How long do Argentines live and how we die?

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Abstract

The aim of this paper is to analyze mortality, recognizing its role in the population dynamics and its relationship with socioeconomic development, with special emphasis on mortality trends in Argentina in the Twentieth Century. We also examine determinants and mortality differentials by sex, age, socioeconomic status, region and causes.

Life expectancy at birth, from the late Nineteenth Century, had an almost linear upward trend. From 1883 until 2013, e_0 increased from 33 to 76 years, with an absolute gain of 43 years equivalent to 0.33 years per calendar year. Deviations from the line are small, though improvements have not been uniform throughout the period considered.

The mortality of a country is the result, at the aggregate level of mortality in the various regions within it. The values of life expectancy discussed above are a weighted average that hides significant regional differences, indicating inequalities in living conditions among populations. However, the gap between regions has declined significantly, from more than 13 years in 1914 to 6 years in 2001/02.

In the last half century, the overall age-standardized mortality decreased 43%, and the largest reduction corresponds to infectious diseases, with rates 74% lower in 2007 than in 1960, continuing to lose weight among the causes of death. The lowest relative reduction corresponds to the deaths by violence or external causes (35%).

There is a wide disparity of opinion whether technical, medical and environmental future changes will have more or less impact than in the past. The balance of these factors is far from being established, but more detailed knowledge of the past pathways is a key element, to which this paper tries to contribute.

Keywords: <mortality> <determinants> <trends> <differentials> <epidemiologic transition> <longevity>

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HOW LONG DO ARGENTINES LIVE AND HOW WE DIE?

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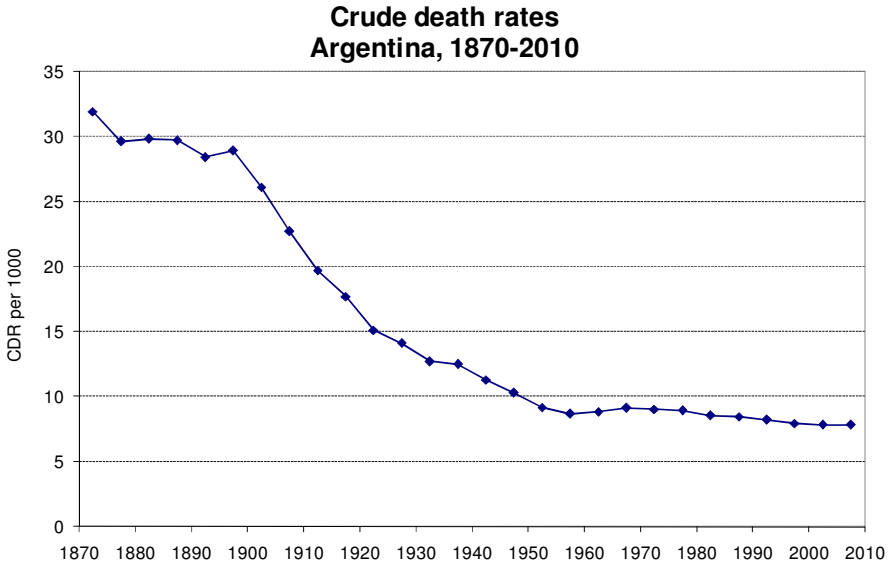
The historical evolution of mortality

The evolution of mortality can first be described in terms of the crude death rate (CDR). The CDR is part of the growth of a population that relates all deaths during a given year to the total population, while measuring its decrease due to mortality. It is a weighted average of the specific mortality rates by age and, therefore, it is affected by the population age structure, and does not accurately reflect the overall level of mortality[1].

Available data series begin in 1870 and show some stability around 30 per thousand by the end of the Century. Then there is a marked and sustained decrease to values around 9 per thousand in the 1950s. Since then, the CDR has practically stagnated, slightly descending to its current level of 8 per thousand (Figure 1).

Figure 1



Source: Annex Table 1.

[1] "Since mortality varies with age, the crude rate can be misleading when comparing populations that do not have a similar composition by age and sex. Populations composed of a high proportion of elderly in which mortality is higher, naturally show higher CDR than those of younger populations" (MSAL, 2008).

This stagnation is due in part to a real slowdown in mortality decline (measured in terms of life expectancy at birth), but also to the aging process in Argentina. This process, in turn, is due to fertility decline since the early twentieth century, to the reduction and removal of immigration from overseas and, more recently, to improvements in survival at older ages.

A more appropriate measure to describe the changes in overall mortality is the life expectancy at birth (LEB or e_0)[2], given that it is not affected by the age structure of the population.

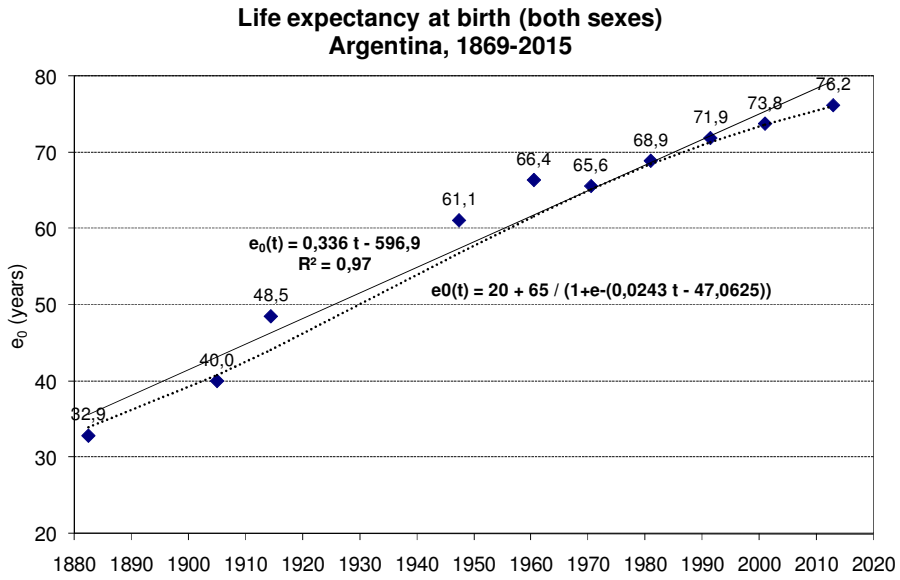
Since the late nineteenth century, LEB had an almost linear upward trend: from 1883 (mid-year of the first inter-census period) to 2013 (mid-period estimation for 2010-15) LEB increased from 33 to 76 years, an absolute gain of 43 years, equivalent to 0.33 years per calendar year during 130 years.

Deviations from the line are small, although improvements have not been uniform throughout the period (Figure 2). After a moderate climb until the early Twentieth Century, acceleration took place between the first and second decade of the Century, with a gain of almost a year of life per calendar year. In the following decades the progress continued, though at a slower pace. During the 60s there was even a temporary setback[3], followed by a recovery of the upward trend, but more and more slowly, reaching a LEB close to 76 years in 2010-15. This behavior is consistent with an expected reduction in LEB gains as the level of mortality decreases, which has led several authors to postulate a logistic-trend as presented with a dashed line in Figure 2.

[2] LEB is defined as the average number of years lived by the members of a hypothetical cohort of births exposed from birth to extinction to the age-specific mortality rates prevailing in the population under study.

[3] This phenomenon has not been satisfactorily explained yet. During the 1970s, this fall was considered as a symptom of arrival to a maximum imposed by the socioeconomic conditions of the country (Muller, 1978). Advances in LEB that occurred during later years despite deteriorating socioeconomic conditions, although moderate, forced to discard this hypothesis.

Figure 2



Source: Annex Table 2.

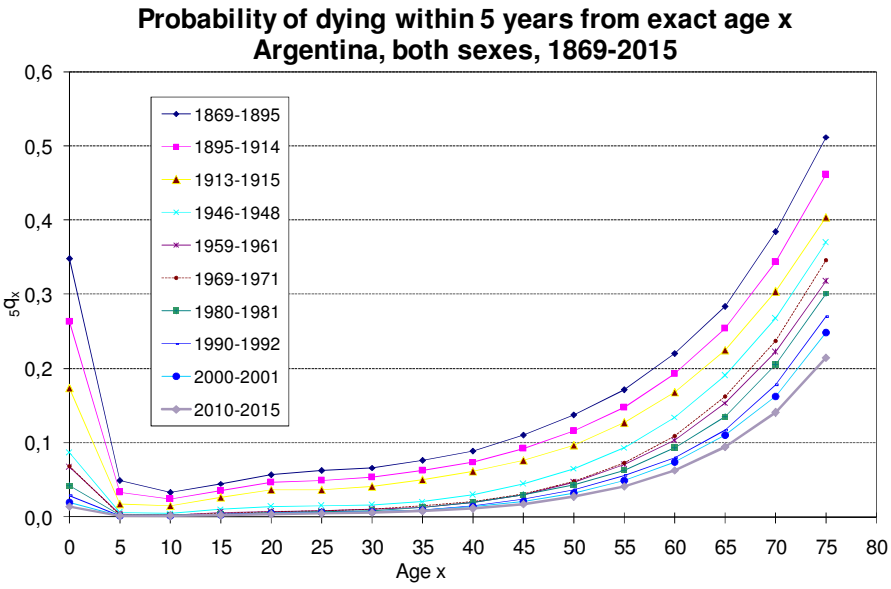
Regarding the international context, the reduction of mortality in Argentina began earlier than in most Latin American countries and, unlike them, due to its early improvements in general living conditions associated with socioeconomic development rather than to the advancement of knowledge and medical technology or to efforts towards combating infectious diseases directly (Lattes, 1975). In this aspect, mortality fall in Argentina is similar to the process experienced by developed countries, and away from most of the rest of Latin America. Among many factors that have contributed to the early onset of a steady mortality decline we should mention the early modernization of society in Argentina in relation to most Latin American countries, the high level of urbanization and the expansion of formal education. Thus, while in the 1950s many countries in the region were taking the first steps in the epidemiological transition, Argentina had already paid for much of its route.

Differentials in mortality by age

Mortality, as other demographic phenomena, shows a different behavior depending on age. The risk of death is highest during the first years of life, especially in the first year, and reduced between 5 and 15 years. Then mortality increases smoothly until about age 40, to increase subsequently reaching high values again at older ages.

Besides, mortality reduction does not occur at the same rate in all ages. The fall is faster for early ages and as age increases the spread of values for the different periods decreases (especially during the initial stages). This process has resulted in the typical transformation of the age structure of mortality, changing from a letter U-shape (with similar mortality between younger and older groups) to a J-shape (Figure 3).

Figure 3



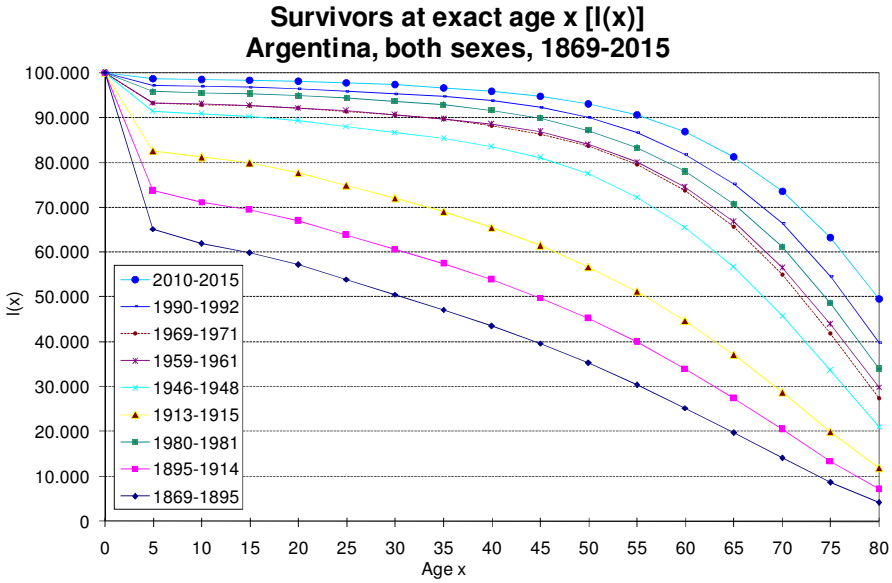
Source: Annex Table 3.

In Argentina, although mortality decreased in all age groups throughout the whole period (except for 1960s), reductions have been very heterogeneous. The analysis of the probabilities of dying within five years (from ages ending in 0 and 5), show that the largest relative declines correspond to those under 35 years (over 90%), followed by ages 35 to 60 (reductions between 75% and 90%). Finally, after age 60 relative

improvements begin to be increasingly lower (between 60% and 70%). In all periods, the described order of relative decline remains similar (Annex Table 3).

An alternative way to show the evolution of age-specific mortality is through the survivorship function in the life tables (l_x), where mortality decline generates a process of "rectangularization of the l_x "(Figure 4).

Figure 4



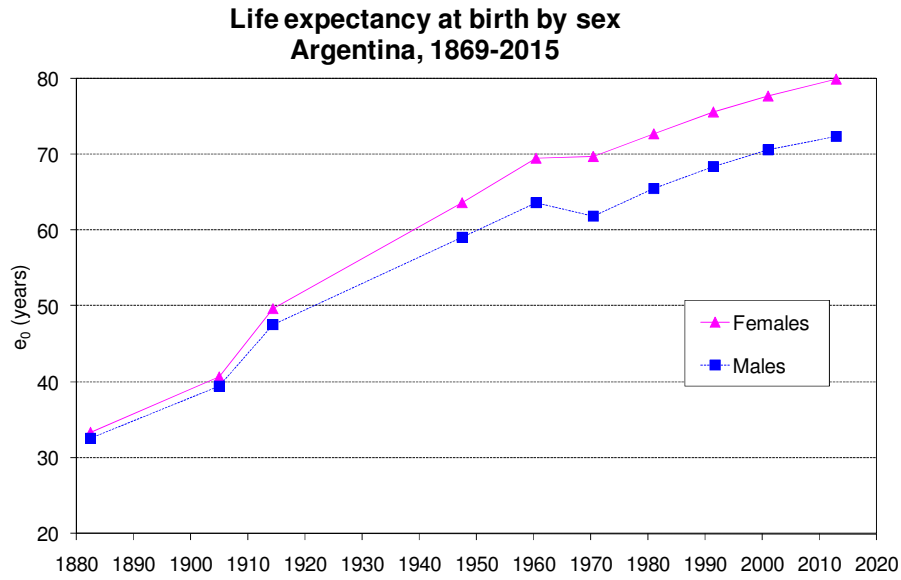
Source: Annex Table 4.

Differential mortality by sex

Mortality affects both sexes in different ways: men tend to have higher mortality than women due to biological and socioeconomic causes. In all the years considered, LEB is greater for women than for men (Figure 5). The difference was less than 1 year in the period 1869-95 but, following the international standard, the gap increases as LEB increases.

Between 1960 and 1970, LEB decline corresponded only to males and this made the gender gap even wider. From that date the gains experienced by males become larger or similar to those of women and therefore the excess male mortality begins to decrease and stabilize in the last two decades with a difference in LEB just over 7 years.

Figure 5



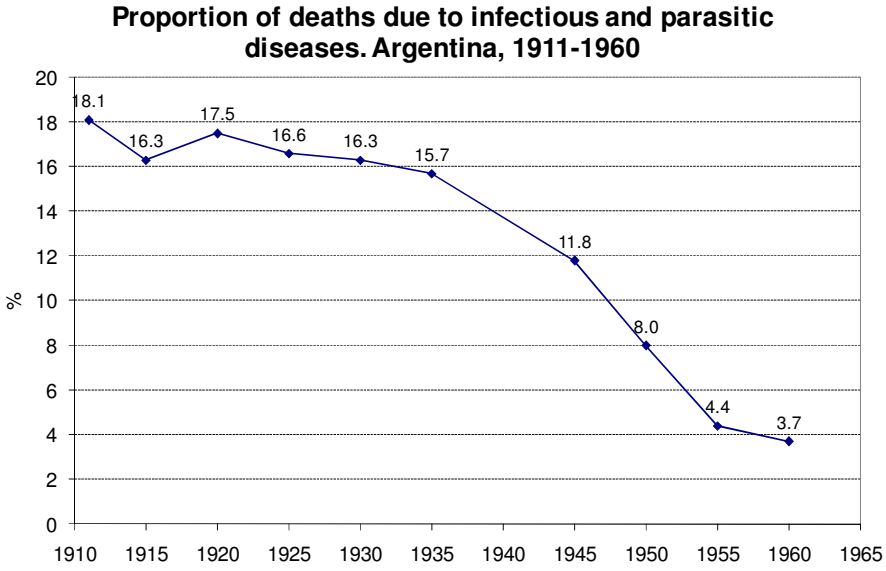
Source: Annex Table 5.

The causes of mortality

The so-called epidemiologic transition describes the empirical process of mortality decline, which is accompanied by a transformation in the structure of its causes. Generally speaking, the drop of mortality responds initially to a reduction in the incidence of communicable diseases (infectious and parasitic), resulting in an increase of the relative weight of circulatory diseases, neoplasms and violence. Once the former type of diseases has been controlled, the fall in mortality is slowed down, given the larger difficulties to reduce the latter.

According to Pantelides (1983), major changes in the epidemiological profile of Argentina become apparent in the late 1930s. Since that time, mortality by communicable diseases decreases at a faster rate than overall mortality, reducing their relative importance (Figure 6). This pattern suggests that until the 1940s mortality decline was probably due to a general improvement of living conditions more than to special efforts to control infectious and parasitic diseases, as in the previous two decades they decreased at the same rate than the other causes of death.

Figure 6



Source: Grushka (2010), based on Pantelides (1983) and Somoza (1971).

It is worth noting that the series includes data only available from 1911 and that epidemics had great effect on the mortality of the last third of the nineteenth century: cholera in 1867-68, 1886-87 and 1894-95, yellow fever in 1870-78, smallpox in 1874, bubonic plague in 1899-1900 (Carbonetti and Celton, 2007). Thus, considering that the transition from mortality in Argentina started then, it is likely that reductions in specific rates and in relative weight of communicable diseases began before 1911, declining slowly for a few decades and accelerating again in the 1940s.

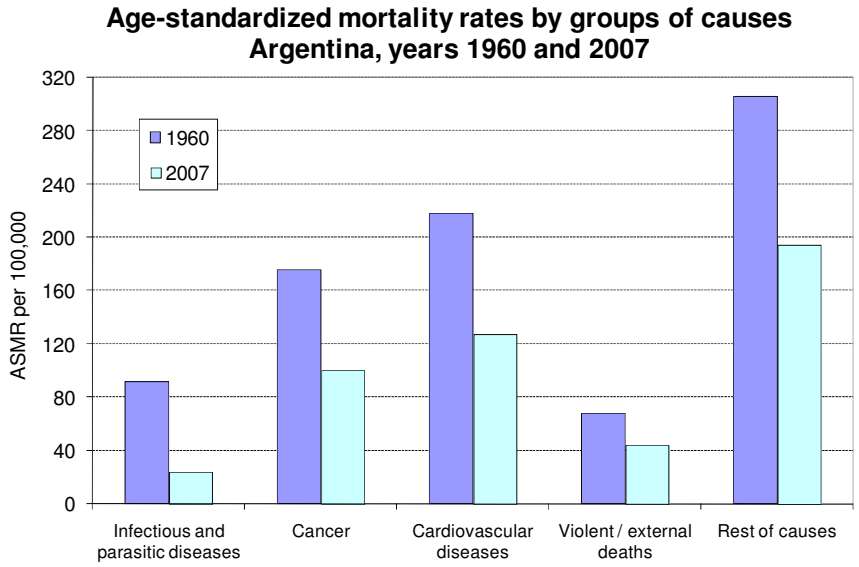
The latter reduction is linked to progress of medicine (especially with the introduction of penicillin and sulfamide), extension of water supply, and social and health policies involving social awareness about hygiene standards in child care (Carbonetti and Celton, 2007).

Furthermore, it is important to note that distribution of deaths is also affected by the age structure of the population. Being crude indicators (not standardized for age), the changes observed since 1945 expressed a reduced risk of dying from infectious diseases, but also a relative decline in the younger population, for which the risk is

higher than in other ages. Actually, the most appropriate way to account for changes in the risks associated with various causes is not from the distribution of deaths, but through the comparison (by specific causes) of age-standardized mortality rates (ASMR).

Improvements in the registration of deaths by cause in Argentina during the 1960s allowed more detailed analysis from that date, though not without difficulties linked to the distribution of ill-defined or unknown causes and changes in codification of the international classification of diseases. In Figure 7, ASMR by causes are grouped into five major categories for the years 1960 and 2007. In the last half century, the general level of mortality decreased 43%, the lowest relative reduction corresponds to violence or external causes (35%), and the highest reduction to infectious diseases (74%), a group that continued losing weight among the causes of death (Grushka, 2010).

Figure 7



Source: Annex Table 6.

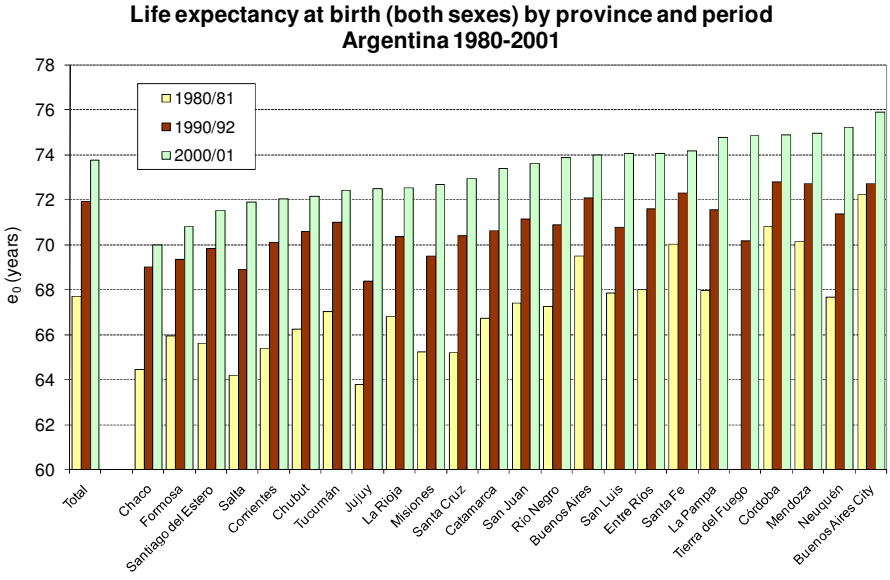
Mortality differentials between regions

The mortality of a country is the result of the aggregate mortality in the regions that comprise it. The values of life expectancy discussed above are weighted averages and

hide significant regional differences, indicating inequalities in living conditions between the populations.

The gap in LEB between regions has decreased significantly: in 1914 was more than 13 years (Buenos Aires with 51.4 years and Northeast 37.9), and in 1970 less than 7 (Cuyo 66.9 and Northwest 59.5) (Muller, 1978). For 1980, the maximum differential between provinces was over 8 years (Buenos Aires City 72.2 and Jujuy 63.8), decreases in the next decade to just 4 years (Cordoba 72.8 and Jujuy 68.4) and grows to 6 years in 2001/02 (Buenos Aires City 75.9 and Chaco 70.0). The trend towards closing gaps coincides with international experience (Soares, 2007).

Figure 8



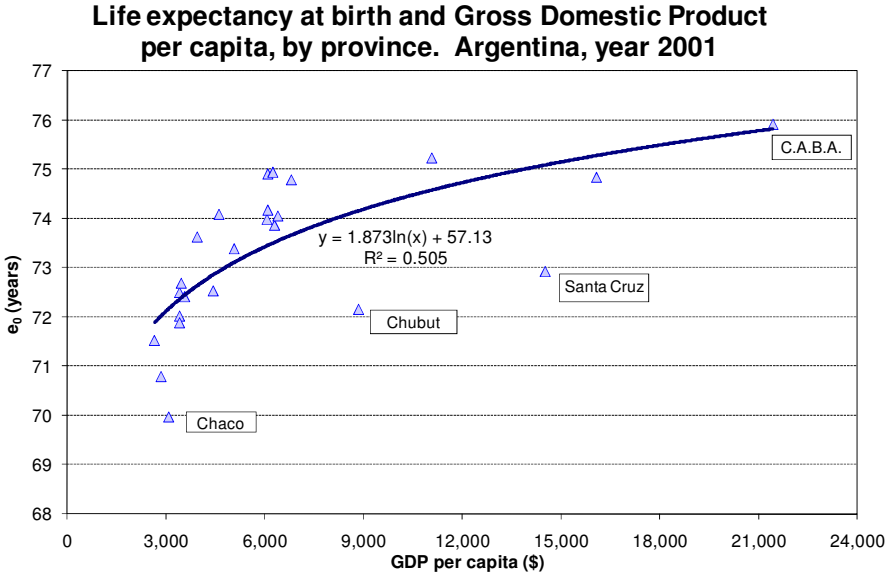
Source: Annex Table 7.

Internationally, the different levels of mortality are associated with the level of socioeconomic development (Preston, 1975). The characteristics of this relationship and its evolution have been recently reviewed and analyzed by the same author (Preston, 2007), while other studies emphasize the importance of complementary health interventions (Kunitz, 2007), the contribution of technical progress (Bloom and Canning, 2007), the ability to get healthier with the same income over time (Wilkinson,

2007), or the historical development of each country and other factors (besides income) affecting LEB (Riley, 2007). Meanwhile, Soares (2007) analyzed the determinants of mortality reduction and its implications in terms of inequalities, based on evidence of increased LEB in different countries and associated variables. More recently, Schnabel and Eiler (2009) modeled the relationship between LEB and Gross Domestic Product per capita (GDPpc) to estimate individual performance, to show how it changed over time and to identify possible boundaries.

In Figure 9 we present for Argentina the relationship between LEB and an economic indicator as GDPpc for each province. The relationship is quite similar to that established internationally in the works cited above: the association is clearly positive and larger resources could be considered the cause of better health through better education, nutrition, housing, and increased demand for health services (Soares, 2007). The cases further away from the general trend correspond to two Patagonian provinces (Chubut and Santa Cruz), with extra resources (linked to the oil industry) and a population that fails to benefit directly (at least in relative terms).

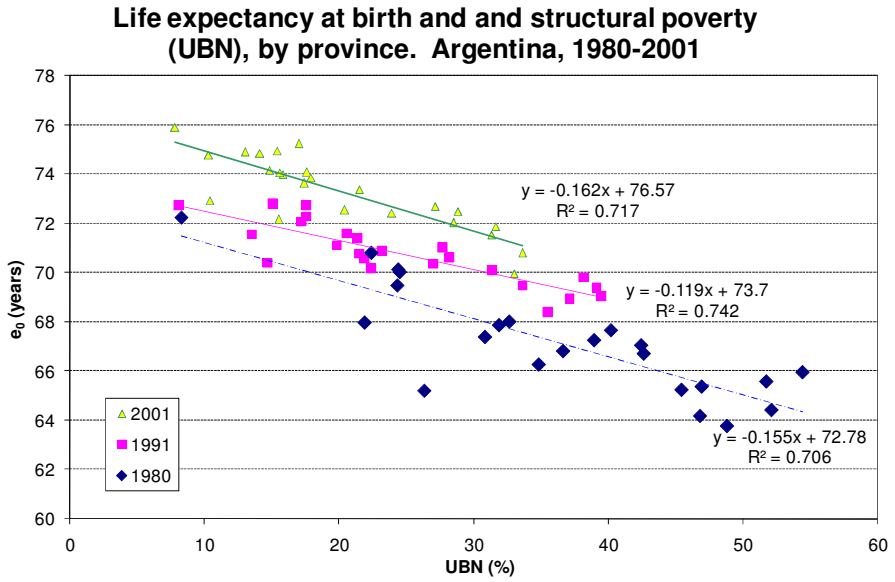
Figure 9



Source: Annex Tables 7 and 8.

Another indicator of structural poverty is the proportion of population with 'unsatisfied basic needs' (UBN), defined according to INDEC (1984). In this case, the relationship in each province with the respective LEB is available from the last three national censuses (1980, 1991 and 2001) and each percentage point of UBN is associated with a decrease in LEB between 0.12 and 0.16 years (Figure 10).

Figure 10

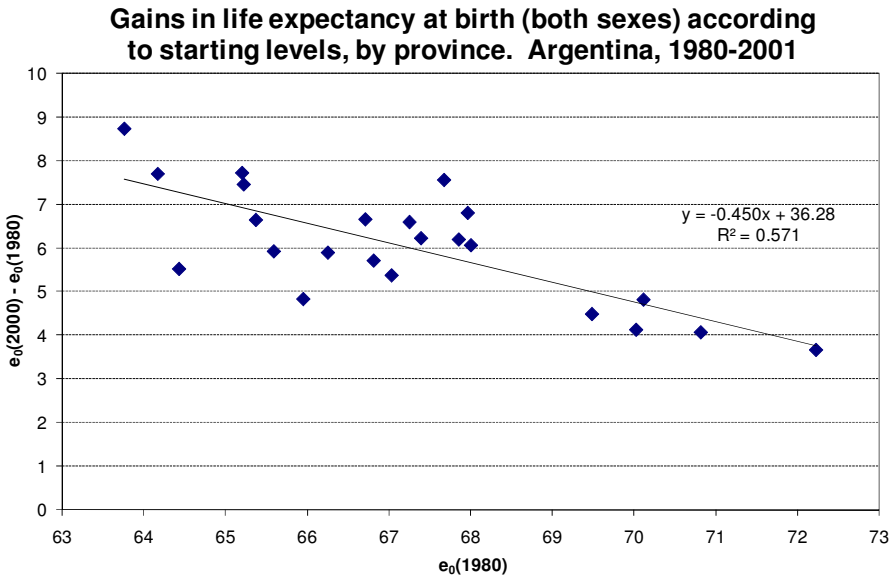


Source: Annex Tables 7 and 9.

It is interesting to note that, in each decade the proportion of population with UBN decreases (and displacement would be on the same line), but the same level of UBN is associated with a higher LEB (lines move up). The finding is similar to the international experience: an important part of the decline in mortality is due to structural factors unrelated to economic development, including interventions for particular diseases and (mainly mothers') education (Soares, 2007).

Another aspect to consider in this process of reducing gaps is what is known as 'regression to the mean': provinces starting (in 1980-1981) with higher LEB tend to get lower gains (in the following two decades) than those beginning with lowest levels.

Figure 11



Source: Annex Table 7.

Perspectives on mortality and longevity [4]

The latest official projections in Argentina were prepared jointly by the National Institute of Statistics and Censuses (INDEC) and the Latin American and Caribbean Demographic Center (CELADE), although publication criteria differ: while CELADE (2004) continued the practice of publishing information until 2050, INDEC (2004) did only until 2015 (for details, see Rofman, 2007).

Mortality projections are based on the usual criteria of decreasing gains in LEB, determining the expected values for each five-year period to 2045-50 (Pujol, 1995; INDEC, 2004). Also, because the sex differential for women is the highest in Latin America (7.5 years in LEB), it remains constant throughout the projection.

The projection of the age structure of mortality was carried by interpolating between the most recent life tables by sex (2000-01) and the so-called "CELADE's limit tables", while the resulting age-specific probabilities of dying must reproduce the projected LEB levels.

[4] This section is based on Grushka (2010).

According to these estimates, in the next four decades, LEB would increase from 75.2 years in the period 2005-10 to 80.7 in 2045-50, i.e. at a rate of 0.14 years per calendar year (0.16 in the first two decades and 0.12 in the following two).

Moreover, United Nations (2004) reported first long-term projections that reach the year 2300, with details to global, regional and country. LEB estimated for Argentina in 2300 is close to 100 years, with an average increase between 2050 and 2300 of 0.08 years per calendar year.

One of the most important implications of having long-term projections relates to the field of social security. Actuarial valuations for Argentina were prepared based on the mortality of the total population (Grushka, 2002; MTESS, 2005), although there are clear indications that the beneficiaries would constitute a select group of lower mortality (Lacasta, 2008; Rofman, 1994). To evaluate and verify alternative hypotheses, it is necessary to overcome the severe data limitations and to develop more research, taking into account interdisciplinary approaches on longevity in the international context and the theoretical debate referred below.

After two centuries of continuous and significant decrease in mortality, there is a wide diversity of views on whether changes technical, medical and environmental future will have more or less impact on LEB than in the past. Gallop (2007) identifies three factors potentially positive for the future development of LEB: reduction in levels of deprivation and housing improvements, public support to improve health, income and expenditure on medical advances, decline in the prevalence of smoking population, and three negative factors such as obesity, the emergence of new diseases (HIV, SARS) and resurgence of old diseases (f.i., tuberculosis), while that modern lifestyles have a net effect unclear.

In recent decades there have been considerable discrepancies among demographers and biologists about what are the possible future scenarios. Some pessimists think that LEB is approaching a limit, while others, very optimistic, expect unlimited progress. The discussion becomes more relevant when considering, for example, that increases in LEB is a key factor of increased costs of pensions and health care for the elderly (Bongaarts, 2006).

Schatzkin (1980), based on several country experiences pre-industrial (agricultural societies), argues that prolongation of human life is statistical and biologically possible. The realization of that gain is difficult, but there is a profound difference between a challenge and an organically unattainable goal.

Pessimists believe that LEB has an upper limit close to 85 years and provide biological and demographic evidence to support this view (Fries, 1980; Olshansky, Carnes, and Cassel, 1990). This perspective was largely accepted and population projections prepared from 1950 to 1990 included a maximum LEB that, paradoxically, has been increasing as the years passed.

By the end of the 20th Century, the pessimistic position has waned. First, most previous proposals to limit LEB were overcome, often shortly after posting (Oeppen and Vaupel, 2002). Thus, the United Nations most recent projections abandoned this practice (United Nations, 2008). Second, specific mortality rates at older ages show no signs of reducing its decline with advancing age (Lee and Carter, 1992; Kannisto et al., 1994). Third, if there is a limit, it should be expected that countries close to that limit show very small gains and spread out over time. Finally, the assertion that mortality at older ages is not subject to the forces of natural selection is being questioned (Lee, 2003).

Oeppen and Vaupel (2002) argue that in the last century and a half LEB has increased 2.5 years per decade, and believe that in a "reasonable scenario" this trend would continue. The steady upward trend of LEB in recent decades confirms the view that, for now, there is no proof of approaching a limit, although the pace of these improvements has been below optimistic estimates.

Thus, most national and international institutions prepare their "official" projections conservatively, but without imposing limits on LEB. For example, projections for the next half century assume that LEB for women in the United States would increase 1.1 years per decade (United Nations, 2006).

Bongaarts (2006) shares the pessimists' view that past improvements in LEB are greatly due to significant reductions in child and young mortality that may not be repeated. Indeed, this is one of the main reasons that significant increases in LEB occurred between 1850 and 1950, and are much slower afterwards. However, the decline in senescent mortality, minimal until 1950, has gained importance and should lead to further progress in the coming decades.

Carnes and Olshansky (2007) identifies three schools of thought regarding the position on mortality trends and longevity: the Futurists, who think that progress will be sustained over time, the Optimists, who think it is feasible a LEB over 100 years into the XXI Century, and the Realists, imposing a limit on improvements in longevity, questioning an average LEB over 85 years. These authors identify themselves with the third stream and argue: medical expenditure in the last stages of life is not useless, improving quality and not just quantity of years lived; the immutability of the causes of death is a myth because they are not encoded in the genome; LEB limit to 85 years arise from increasingly smaller improvements and the difficulty in delaying the onset of diseases typical of aging.

Another approach to increasing human longevity in countries with low mortality studies the emergence of so-called supercentenarians (people over 110 years). It is documented that, at the end of World War II, supercentenarians began to emerge in Europe and Japan. The first valid case became known in the 1960s and since the mid-1980s, their numbers grew exponentially. According to Robine and Vaupel (2002), the maximum human life has been a constant biological about 100-110 years and appears to have been overcome during the last 20 years of the XX Century: between 1980 and 2000, the maximum age at death reported (with reliable data) has increased from 112 to 122 years.

The annual probability of death at age 110 is about 50 percent, and remains oscillating at that level up to age 114 without following the Gompertz curve (increasing probability of death with age). Data after age 115 are very rare and have not been analyzed. However, a previous study (Vaupel et al., 1998) suggests that mortality may even decrease. Thus, mortality at older ages would best suit other laws, such as logistics or quadratic.

We cannot say much about the prospects for longevity in Argentina after briefly reviewing the diversity of approaches, assumptions and different findings, often contradictory. More detailed knowledge of the past pathways is a key element, to which this paper tries to contribute. The challenges are open... but more and better research should be our commitment.

Statistical Annex

Table 1. Crude death rates for five-year periods. Argentina, 1870-2010

Five-year period	Crude death rate (per 1000)	Five-year period	Crude death rate (per 1000)
1870-1875	31.9	1940-1945	11.3
1875-1880	29.6	1945-1950	10.3
1880-1885	29.8	1950-1955	9.2
1885-1890	29.7	1955-1960	8.7
1890-1895	28.4	1960-1965	8.8
1895-1900	28.9	1965-1970	9.1
1900-1905	26.1	1970-1975	9.0
1905-1910	22.7	1975-1980	8.9
1910-1915	19.7	1980-1985	8.5
1915-1920	17.7	1985-1990	8.5
1920-1925	15.1	1990-1995	8.2
1925-1930	14.1	1995-2000	7.9
1930-1935	12.7	2000-2005	7.9
1935-1940	12.5	2005-2010	7.8

Source: Grushka (2010).

Table 2. Life expectancy at birth and mean annual increment. Argentina (both sexes), 1869-2015

Period	Central point	Life expectancy at birth	Length of period (years)	Mean annual increment
1869-1895	1882.5	32.9		
			22.5	0.32
1895-1914	1905.0	40.0		
			9.5	0.89
1913-1915	1914.5	48.5		
			33.0	0.38
1946-1948	1947.5	61.1		
			13.0	0.41
1959-1961	1960.5	66.4		
			10.0	-0.08
1969-1971	1970.5	65.6		
			10.5	0.32
1980-1981	1981.0	68.9		
			10.5	0.29
1990-1992	1991.5	71.9		
			9.5	0.20
2000-2001	2001.0	73.8		
			12.0	0.20
2010-2015	2013.0	76.2		

Note: LEB in the inter-census periods 1869-1895 and 1895-1914 were estimated based on the first three national population censuses, and they should be considered as approximations (Somoza, 1971).

Sources: Somoza (1971), Muller (1978), INDEC (1988, 1995 y 2005), and own elaboration based on CEPAL (2009).

Table 3. Probability of dying within 5 years from exact age x
Argentina, both sexes, 1869-2015

Age x	1869-1895	1895-1914	1913-1915	1946-1948	1959-1961	1969-1971	1980-1981	1990-1992	2000-2001	2010-2015
0	0.34832	0.26356	0.17382	0.08649	0.06718	0.06860	0.04228	0.02892	0.01980	0.01402
5	0.04949	0.03362	0.01780	0.00593	0.00354	0.00315	0.00263	0.00164	0.00154	0.00124
10	0.03328	0.02442	0.01564	0.00559	0.00310	0.00300	0.00256	0.00182	0.00145	0.00115
15	0.04499	0.03579	0.02686	0.01109	0.00569	0.00559	0.00448	0.00374	0.00305	0.00240
20	0.05719	0.04686	0.03734	0.01430	0.00752	0.00747	0.00604	0.00520	0.00494	0.00390
25	0.06257	0.04920	0.03720	0.01504	0.00891	0.00871	0.00700	0.00589	0.00601	0.00485
30	0.06685	0.05344	0.04125	0.01633	0.01050	0.01085	0.00889	0.00704	0.00742	0.00610
35	0.07628	0.06281	0.05068	0.02124	0.01332	0.01495	0.01272	0.01005	0.00973	0.00812
40	0.08898	0.07475	0.06224	0.02978	0.01933	0.02144	0.01974	0.01534	0.01387	0.01167
45	0.11005	0.09251	0.07703	0.04427	0.03051	0.03173	0.02993	0.02412	0.02095	0.01768
50	0.13727	0.11573	0.09703	0.06554	0.04700	0.04863	0.04352	0.03738	0.03218	0.02723
55	0.17184	0.14799	0.12727	0.09402	0.07097	0.07321	0.06346	0.05594	0.04926	0.04179
60	0.22009	0.19302	0.16860	0.13483	0.10392	0.10942	0.09324	0.08026	0.07395	0.06311
65	0.28365	0.25421	0.22552	0.19101	0.15380	0.16229	0.13494	0.11765	0.11039	0.09464
70	0.38431	0.34419	0.30393	0.26794	0.22275	0.23748	0.20587	0.17872	0.16278	0.14066
75	0.51228	0.46147	0.40433	0.36964	0.31759	0.34612	0.30149	0.27010	0.24911	0.21502

Relative values for the probability of dying within 5 years (base period 1869-1895)
Argentina, both sexes, 1869-2015

Edad	1869-1895	1895-1914	1913-1915	1946-1948	1959-1961	1969-1971	1980-1981	1990-1992	2000-2001	2010-2015
0	100.0	75.7	49.9	24.8	19.3	19.7	12.1	8.3	5.7	4.0
5	100.0	67.9	36.0	12.0	7.2	6.4	5.3	3.3	3.1	2.5
10	100.0	73.4	47.0	16.8	9.3	9.0	7.7	5.5	4.3	3.5
15	100.0	79.6	59.7	24.6	12.6	12.4	10.0	8.3	6.8	5.3
20	100.0	81.9	65.3	25.0	13.1	13.1	10.6	9.1	8.6	6.8
25	100.0	78.6	59.5	24.0	14.2	13.9	11.2	9.4	9.6	7.8
30	100.0	79.9	61.7	24.4	15.7	16.2	13.3	10.5	11.1	9.1
35	100.0	82.3	66.4	27.8	17.5	19.6	16.7	13.2	12.8	10.6
40	100.0	84.0	69.9	33.5	21.7	24.1	22.2	17.2	15.6	13.1
45	100.0	84.1	70.0	40.2	27.7	28.8	27.2	21.9	19.0	16.1
50	100.0	84.3	70.7	47.7	34.2	35.4	31.7	27.2	23.4	19.8
55	100.0	86.1	74.1	54.7	41.3	42.6	36.9	32.6	28.7	24.3
60	100.0	87.7	76.6	61.3	47.2	49.7	42.4	36.5	33.6	28.7
65	100.0	89.6	79.5	67.3	54.2	57.2	47.6	41.5	38.9	33.4
70	100.0	89.6	79.1	69.7	58.0	61.8	53.6	46.5	42.4	36.6
75	100.0	90.1	78.9	72.2	62.0	67.6	58.9	52.7	48.6	42.0

Sources: own elaboration based on Somoza (1971), Muller (1978), INDEC (1988, 1995, and 2005), and CEPAL (2009).

Table 4. Survivors at exact age x [l(x)]
Argentina, both sexes, 1869-2015

Edad x	1869-1895	1895-1914	1913-1915	1946-1948	1959-1961	1969-1971	1980-1981	1990-1992	2000-2001	2010-2015
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
5	65,168	73,644	82,618	91,351	93,282	93,140	95,772	97,108	98,020	98,598
10	61,943	71,168	81,147	90,809	92,952	92,847	95,520	96,949	97,869	98,476
15	59,881	69,430	79,878	90,302	92,664	92,568	95,276	96,772	97,727	98,363
20	57,187	66,945	77,733	89,300	92,136	92,051	94,849	96,410	97,429	98,126
25	53,917	63,808	74,830	88,023	91,444	91,363	94,276	95,909	96,948	97,743
30	50,543	60,669	72,047	86,699	90,629	90,567	93,616	95,344	96,365	97,269
35	47,164	57,427	69,075	85,284	89,677	89,585	92,784	94,673	95,650	96,676
40	43,567	53,820	65,574	83,472	88,483	88,245	91,603	93,721	94,719	95,891
45	39,690	49,797	61,493	80,986	86,772	86,353	89,795	92,284	93,405	94,772
50	35,322	45,190	56,756	77,401	84,125	83,613	87,108	90,058	91,448	93,096
55	30,474	39,960	51,249	72,328	80,171	79,547	83,317	86,692	88,505	90,562
60	25,237	34,046	44,726	65,528	74,481	73,724	78,029	81,842	84,146	86,777
65	19,683	27,475	37,185	56,693	66,741	65,657	70,754	75,273	77,923	81,300
70	14,100	20,490	28,799	45,864	56,476	55,001	61,206	66,417	69,321	73,606
75	8,681	13,438	20,046	33,575	43,896	41,940	48,606	54,547	58,037	63,253
80	4,234	7,237	11,941	21,164	29,955	27,423	33,952	39,814	43,579	49,652

Sources: own elaboration based on Somoza (1971), Muller (1978), INDEC (1988, 1995, and 2005), and CEPAL (2009).

Table 5. Life expectancy at birth by sex and mean annual increment. Argentina, 1869-2015

Period	Central point	Life expectancy at birth			Length of period (years)	Mean annual increment	
		Males	Females	Difference		Males	Females
1869-1895	1882.5	32.6	33.3	0.72			
					22.5	0.31	0.33
1895-1914	1905.0	39.5	40.7	1.19			
					9.5	0.85	0.95
1913-1915	1914.5	47.6	49.7	2.13			
					33.0	0.35	0.42
1946-1948	1947.5	59.1	63.6	4.50			
					13.0	0.35	0.46
1959-1961	1960.5	63.7	69.5	5.85			
					10.0	-0.18	0.02
1969-1971	1970.5	61.9	69.7	7.80			
					10.5	0.34	0.29
1980-1981	1981.0	65.5	72.7	7.20			
					10.5	0.28	0.28
1990-1992	1991.5	68.4	75.6	7.20			
					9.5	0.24	0.23
2000-2001	2001.0	70.6	77.7	7.10			
					12.0	0.15	0.18
2010-2015	2013.0	72.5	80.0	7.50			

Sources: Somoza (1971), Muller (1978), INDEC (1988, 1995 y 2005), and CEPAL (2009).

Table 6. Mortality by groups of causes: standardized rates and distribution. Argentina, 1960 - 2007

Group of causes	ASMR per 100,000		Proportional change	Distribution (%)	
	1960	2007		1960	2007
Infectious and parasitic diseases	92	24	-74.2%	10.7	4.6
Cancer	176	100	-43.0%	20.5	19.1
Cardiovascular diseases	218	128	-41.4%	25.4	30.2
Violent / external deaths	68	44	-35.5%	7.9	6.2
Rest of causes	306	194	-36.5%	35.5	39.9
Total	**860**	**490**	**-43.0%**	**100.0**	**100.0**

Note: rates for 2007 were standardized based on 1960 age structure (INDEC, 2005a).
Source: Grushka (2010), based on Lattes (1975), Cerisola (1972), and MSAL (2008).

Table 7. Life expectancy at birth (both sexes) by province. Argentina 1980-2001

Province	1980/1981	1990/1992	2000/2001
Total del país	**67.71**	**71.93**	**73.77**
Buenos Aires City	72.23	72.72	75.91
Buenos Aires Province	69.49	72.09	73.99
Catamarca	66.72	70.61	73.38
Chaco	64.44	69.02	69.97
Chubut	66.26	70.58	72.16
Córdoba	70.82	72.79	74.90
Corrientes	65.38	70.09	72.03
Entre Ríos	68.01	71.61	74.08
Formosa	65.96	69.37	70.80
Jujuy	63.77	68.37	72.50
La Pampa	67.97	71.57	74.78
La Rioja	66.82	70.38	72.54
Mendoza	70.12	72.72	74.95
Misiones	65.23	69.49	72.69
Neuquén	67.68	71.39	75.24
Río Negro	67.26	70.87	73.86
Salta	64.18	68.92	71.88
San Juan	67.40	71.13	73.63
San Luis	67.86	70.79	74.06
Santa Cruz	65.21	70.41	72.93
Santa Fe	70.03	72.29	74.17
Santiago del Estero	65.60	69.83	71.53
Tierra del Fuego	-	70.16	74.84
Tucumán	67.04	71.01	72.42
Maximum	72.23	72.79	75.91
Mínimum	63.77	68.37	69.97
Range	8.46	4.42	5.94
Unweighted mean	67.19	70.76	73.30
Standard deviation	2.16	1.22	1.46
Variation coefficient	3.2%	1.7%	2.0%

Sources: INDEC (1988, 1995 and 2005b).

Table 8. Gross Domestic Product (GDP), by province. Argentina, 2001

Provincia	Total GDP (millions $)	Total population (thousands)	GDP per capita ($)
Total del país	254,526	37,156	6,850
Buenos Aires City	64,167	2,995	21,422
Buenos Aires Province	85,904	14,167	6,064
Catamarca	1,704	336	5,074
Chaco	3,052	991	3,079
Chubut	3,761	425	8,843
Córdoba	19,167	3,144	6,096
Corrientes	3,213	939	3,421
Entre Ríos	5,409	1,174	4,609
Formosa	1,397	490	2,853
Jujuy	2,096	617	3,397
La Pampa	2,084	306	6,808
La Rioja	1,308	295	4,441
Mendoza	10,042	1,606	6,253
Misiones	3,351	968	3,460
Neuquén	5,386	487	11,064
Río Negro	3,602	573	6,282
Salta	3,695	1,084	3,408
San Juan	2,478	628	3,946
San Luis	2,382	373	6,389
Santa Cruz	2,875	198	14,511
Santa Fe	18,877	3,095	6,098
Santiago del Estero	2,139	809	2,644
Tierra del Fuego	1,626	101	16,064
Tucumán	4,810	1,354	3,554

Source: Grushka (2010), based on CEPAL (2006) and INDEC (2005a).

Table 9. Population with Unsatisfied Basic Needs (UBN), by province. Argentina 1980-2001

Province	% of population living in households with UBN (1)			Absolute reductions		
	1980	1991	2001	1980-1991	1991-2001	1980-2001
Total	**27.7**	**19.9**	**17.7**	7.8	2.2	10.0
Buenos Aires City	8.3	8.1	7.8	0.2	0.3	0.5
Buenos Aires Province	24.3	17.2	15.8	7.1	1.4	8.5
Catamarca	42.6	28.2	21.5	14.4	6.7	21.1
Chaco	52.1	39.5	33.0	12.6	6.5	19.1
Chubut	34.8	21.9	15.5	12.9	6.4	19.3
Córdoba	22.4	15.1	13.0	7.3	2.1	9.4
Corrientes	46.9	31.4	28.5	15.5	2.9	18.4
Entre Ríos	32.6	20.6	17.6	12.0	3.0	15.0
Formosa	54.4	39.1	33.6	15.3	5.5	20.8
Jujuy	48.8	35.5	28.8	13.3	6.7	20.0
La Pampa	21.9	13.5	10.3	8.4	3.2	11.6
La Rioja	36.6	27.0	20.4	9.6	6.6	16.2
Mendoza	24.4	17.6	15.4	6.8	2.2	9.0
Misiones	45.4	33.6	27.1	11.8	6.5	18.3
Neuquén	40.2	21.4	17.0	18.8	4.4	23.2
Río Negro	38.9	23.2	17.9	15.7	5.3	21.0
Salta	46.8	37.1	31.6	9.7	5.5	15.2
San Juan	30.8	19.8	17.4	11.0	2.4	13.4
San Luis	31.9	21.5	15.6	10.4	5.9	16.3
Santa Cruz	26.3	14.7	10.4	11.6	4.3	15.9
Santa Fe	24.5	17.6	14.8	6.9	2.8	9.7
Santiago del Estero	51.7	38.2	31.3	13.5	6.9	20.4
Tierra del Fuego	27.5	22.4	14.1	5.1	8.3	13.4
Tucumán	42.4	27.7	23.9	14.7	3.8	18.5
Maximum	54.4	39.5	33.6	18.8	8.3	23.2
Mínimum	8.3	8.1	7.8	0.2	0.3	0.5
Range	**46.1**	**31.4**	**25.8**	18.6	8.0	22.7
Unweighted mean	35.7	24.7	20.1	11.0	4.6	15.6
Standard deviation	11.6	8.8	7.6	4.0	2.1	5.2
Variation coefficient	32%	36%	38%	37%	45%	34%

(1) : Population living in households with UBN out of total population in households, for each province (%).

Note: Households with UBN present at least one of the following indicators of deprivation:
- Overcrowding: more than three people per room
- Poor Housing
- Health conditions: without any toilet
- School attendance: a child of school age do not attend school
- Subsistence capacity: 4 or more people per working member and head with low education.

Source: Grushka (2010), based on National Population Censuses 1980, 1991, and 2001.

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