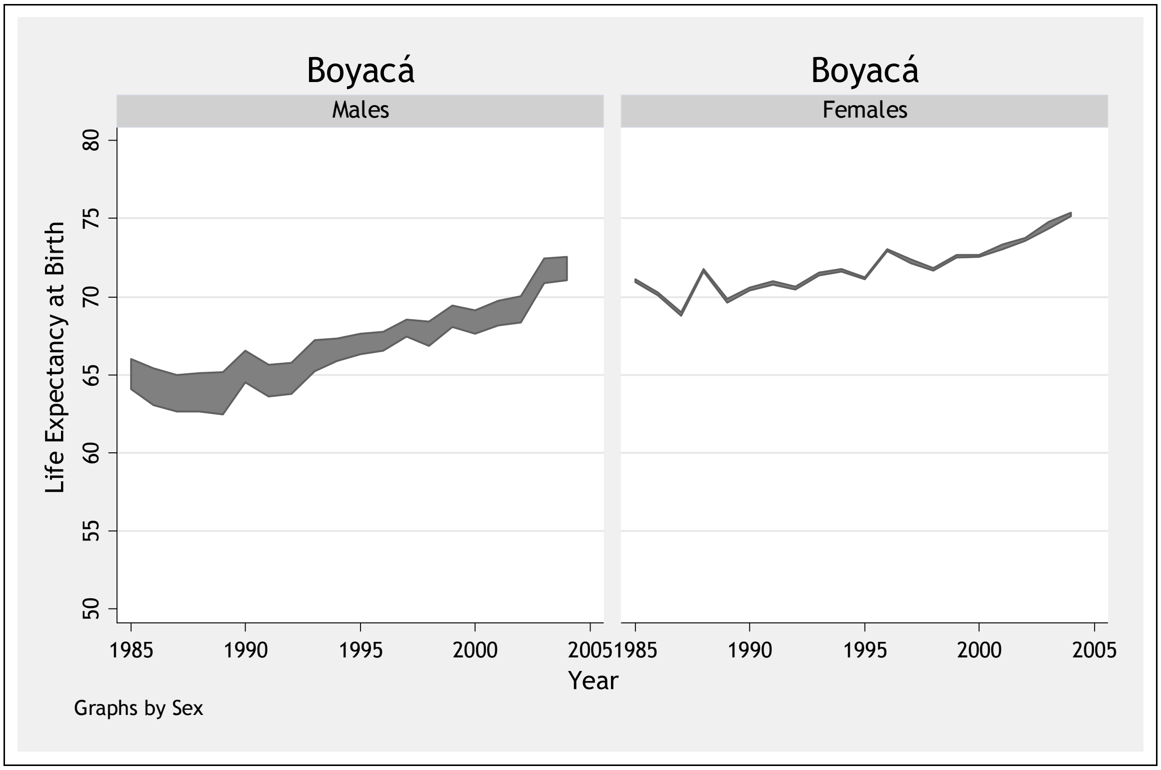
Graphs by Sex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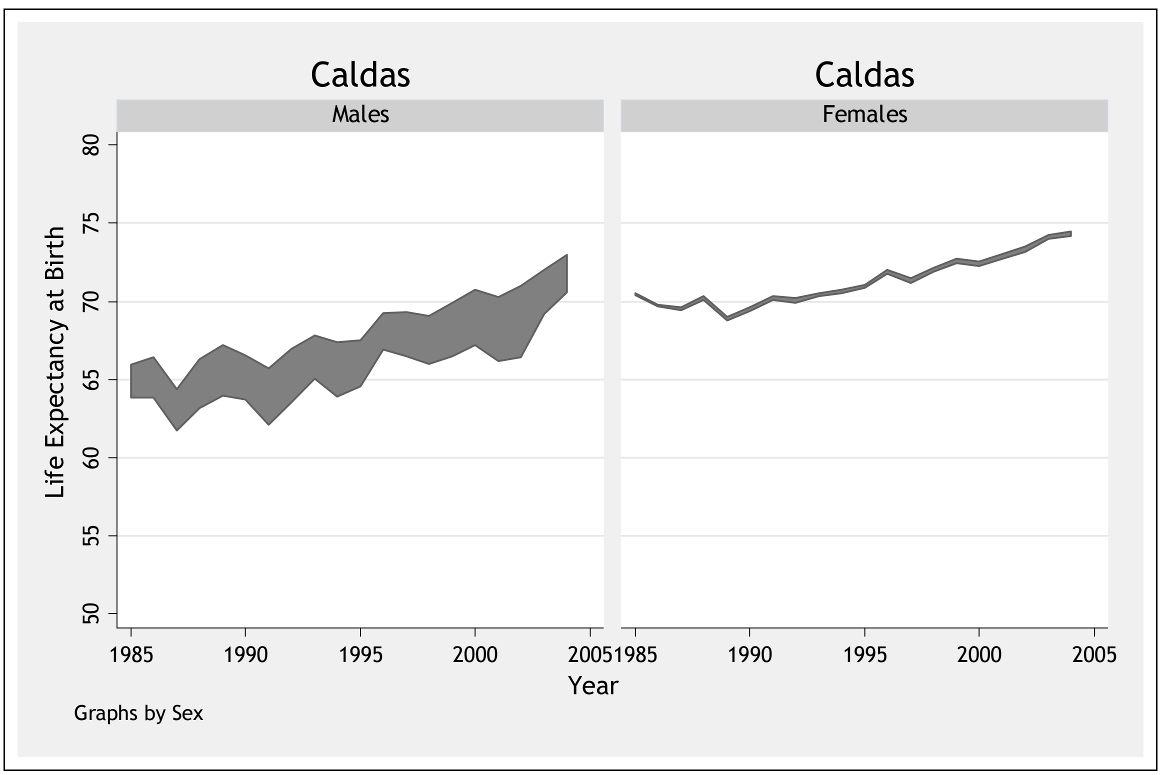
Graphs by Sex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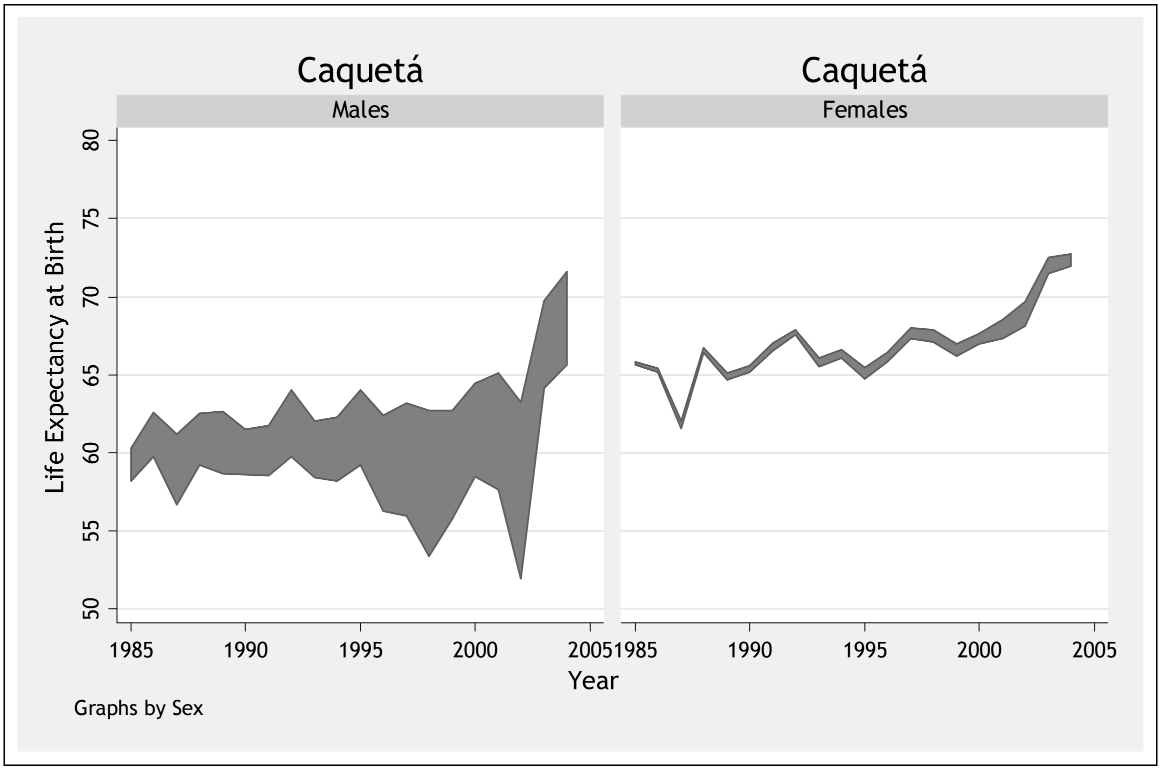
Year
Graphs by Sex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Caquetá
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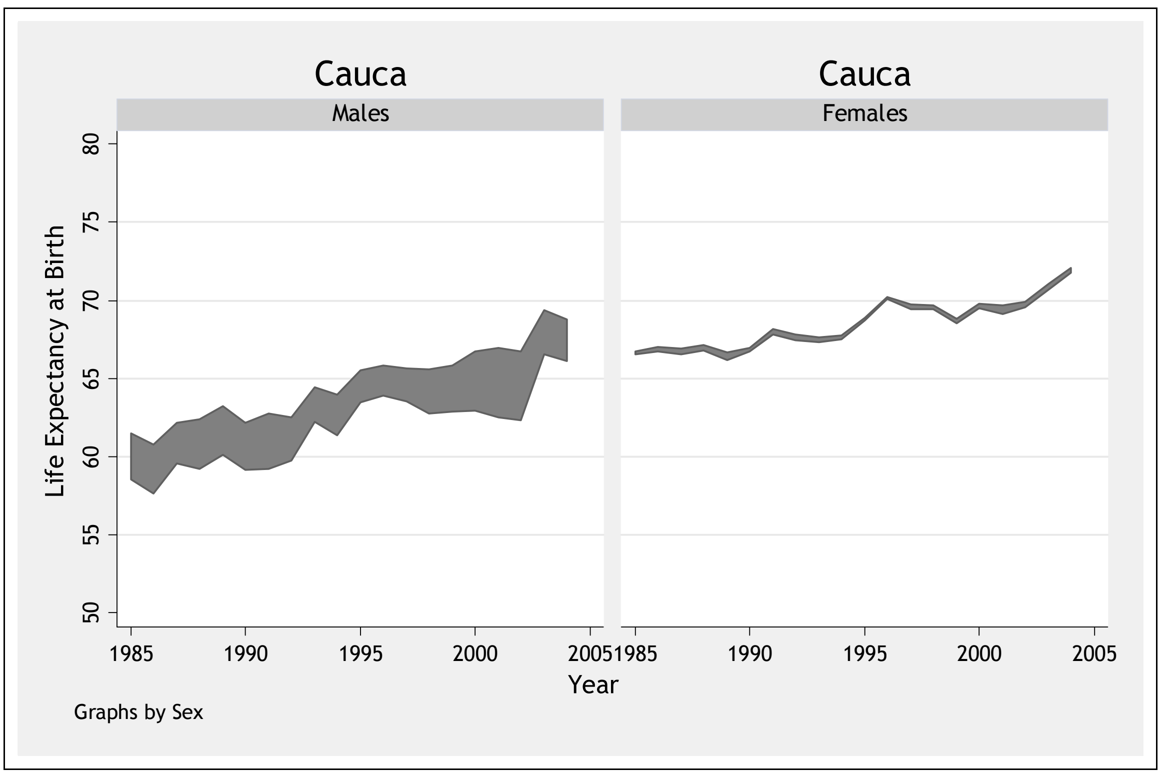
Year
Graphs by Sex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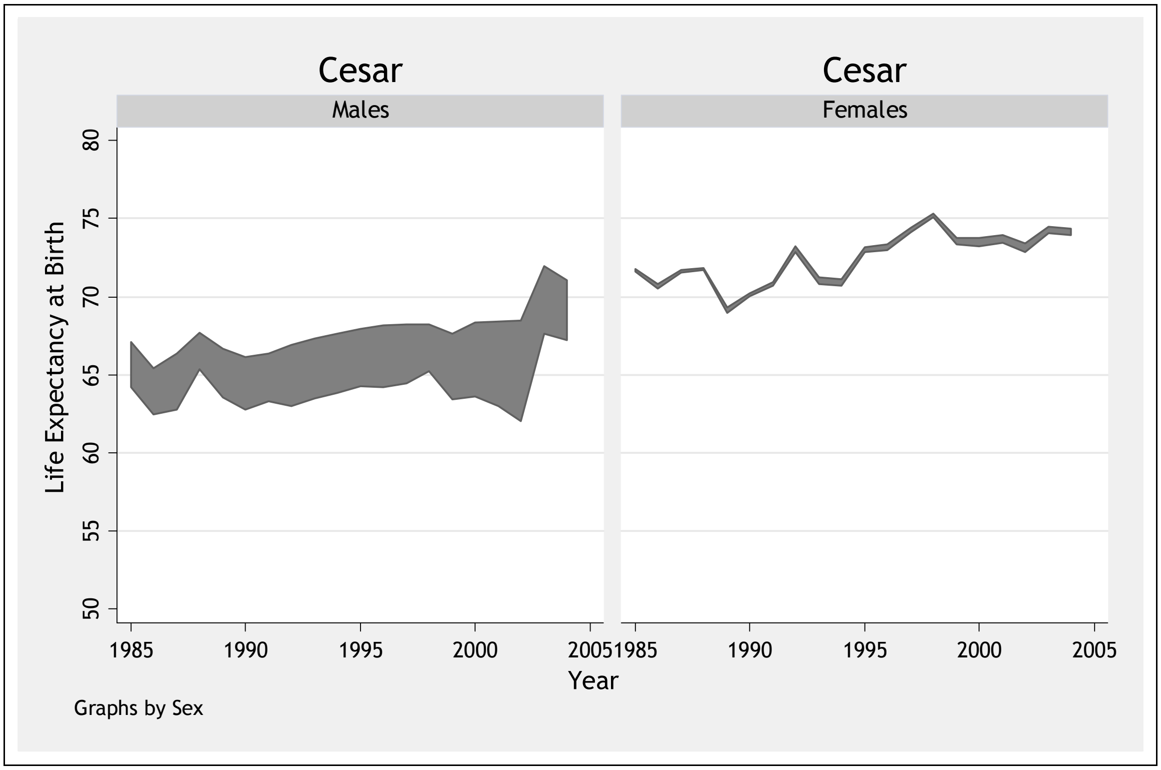
Graphs by Sex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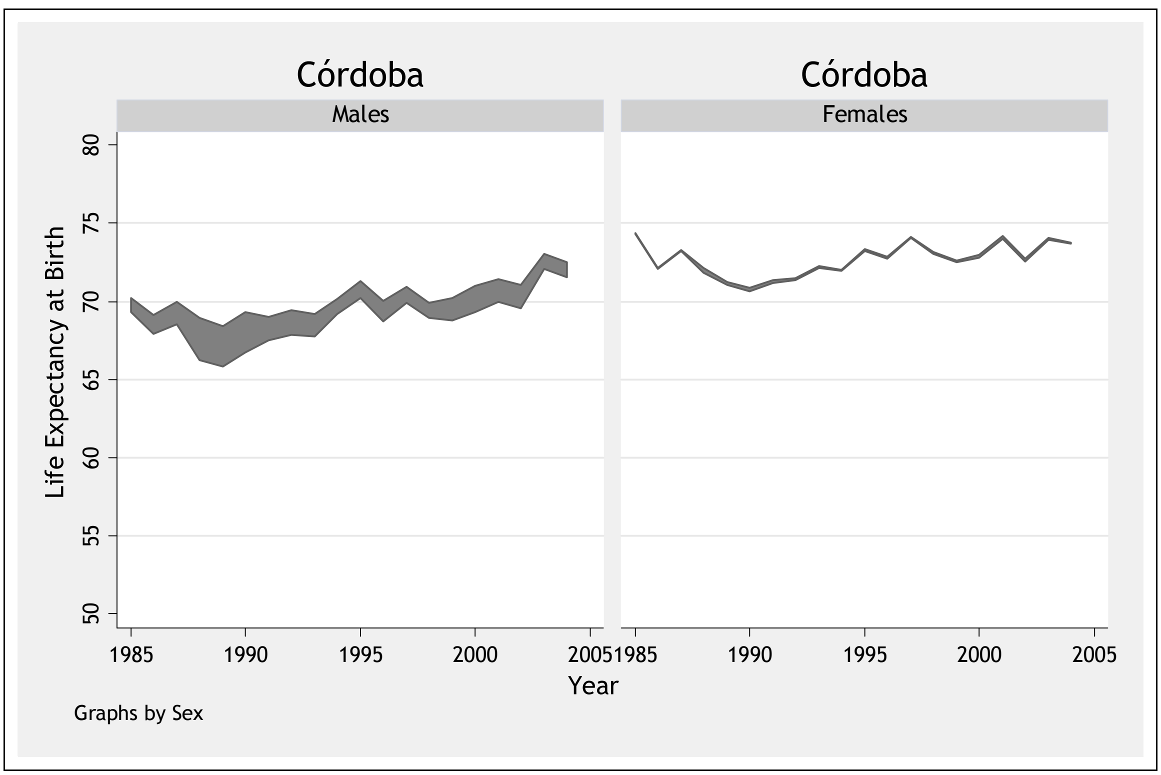
Graphs by Sex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Córdoba
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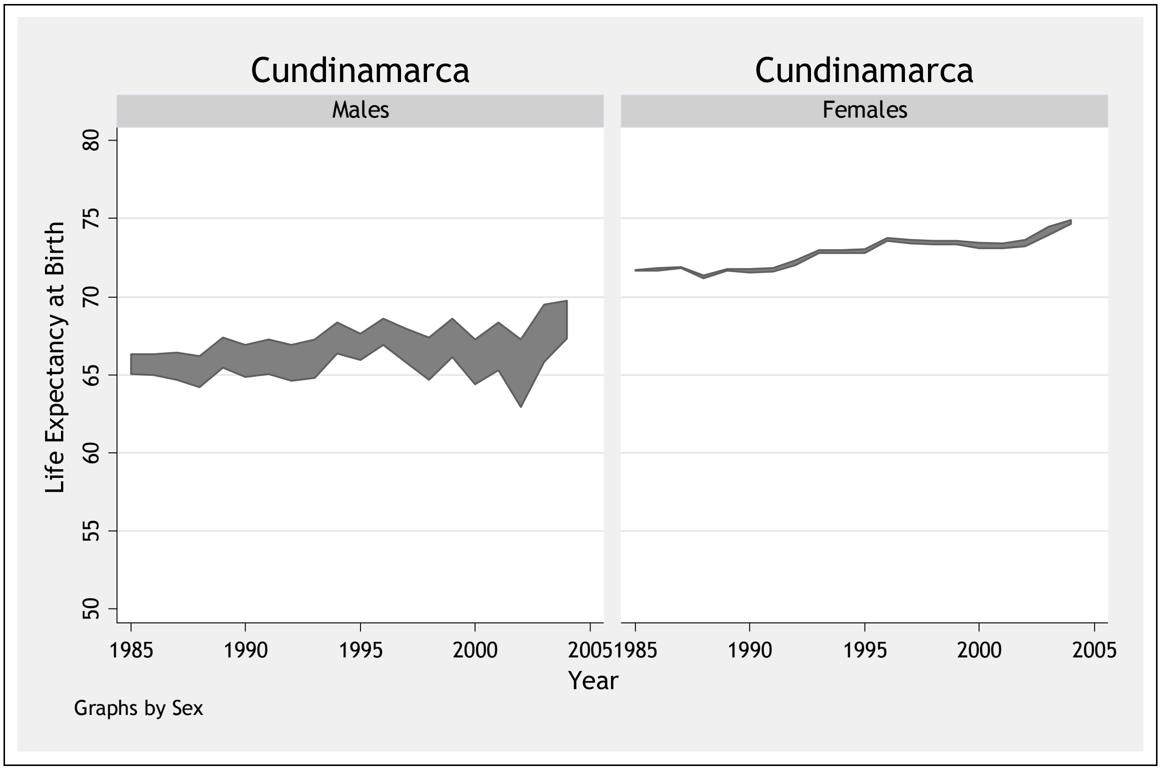
Year
Graphs by Sex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Males
Cundinamarca
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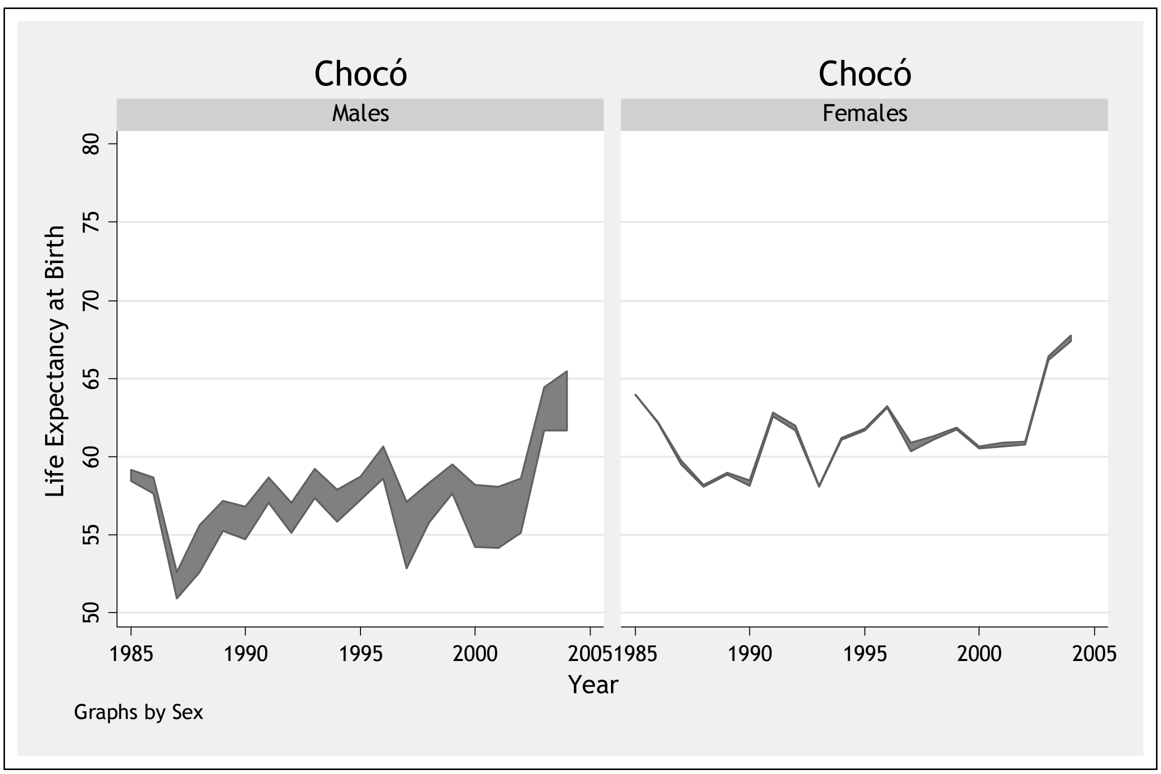
Year
Graphs by Sex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Males
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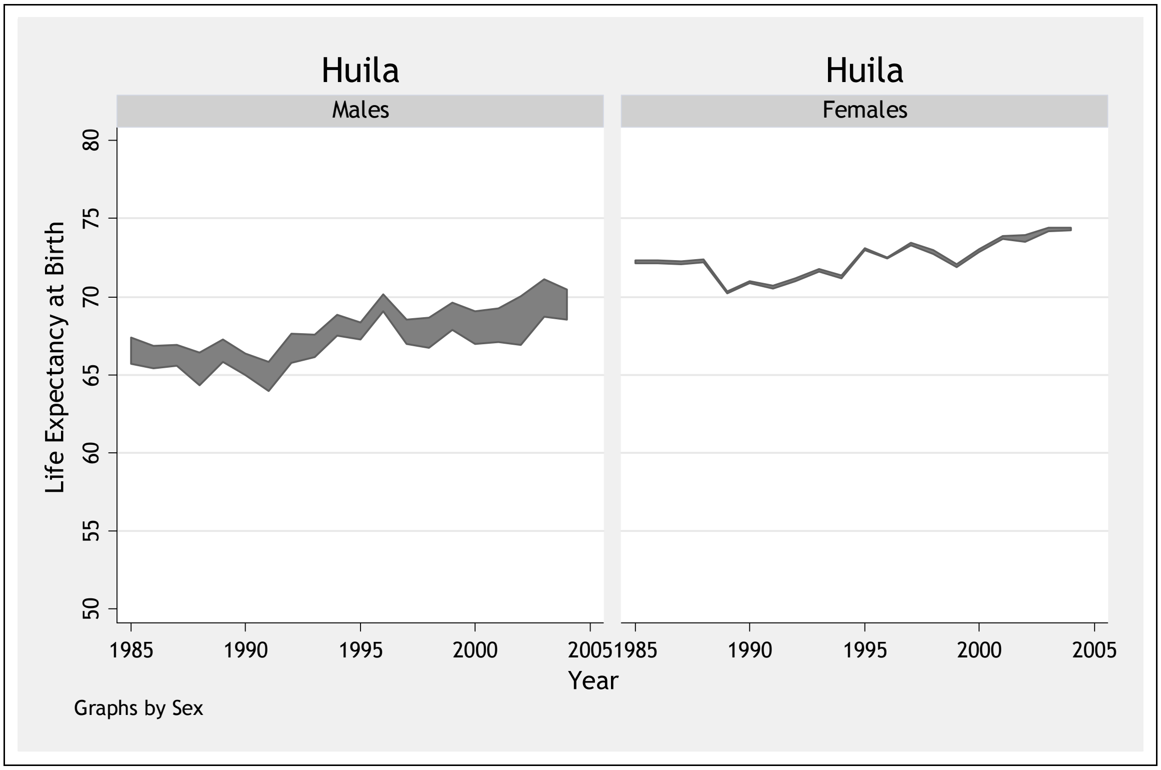
Year
Graphs by Sex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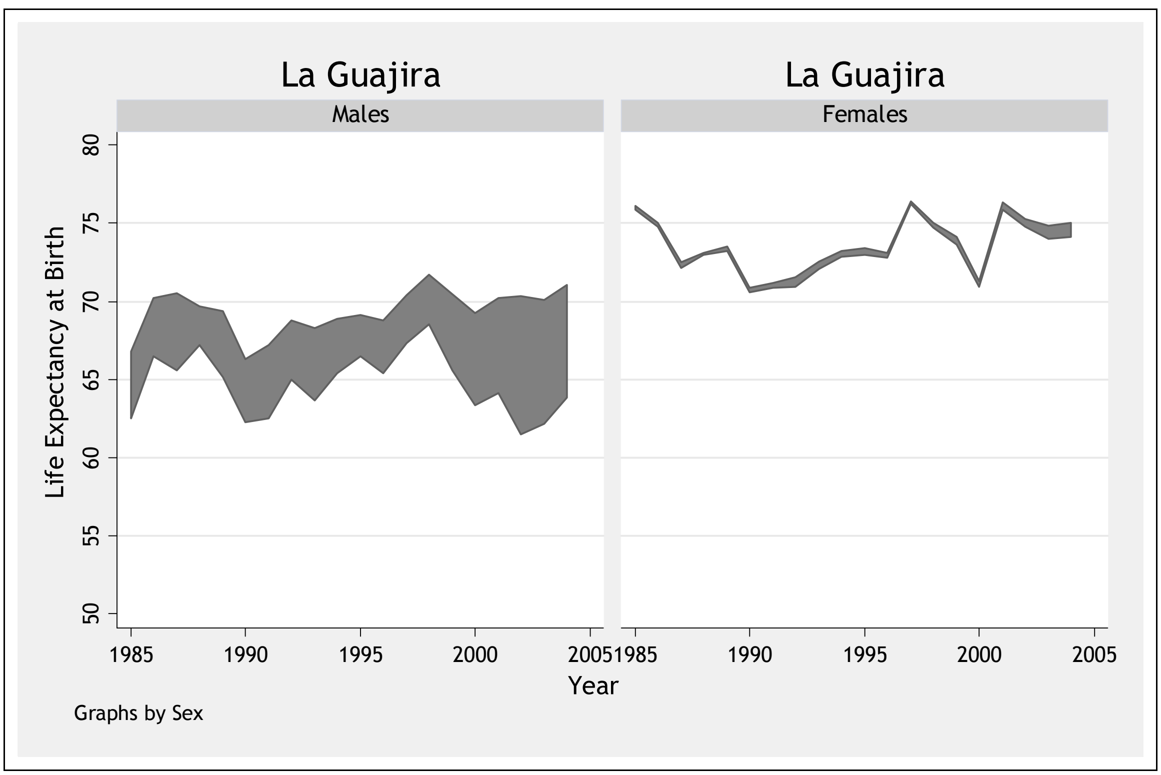
Graphs by Sex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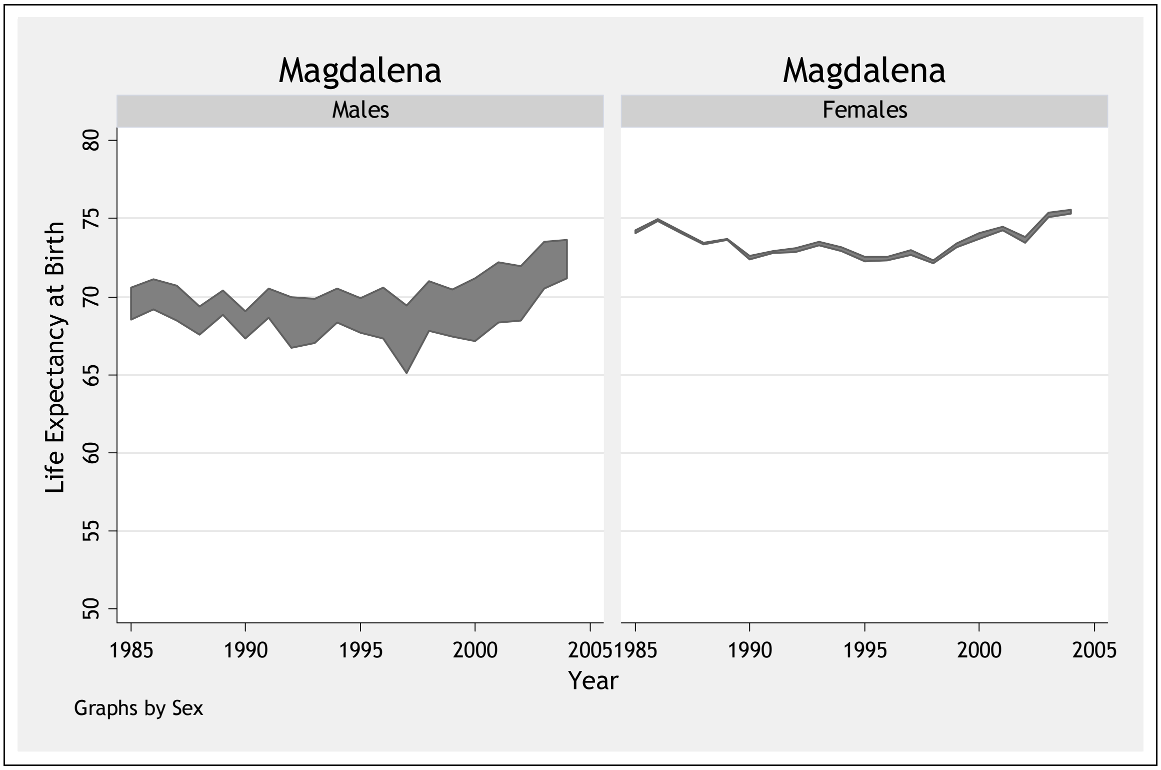
Year
Graphs by Sex



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Males
Magdalena
Females
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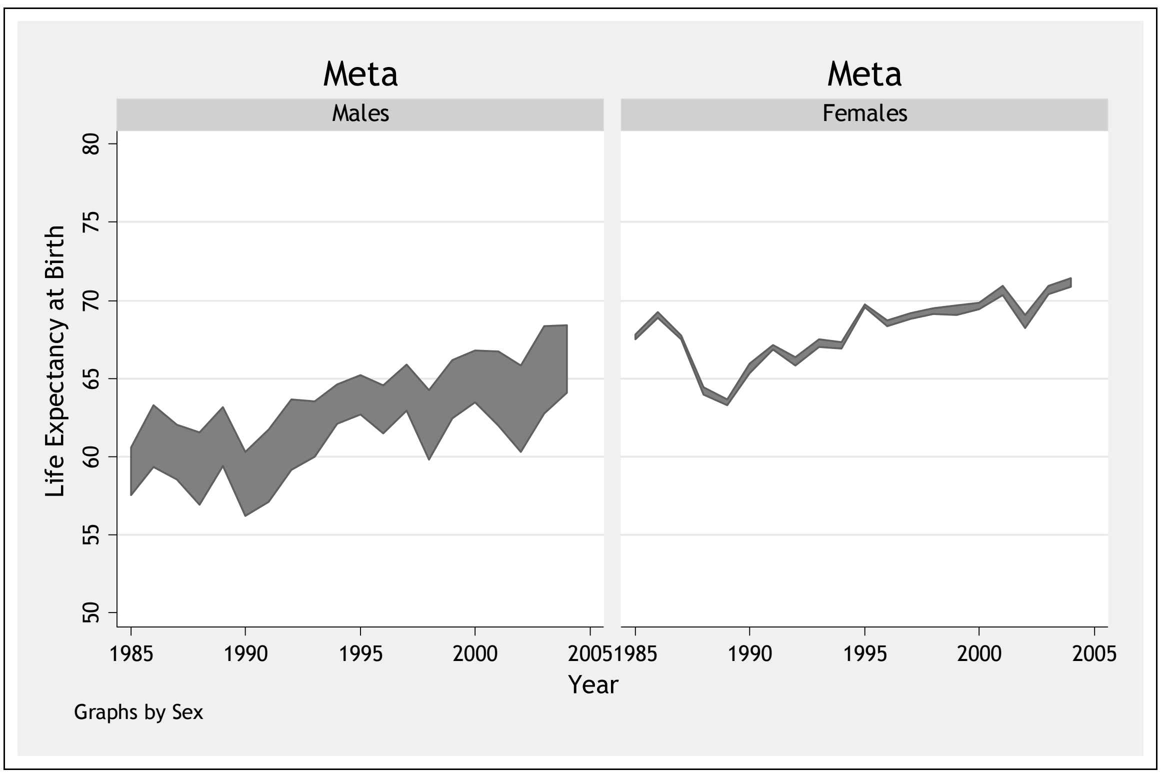
Year
Graphs by Sex



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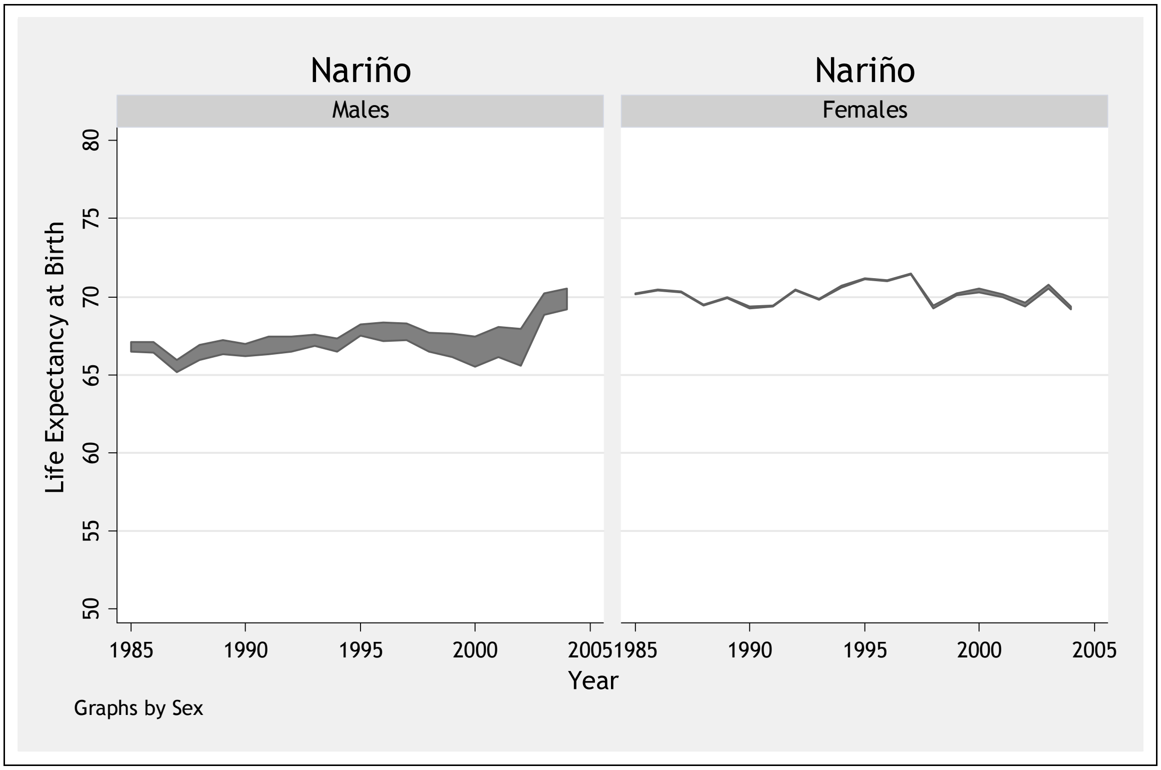
Year
Graphs by Sex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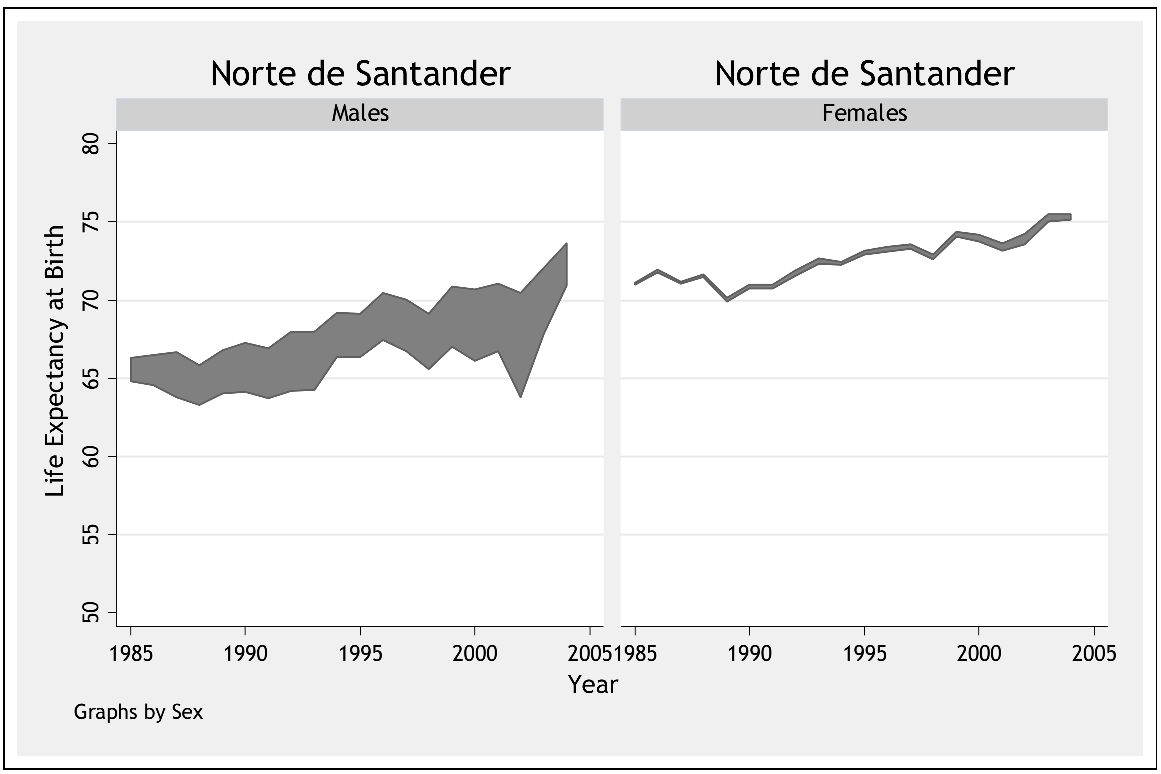
Year
Graphs by Sex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Norte de Santander
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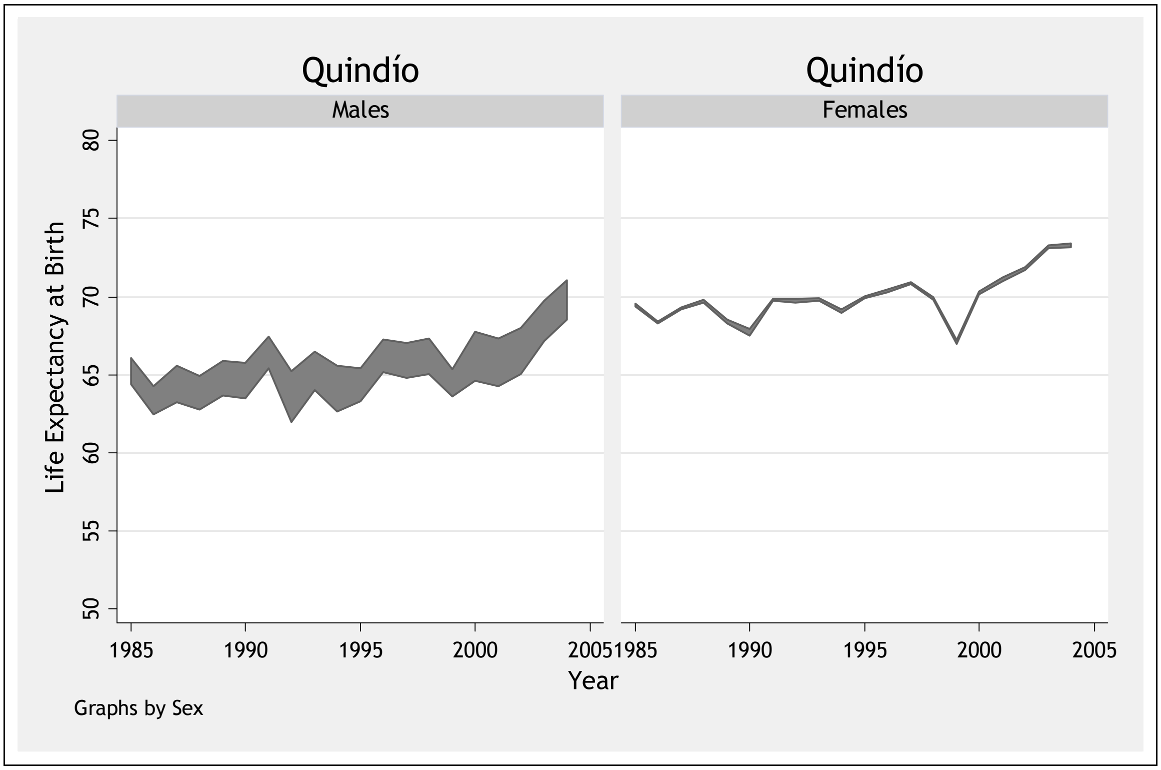
Graphs by Sex



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Males
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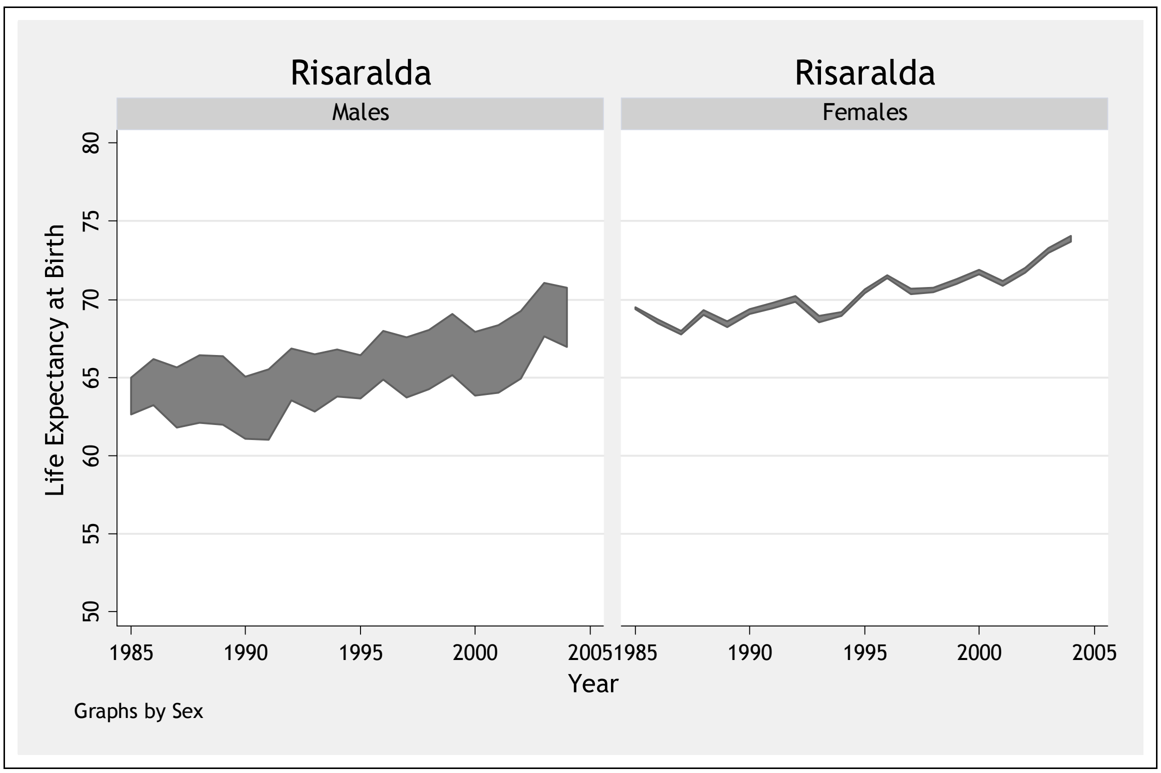
Graphs by Sex



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Risaralda
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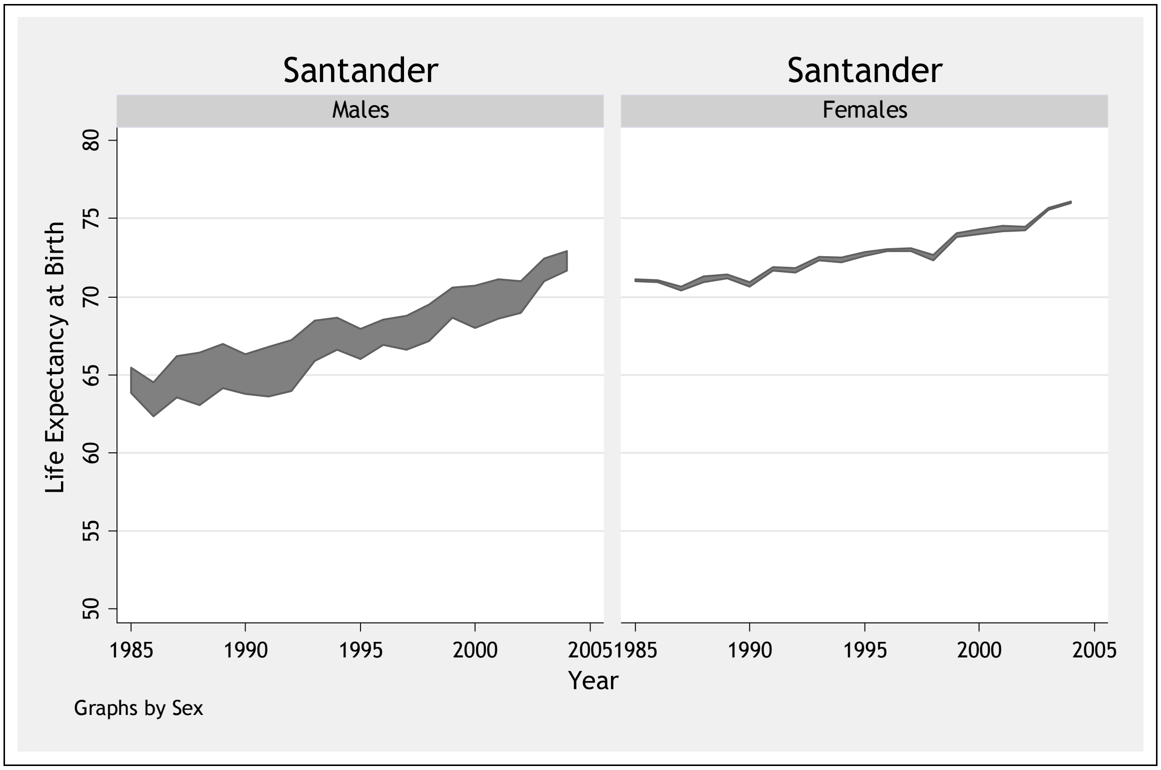
Graphs by Sex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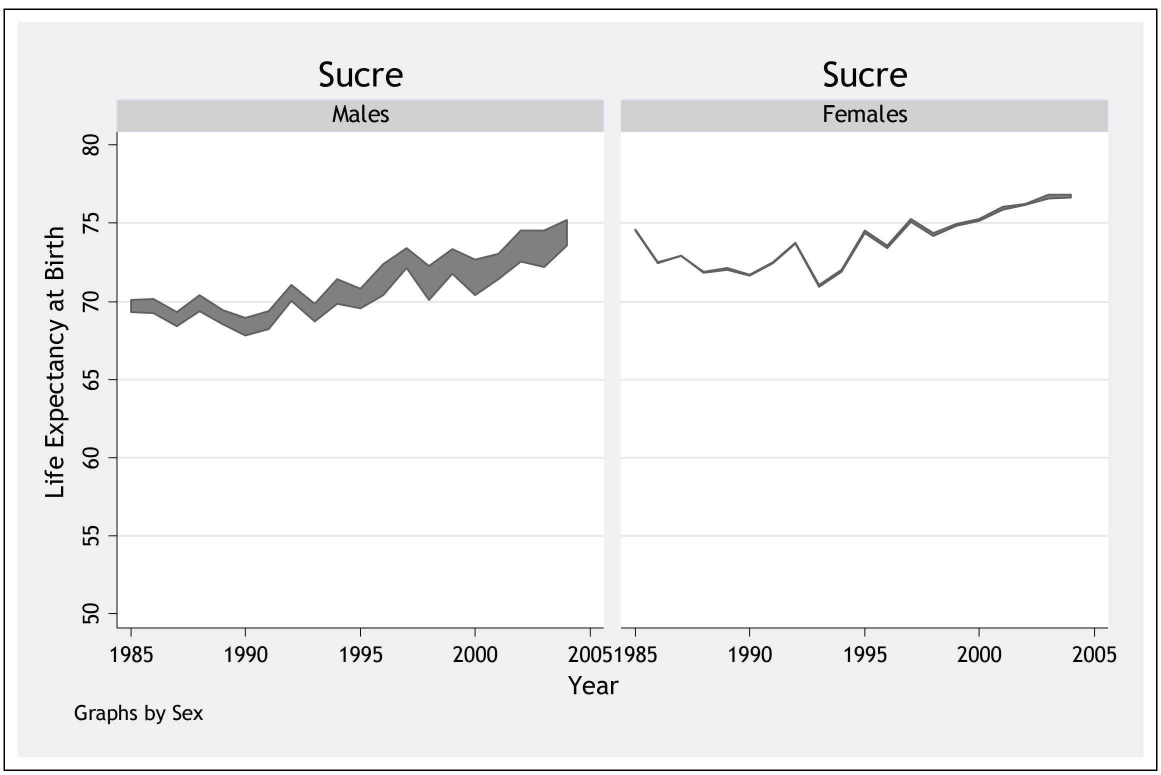
Graphs by Sex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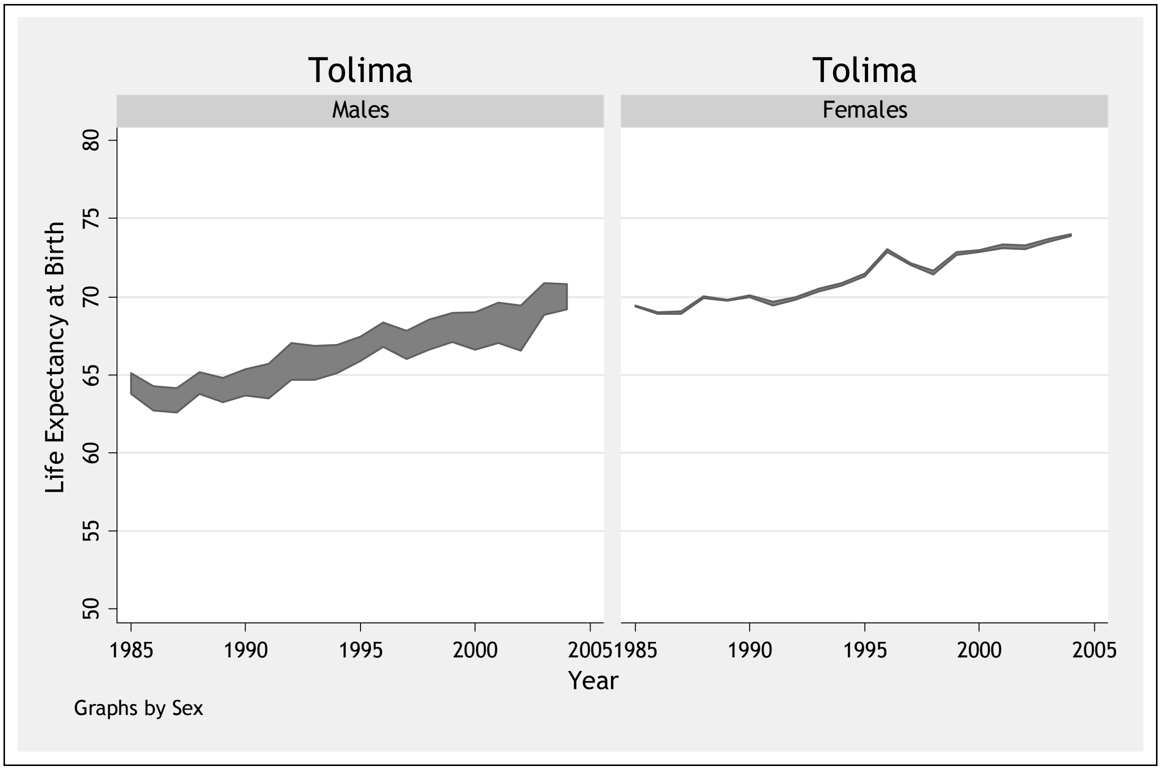
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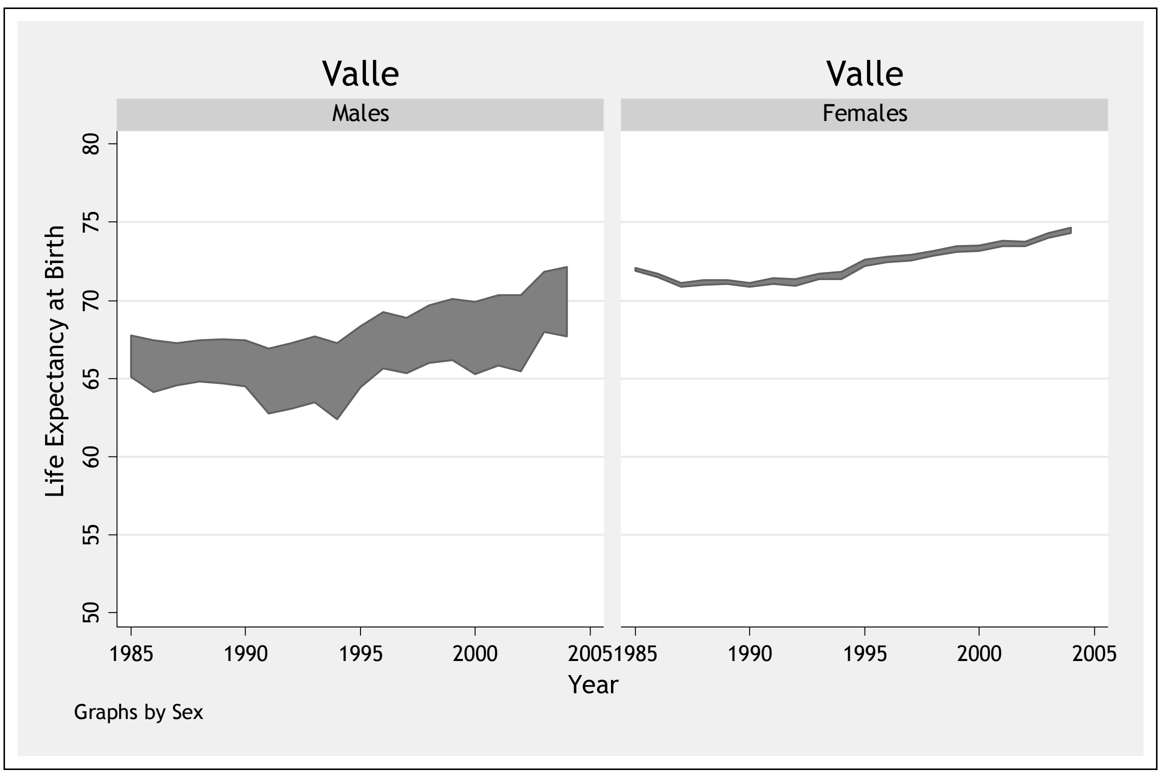
Graphs by Sex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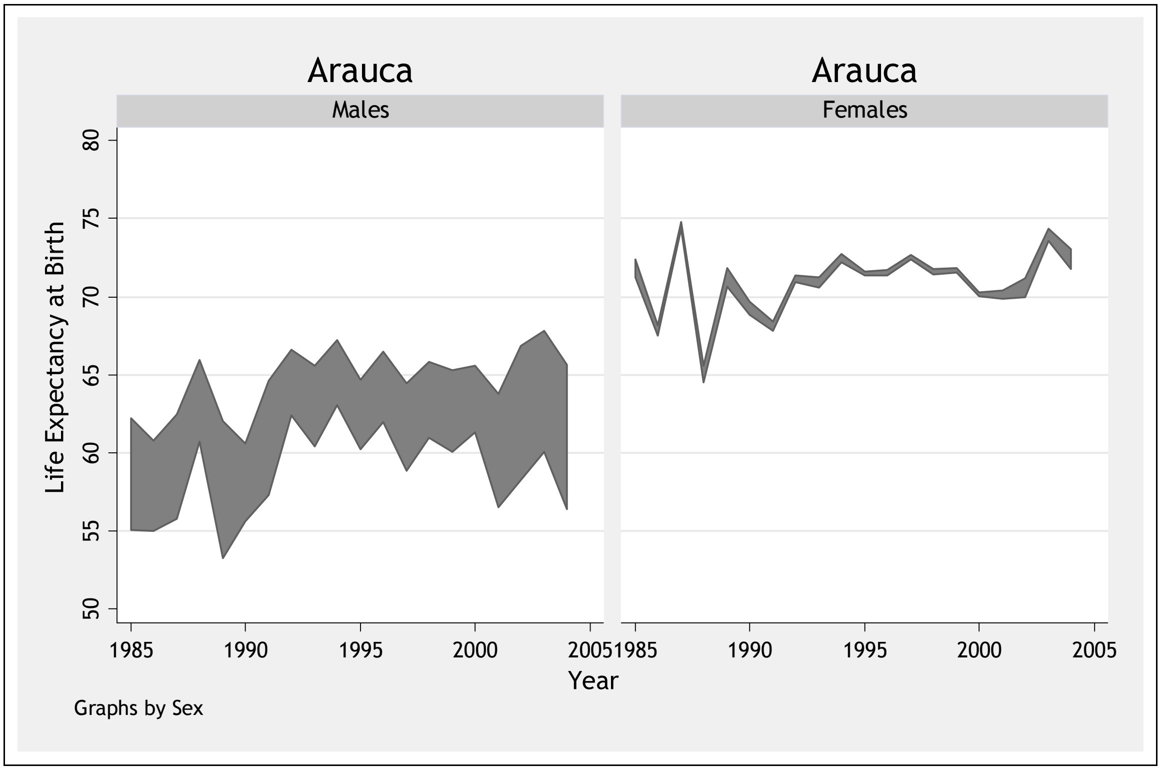
Graphs by Sex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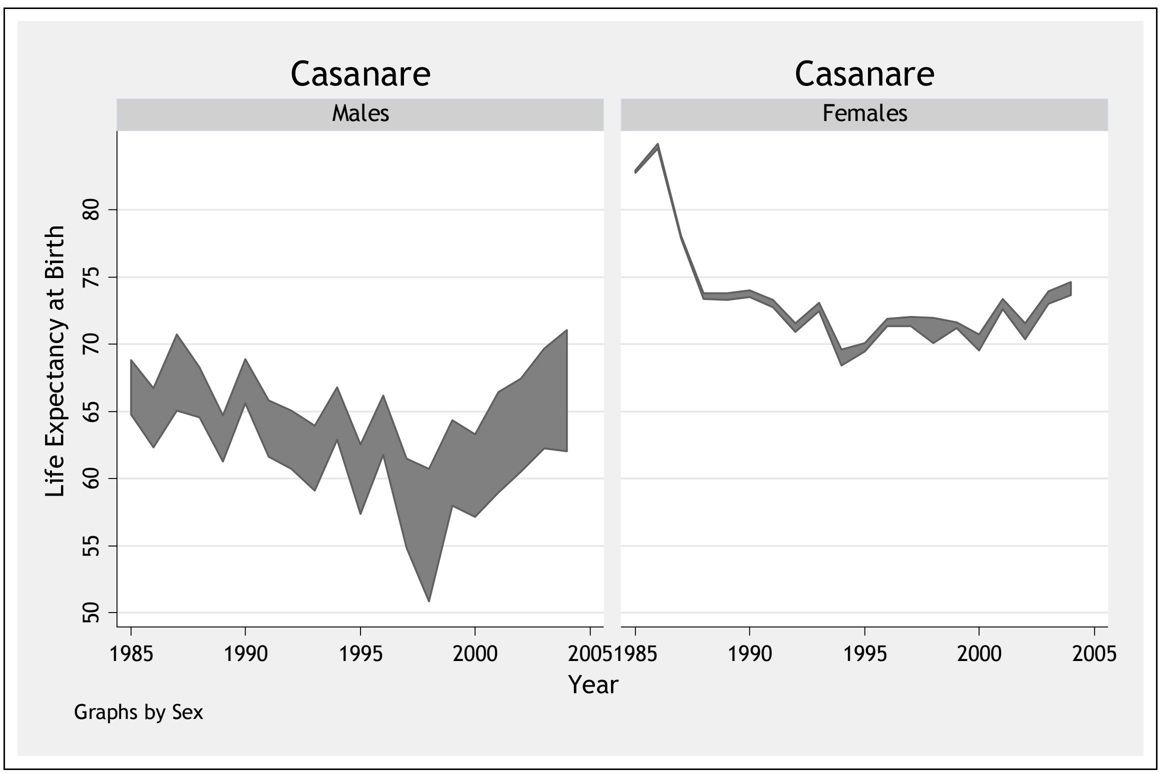
Graphs by Sex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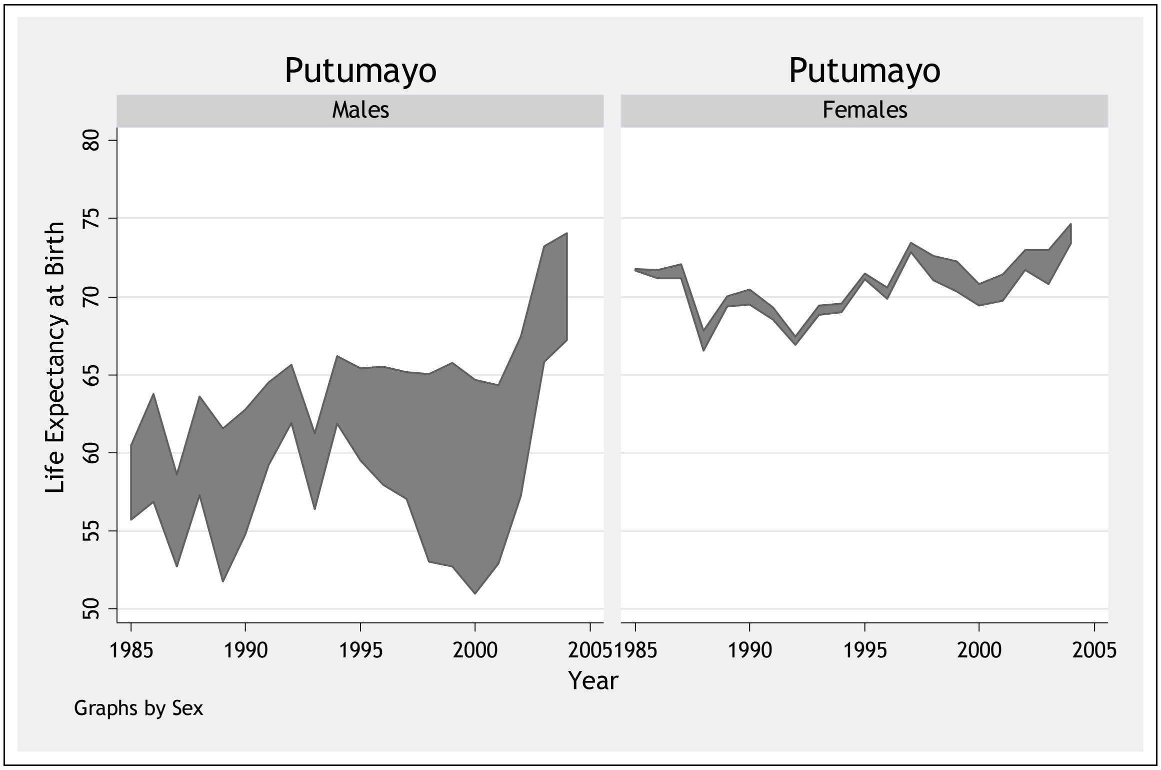
Year
Graphs by Sex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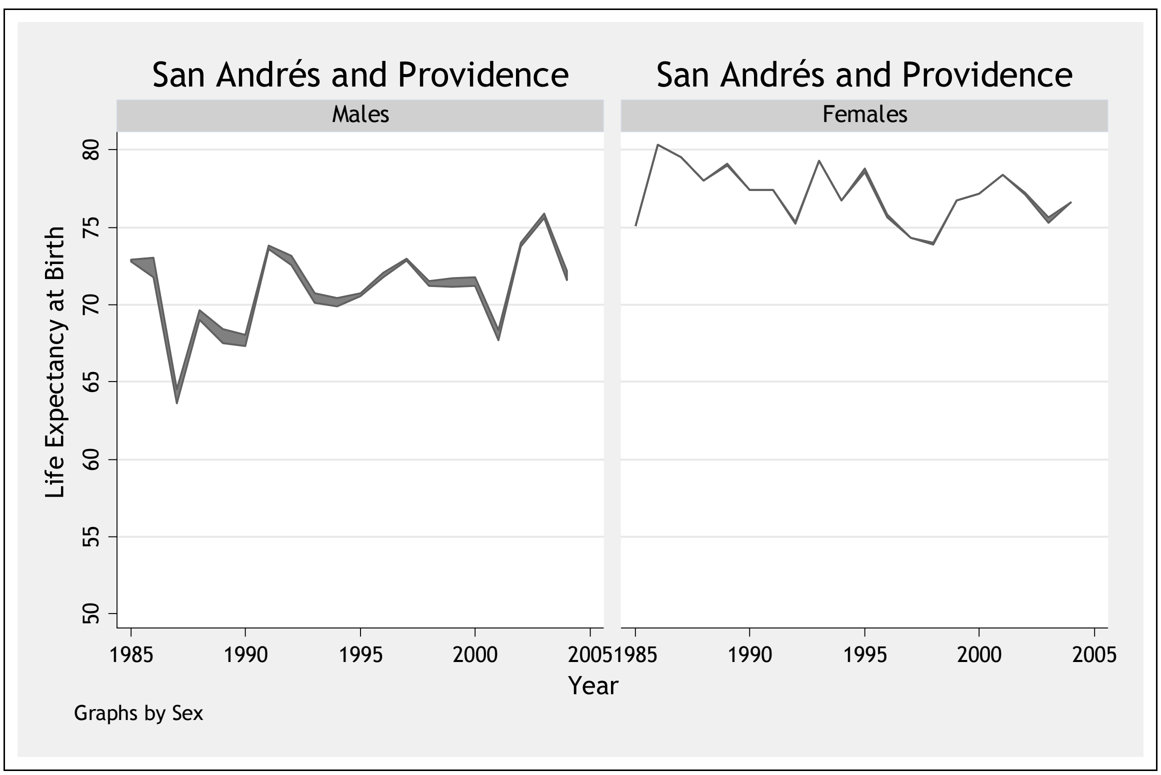
Putumayo
Females
Life Expectancy at Birth
Year
Graphs by Sex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Males
San Andrés and Providence
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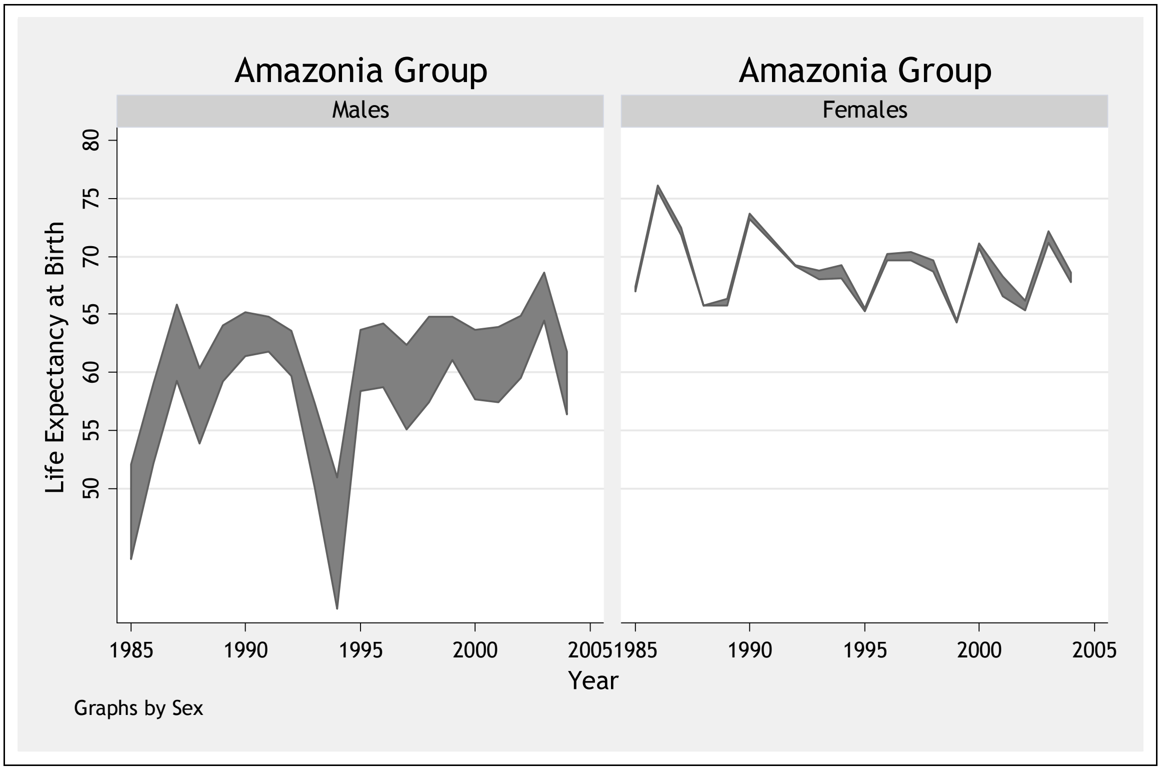
Life Expectancy at Birth
Year
Graphs by Sex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Amazonia Group
Males
Females
Life Expectancy at Birth
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Year
Graphs by Sex

8. References

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