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Health Vulnerability in Urban Contexts:

Mortality Evolution due to tumors in Campinas (Brazil), Cordoba (Argentina) y Medellin (Colombia), 1980-1982 and 2003-2005 Periods

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Introduction

In recent decades, most Latin-American countries have experienced a change in the mortality profile. This is product of the epidemiologic transition or polarization, going from an important gravitation of infectious diseases in children and young people to the dominance of degenerative diseases, especially cancer and cardiac diseases, which affect mainly adults. The most general manner in the modification processes in morbidity patterns for causes, sex and age, also studied by Frederiksen in 1969, are systematized by Omran in the 1971 "Epidemiologic Transition" theory (Barreto y Carmo, 1993; Veras, 1999). Some of the multiple causalities of this change are modernization, the progress in medical technologies (detection and treatment), demographic, epidemiologic and social transformations fed by globalization processes, urbanization and labor market, which raise new challenges to public health which were not contemplated three decades ago.

Regarding the Pan-American Health Organization (PAHO), it considers that the aging, consequent to the marked decrease of fertility in the 20th century, in the presence of other important sociodemographic processes such as migration and urbanization, has generated specific and complex demands of service and health and social goods. Besides, most countries of the Americas have experienced what has been called "Epidemiological Polarization". This process is characterized by its simultaneous and substantial repercussions on the population mortality profile, on both transmissible and not transmissible diseases and the external causes (Frenk and others, 1996; PAHO, 2002).

The world has changed in the last 30 years, when 38% of the population lived in cities, in 2008, this percentage is higher than 50% and in the future, the larger growth will take place in the smaller cities of developed countries, which size and complexity will have no precedent (WHO, 2008). The urbanization process, aging and the current lifestyles are reasons that make chronic diseases and not transmissible diseases, such as depression, diabetes, cardiovascular diseases, cancer and trauma, increasingly important causes of morbility and mortality, displacing the death causes of the young population to older people. At the same time, not transmissible diseases are displacing the infectious and perinatal ones.

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According to the World Health Organization (WHO, 2006), cancer is a generic term to describe a group of more than 100 diseases which can affect any body part and one of its characteristics is the quick generation of abnormal cells that grow beyond its normal limits and can invade adjacent areas of the body or disseminate to other organs in a process that allows the formation of metastasis. Other used terms are neoplasia and malignant tumor.

In 2000, seven types of cancer explained around 60% of the new cases of cancer that were diagnosed and of all the deceases from cancer in developing countries: the cervical, liver, stomach, esophagus, lung, colon and rectus and breast cancer; the first four show a lower incidence but it is growing together with the other ones. The types of cancer that most abound in high income countries are: lung, colon and rectus, breast and prostate and they have been linked to factors such as the earlier initiation of the tobacco addiction epidemic and an earlier exposition to cancerous substances, feeding and lifestyle. Instead, the malignant neoplasias which are more frequent in low and middle-income countries are: cervical, liver and stomach cancer and they relate with chronic infections (BM, 2006)

Neoplasia constitutes one of the main causes of death in the world; in 2005 13% (7.6 million) of the deceases was due to this cause, and the main ones are: lung (1.3 million of annual deaths), stomach (almost 1 million), liver (662,000), colon (655,000) and breast (502,000). In men, the most frequent cancer types are: lung, stomach, liver, colon and rectus, esophagus and prostate cancer; in women, the main types are: breast, lung, stomach, colon and rectus and cervical cancer. It is expected that the cancer death toll continues to grow and reaches 9 million in 2015 and 11.4 million in 2030 (WHO, 2006)

Cancer is produced because of alterations in the genes in charge of growth and cellular reparations. These alterations are the result of interactions between genetic factors and external agents that can be grouped together in the following categories: physical carcinogens, such as ultraviolet light and ionizing radiation, chemical carcinogens, such as asbestos, pesticides, cyanide, arsenic and many more used in industries and farming and biologic carcinogens, such as virus infections (hepatitis B virus and liver cancer, human papillomavirus and cervical cancer), bacterium (*Helicobacter pylori* and stomach cancer) or parasite (schistosoma and bladder cancer) or the vegetables pollution by mycotoxin, such as the aflatoxins produced by mushrooms of the *Aspergillus* genre, which causes liver cancer (WHO, 2006)

Tobacco consumption is a major risk factor and it causes a great variety of cancers (lung, laryngeal, esophagus, stomach, bladder, oral cavity and others) (WHO, 2006). The environmental tobacco smoke that combines active smokers exhaled smoke and the smoke that the tobacco ember emanates between two puffs, called passive or involuntary tobacco addiction, has been related to lung cancer and nasal sinus cancer (WHO, 2002)

Although there are still some aspects to be studied, there is substantial evidence that that diet factors also have an important role as cancer cause (WHO, 2006) Physical inactivity has a defined role as risk factor for colon, breast and colorectal cancer (WHO, 2002) and there is evidence that alcohol causes certain cancer types (mouth, breast, esophagus, pharynx, laryngeal, liver, breast cancer and other) (WHO, 2006)

The Body Mass Index (BMI) elevation increases breast, colon, prostate, kidney and gallbladder cancer risk. Even if that larger risk activation mechanisms is not completely understood, it may be related to hormonal changes induced by obesity (WHO, 2002)

Environmental pollution product of the strong combustion is related to a wide series of intense and chronicle health effects, which depend of the polluting agent composition. Particle pollution (which can be inhaled and reached the lungs because of it small size) are

related in a systematic and independent way to the more serious effects of pollution, lung cancer particularly. Analysis based in particles estimate that environmental pollution causes 5% of trachea, bronchus and lung cancer types and the solid fuel used indoors causes 1,5% of this cancer type (WHO, 2002)

In working environments, there are many of the 150 chemicals or biological agents classified as carcinogens. The risk of having cancer depends on the dose received, on the strength of the carcinogens, on the exposition to other risks and on the individual susceptibility. In international terms, between 20% and 30% of males and between 5% and 20% of females who constitute the active population (aged from 15 to 64 years old) could have been exposed during their working lives to agents that cause lung cancer, such as asbestos, arsenic, beryl, cadmium, chrome, diesel engine exhaust gases, nickel or silica. These occupational forms of exposure are the cause of 10.3% of the most frequent occupational cancer, lung, trachea and bronchus cancer (WHO, 2002)

That is to say, the causal net is complex and it is linked to environmental exposures (foodstuff bioavailability, proximity to farming areas, systems of attention access, among others), biologic (sex, age, race) and of lifestyles (profession, education, values, behavior, etc). Its pattern of incidence is, therefore, characteristic of each geographic region, of cultural trends, of population biologic peculiarities and the historic moment (Stewart y Kleihues, 2003; Potter, 1997 *apud*: Muñoz and others, 2007).

In Argentina, cancer is the second death cause, after cardiovascular diseases (IARC, 2002; *apud:* Muñoz and others, 2007). An epidemiologic investigation conducted in the year 2007, in Cordoba province, in Argentina, showed a cancer incident rate of 206‰000 in women and 181‰000 in men, in the year 2004. When desintegrating the information by departments they come across a cancer incident concentration in the capital departement and the nearby capital departments, with a minor variation among men and women (Muñoz and others, 2007) Regarding the general representation that each tumor site has in the cancer incident total rate in the province, they found the following (global rate, every 100.000 inhabitants): breast (36.9‰000) with 18.5% of the total province, prostate (26.3‰000) with 13.6%, cervical (24.3‰000) with 12.6%, bronchus and lung (11.1‰000) with 5.7%, colon (10.1‰000) with 5.2%, body of the uterus (8,6‰000) with 4.4%, urinary bladder (6.7‰000) with 3.5%, rectal (4.1‰000) with 2.1% y esophageal (2.4‰000) with a contribution of 1.2% of the total cases of the province(Muñoz and others, 2007).

Guerra (2005) highlights that in Brazil there are occurrences of modification in the epidemiologic patterns of cancer mortality with an incidence increase of breast, prostate, colon and rectal cancer, more frequently related to high socioeconomic status. While the high incidence of cervical, penile, stomach and oral cavity cancer, have higher occurrences in populations with worst living conditions. The absolute and relative growth of the elderly population, the changes in sexual and reproductive behavior, are some of the factors pointed by Belon (2006) to explain the high rates of female cervical and breast neoplasia incidences detected in San Pablo State, with high urban development and progress in Brazil. The importance of these diseases as the main incident causes and responsible of mortality in women over 60 years, are consider in the public health agenda, because they represent a major control and cure prospect, if they are early diagnosed and provisioned of the appropriate treatment (Ministério da Saúde do Brasil, 2006). In Campinas city, San Pablo state, the Ministry of Health in an investigation on the trends of female mortality, identified that in 2004, 19.1% of the female deceases were due to neoplasias, and a minor growth in breast cancer mortality between 1980 and 2004, of 23‰000 to almost 26‰000

respectivly, and decrease of the cervical cancer moratlity, of almost 10‰ to 8‰in the same period. To males, the malignant neoplasias represented 18.3% of the death causes in 2004[1]

As it happens in Brasil and Argentina, in Colombia, next to cardiobascular disease and violence, cancer is turning into one of the main causes of death, due to diferent origins such as unsuitable lifestyles, new nutrition patterns, exposure to harmful agents and greater consumption of hazardous substances. Nowadays, deaths originated by tumors represent almost 15% of all deaths and it went from a rate of 43 deceases every one hundred thousand inhabitants in the year 1970 (IARC, 2003) to 65 every one hundred thousands people- exposure year, 2001 (Ochoa, 2004).

In Colombia, it is likely that cancer deaths continue to grow due to a decrease in deceases by infectious diseases, as a result of public health interventions, such as better conditions of drinking water, vaccination and major access to health care, allowing new mortality patterns: cardiovascular, violence and tumors. In the year 2001, the average cancer mortality age was 63,2 years old. The risk of dying increases since the seventh decade of life, but from the 50th year cancer becomes important as a cause of death. The first 10 cause of death, in Colombia, according to the tumor location, (Tenth International Classification of Diseases, ICD-10), stomach appears as the first cause this year, with 15.3% of the total deaths (rate of 10.1‰), followed by lung and bronchus with 10.8% (rate 7.1‰), liver y bile ducts with 7.6% (5‰), prostate 7.1% (4.7‰), breast 5.8% (3.8‰), cervical with 5.6% (3.7‰), colon with 4.7% (3.1‰), brain and nervous system with 4% (2.6‰), pancreatic with 3.2% (2.1‰) and esophageal with 2.3% (1.6‰) (Ochoa, 2004).

Among these causes, five of them are related to the digestive system: esophageal, stomach, liver, pancreatic and colon and they represent the third part of all cancer deaths. The high stomach cancer ocurrance is related to eating habits and the minor level socieconomic stratification which stresses with diets with high animal consumption and salts, together with few fruits and vegetables consumption, alcohol ingestion and exposure to chemical elements. (Diaz and others, 2001) If gender is taken into consideration, the first five death causes, over malignant tumor or neoplasia location, which caused the death of men were: stomach, prostate, lung and bronchus and liver and bile ducts. The main tumor locations on women were: stomach, breast, cervical, liver, bile ducts and lung and bronchus.

In Medellin city, breast cancer mortality in the year 2006 was 14.8 per one hundred thousand women and in the Antioquia department was 10.4‰; the mortality rate for cervical cancer in the city was 4.4‰ women, while in the department was 6.9‰. Prostate cancer in the city was 16‰ men and 12‰ in the department and in lung, trachea and bronchus cancer, the general mortality was 17.7‰ in Medellin and 14.7‰ in Antioquia (Medellin Ministry of Health, 2007).

Objective

This work has as a **general objective** the comparison of the mortality evolution caused by tumors in three Latin American cities: Campinas (Brazil), Cordoba (Argentina) and Medellin (Colombia), in the 1980-1982 and 2003-2005 periods.

[1] Boletim de Mortalidade nº 36, Julho a Dezembro de 2004. Informe do Projeto de Monitorização dos Óbitos no Município de Campinas (http://www.campinas.sp.gov.br/saude/boletins/mort_36/1.htm).

Specific objectives:

1. Observe the change in life expectancy between 1981 and 2004 in the cities studied.
2. Compare the mortality patterns by age and sex of each geographical area.
3. To compare the contribution to the change in life expectancy of the cities, each group of tumors, age and sex.

Methodology

The life expectancy, mortality profile and the contribution of deceases by tumors in exchange of life expectancy in the three studied cities in each period according to gender and age will be compared.

Two periods are analyzed 1980-1982 y 2003-2005. In both cases, the work was done with averages of three years. The information source comes from the official offices[2] of each country, from the data base of the death certificates registered in the vital statistics of Campinas, Cordoba y Medellin.

The information was classified according to the ninth (ICD-9) and tenth Revision of the International Classification of Diseases (ICD-10), considering the anatomical location of the tumor. The neoplasias deaths causes, were grouped acoording to the numbered codes in table 1 of the annex.

The information processing was done with the assistance of the statistic programs SPSS software, PAS (Population Analysis Spreadsheets of US Bureau of The Census) and Excel. Years of life lost will be used to calculate the mortality impact by tumors in the life expectancy decrease.

Regarding the data quality, the cities consider in this work are coincident regarding the information status on mortality through the vital statistics, with low record levels and classified deaths in the ill-defined causes group (Cardona et. al., 2009). In the tumor classification, in the three cities there is 5% or more of ill-defined tumor in the tumor total. In Campinas there was a minor improvement in the tumor classification between 1981 and 2004 (Table A)

The years of life lost to estimate the tumor impact in the decrease of life expectancy were calculated using the life expectancy method in years of life lost (Arriaga, 1994 y 1996). This method calculates the impact of each cause, gender and age in the lost of life hope of the population. It supposes a null mortality between two ages. In this paper the null mortality was supposed between 0 and 80 years old. Each death that occurs in the population before that age limit, takes a portion of years of hope to the population. The virtue of this method is that if highlights the impact that young deceases have over older adults since, for example, the decease of a 15 year old man would take 65 years of life expectancy average to the population, while the decease of a 79 years old person would only take one year to the population total. In order to compare the mortality impact evolution due to causes between two years, the Arriaga´s proposed method was used (1994) with the aim of decomposed the changes of life expectancy occurred between the two

[2] Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health National Bureau of Statistics and Health Information. Colombia. National Administrative Department of Statistics. Register of Deaths.

periods in causes, gender and age. In this case the deceases that took place after the 80 years were considered.

Table A.

Ill-defined deceases percentage Total and ill-defined tumors by gender								
	Percentages of ill-defined over the total				Percentages of ill-defined tumors			
	1981		2004		1981		2004	
	Men	Women	Women	Women	Men	Women	Men	Women
Cordoba	0.9%	0.9%	6.6%	4.1%	3.8%	5.1%	5.2%	4.8%
Medellin	1.2%	1.4%	1.0%	0.9%	5.6%	6.3%	6.8%	6.4%
Campinas	1.3%	1.9%	1.6%	2.0%	5.7%	8.7%	5.3%	5.5%

Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health National Bureau of Statistics and Health Information. Colombia. National Administrative Department of Statistics. Register of Deaths. Elaboration of our own: NEPO/UNICAMP, CEA/UNC, UDEA-CES.
For he ill-defined ICD 10- C76 to C80 and ICD 9 – 195 to 199

Life Expectancy Evolution

In the early 80, the life expectancy at birth were quite different, Cordoba city was the most long-lived, followed by Campinas and Medellin, whose population was about 5 years below life average in Cordoba (Table B). In 2004, the indicators are quite closed, around 71 years for men and 80 for women in the three analyzed cities. The biggest improvements are therefore noticed in Medellin, which life expectancy at birth has increase in almost 15% in the period (9.0 and 9.4 years for men and women, respectively). In Campinas, the population long-lived showed a growth of almost 10% (5.8 years and 6.1 years for men and women, respectively). The lower growth was noticed in Cordoba, 4.0% (2.7 years) for the male population and 5.7% (4.3 years) for women. The gender gap is intensified, and reaches almost 9 years by the end of the period.

Table B: life expectancy at birth and variation between the triennium 1980/1982 and 2003/2005. Cordoba (Argentina), Campinas (Brazil) y Medellin (Colombia) Councils.

Gender	Triennium	Cordoba		Campinas		Medellin	
		e_0	Var %	e_0	Var %	e_0	Var %
Men	1980/82	68.4	4.0	65.1	9.0	62.2	14.4
	2003/05	71.2		70.9		71.2	
Women	1980/82	75.7	5.7	73.2	8.4	70.4	13.4
	2003/05	80.1		79.3		79.9	
Differences (women-men)	1980/82	7.3	22.2	8.2	3.4	8.3	5.5
	2003/05	8.9		8.5		8.7	

Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health National Bureau of Statistics and Health Information. Colombia. National Administrative Department of Statistics. Register of Deaths. Elaboration of our own: NEPO/UNICAMP, CEA/UNC, UDEA-CES.

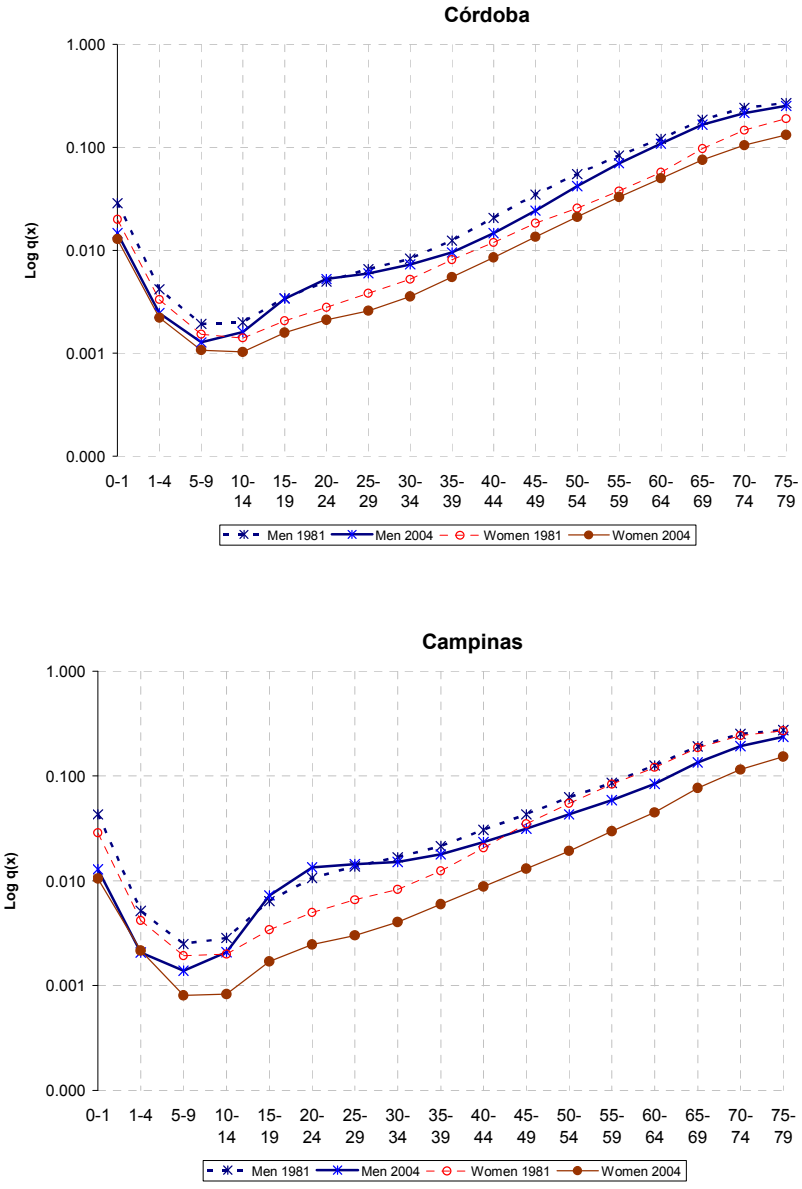
The tree cities represented in the 2003/2005 triennium, a life expectancy at birth superior to national average in the same period, which were 70.6, 67.3 and 69.2 years for the male

population in Argentina, Brazil and Colombia respectively; while the women estimates were 78.1, 74.9 y 75.3 years for the three countries respectively (Guzmán et al, 2006).

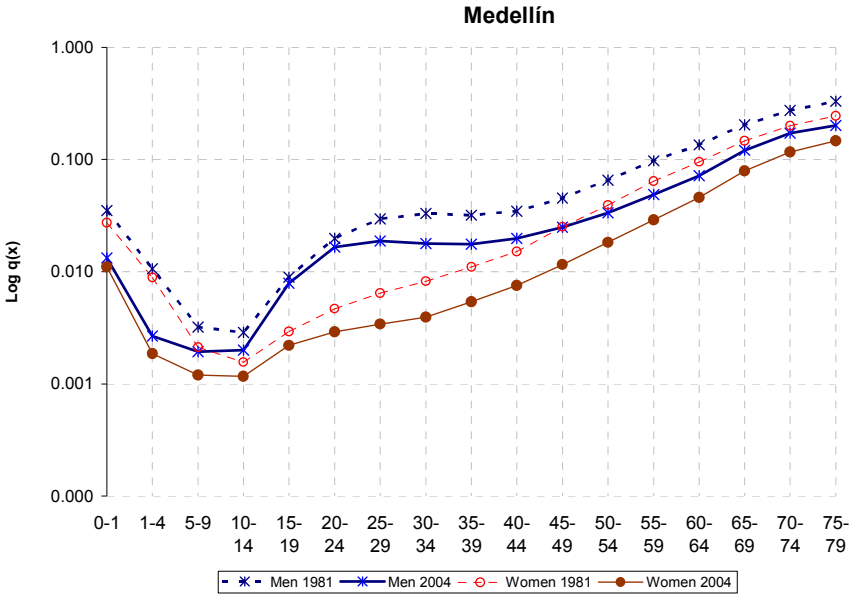
Mortality profile by gender and age – 1980/1982 y 2003/2005

The analysis by age and gender group of mortality in the three cities and the two trienniums 1980/1982 and 2003/2005, reflects in large, differentials patterns (Tables 2-7 in the Annex)

Figure 1. Death chances q(x), by gender and ages. Cordoba (Argentina), Campinas (Brazil) and Medellin (Colombia), triennium 1980/1982 and 2003/2005.



Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health, National Bureau of Statistics and Health Information . Colombia. National Administrative Department of Statistics. Registers of deaths . Elaboration of our own.: NEPO/UNICAMP, CEA/UNC, UDEA-CES



Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health, National Bureau of Statistics and Health Information . Colombia. National Administrative Department of Statistics. Registers of deaths . Elaboration of our own.: NEPO/UNICAMP, CEA/UNC, UDEA-CES

Cordoba shows a decrease in the death chances in all ages, although less intense, in general for women and men till the age of ten. Among men of 15 to 35 years there is no improvement in the death chances and in people over 60 years, the gains are much lesser than the ones observed in women (Fig. 1)

In Campinas, there is an important female mortality decrease in all ages. However, young men of 15 to 35 years old had the mortality levels increased, while in the other ages, they decreased.

It was noticed in the same period, the fall of female mortality in Medellin, but quite lesser for girls from 15 to 25 years old. The superiority of male mortality is much more evident and it goes from 5 to 45 years old. The gain of mortality in the period is very important and unlike the other cities, they are similar among men and women older than 25 years old.

Analysis of mortality by causes

With the aim of analyzing the mortality profile in big groups of causes, the impact of each group of causes was analyzed in the lost of life expectancy in every city, gender and year. The null mortality assumption was used between age zero and 80 years (table 9 and 10 of the Annex)

In 1981, Medellin was the city that lost most life expectancy between 0 and 80 years, 18.5 years for men and 12 years for women; then, Campinas was observed, it los 16.6 years for men and 10.4 for women. Finally, Cordoba los 13.3 years of life expectancy between 0 and 80 years for men and 8.5 for women.

That year, the group of causes with higher impact on Medellin men were external causes which made 6.8 life expectancy years was lost; in second place, it was circulatory system diseases that made 4 years of life expectancy lost; then tumors 2.2 and perinatal affection. In Medellin women, the group of causes with higher impact were Circulatory

system diseases 3,5 YL; tumors 2,4; external causes 1,2 and respiratory system diseases 1 YL.

In the year 1981, in Campinas, men lost years of life with circulatory system diseases (4.7 YL); external causes (2.7); tumors (1.9) and the respiratory system diseases (1.8). Regarding women, the mail lost were produced by circulatory system diseases (3.1), tumors (1.6); respiratory system diseases (1.2) and perinatal causes (1 YL).

Men of Cordoba, in 1981, lost years of life due to circulatory system diseases (4.7 YL); tumors (2.3): external causes (1.8) and perinatal causes (1.1). While women suffer lower life expectancy between 0 and 80 years due to circulatory system diseases (2.6 YL); tumors (1.8); perinatal causes (0.7) and external causes (0.6)

In the year 2004, there was almost a convergence between the three cities regarding the YL between 0 and 80 years, but with variations in the cause's distribution. Men lost 11.1 YL in Cordoba and Medellin and 12.1 in Campinas; on the other hand, women lost 6.3 YL in Medellin and Campinas and 6.5 YL in Cordoba.

Regarding men in Medellin, the group of causes with the higher impact on the decline of life expectancy continued to be external causes, but now with a lost of 3.6 YL; in second place circulatory system diseases (2.1 YL); tumors (1.8 YL) and respiratory system diseases (0.8 AVP). For females, the higher impact in life expectancy was tumors (1.7 YL); circulatory system diseases (1.3 YL) came in second and external causes (0,6 YL).

In Campinas city, men lost years of life expectancy for external causes (3.4 YL); circulatory system diseases (2.7 YL); tumors (1.9 YL) and respiratory system diseases (0.9 YL). Women had years of life expectancy taken due to circulatory system diseases (1.7 YL); tumors (1.5); external causes (0.5) and respiratory system diseases

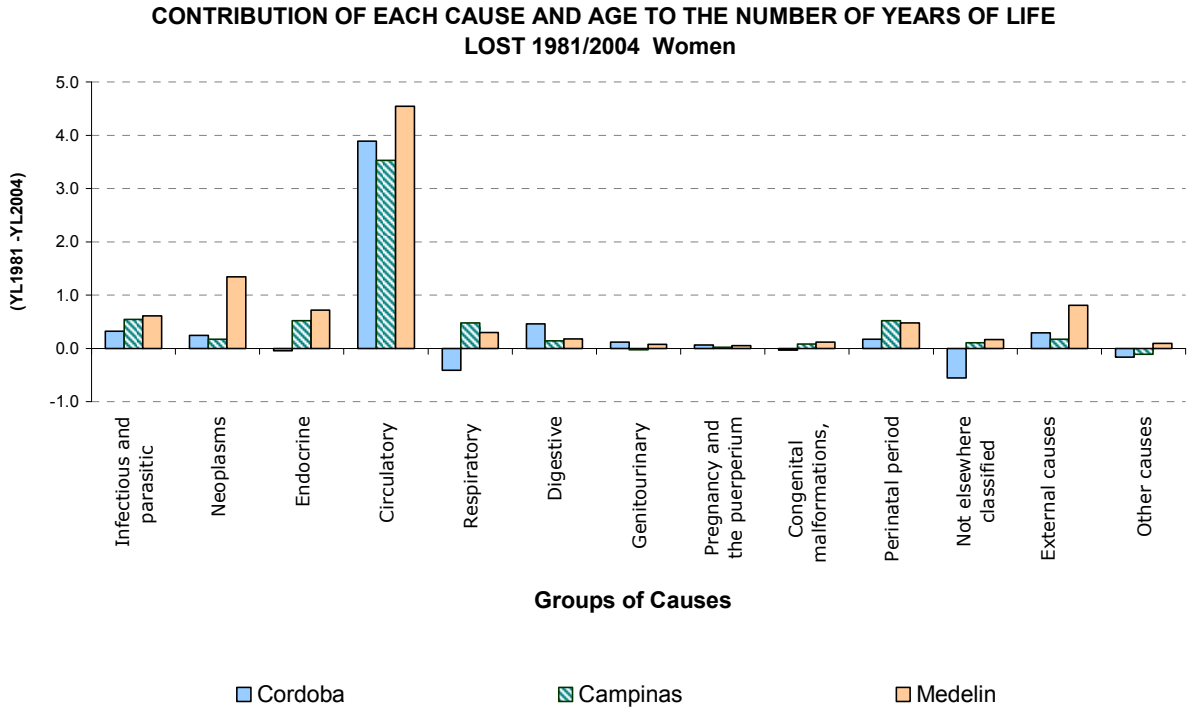
The men from Cordoba lost life expectancy due to circulatory system diseases (2.7 YL); tumors (2.1) and external causes (1.4) and ill-defined (1 YL). Women from Cordoba lost 1.8 YL because of tumors; 1.3 because of circulatory system diseases and 0.5 YL because of congenital and ill-defined anomalies.

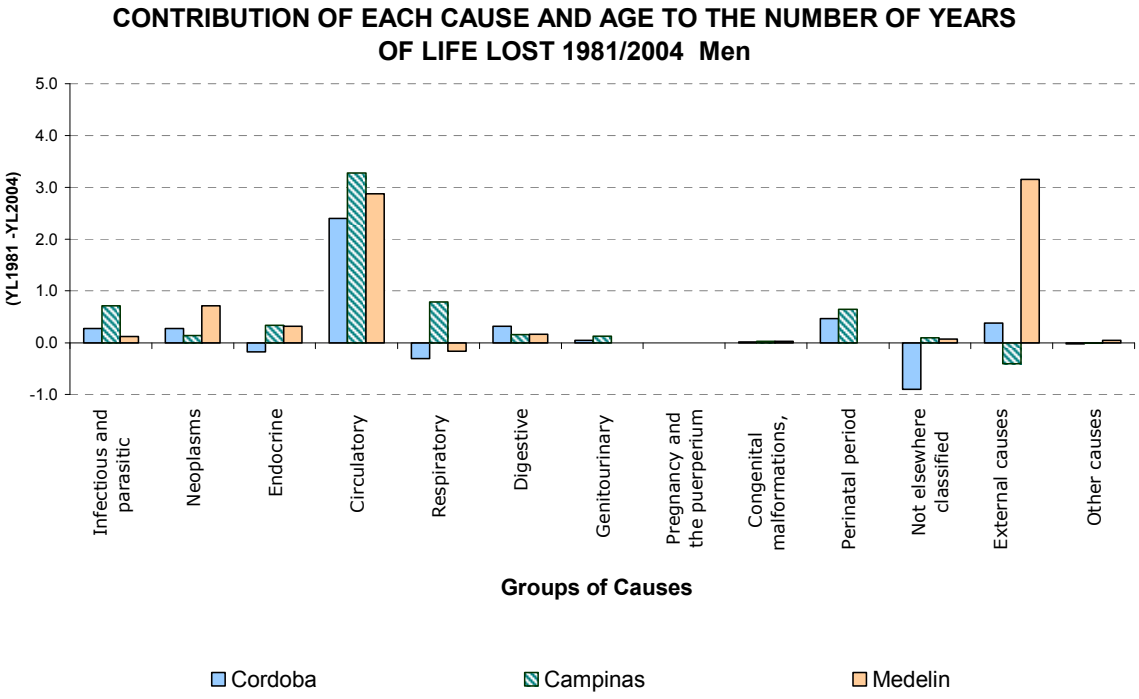
Contributions of each group of causes to life expectancy change – 1980/1982 and 2003/2005

According to previous studies, (Alvarez et al., 2008), tumors have gain relative importance in the second period, for both genders in the three cities. On the other hand, also for both genders in the three cities, the importance of infectious, parasitic and circulatory system diseases has decreased. As it was already demonstrated by the same authors, between 1980 and 2004, external causes, especially the most violent ones, gain importance in the mortality of male population who lived in Brazilian cities, and lost importance in Medellin and Cordoba, but with quite different tendencies and oscillation in the period. (Ribotta et al., 2008).

For sure, due to a development in the demographic transition and population aging, the detection and the risk factors knowledge in the different diseases have an important role in the epidemiologic patterns changes. The impacts in the life expectancy of these trends can be better evaluated by indicators that cancel the effect of the age structure differences, such as the Years of Life Lost (YL) described in Figure 2.

Figure 2





Source Elaboration of our own: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health, National Bureau of Statistics and Health Information . Colombia. National Administrative Department of Statistics. Registers of deaths .: NEPO/UNICAMP, CEA/UNC, UDEA-CES.

For both, women and men of Medellin, the positive impacts in the life expectancy, between 1981 and 2004, are higher and quite relevant for the circulatory system diseases, represented by a 3.3 years gain for men in Caminas, 2.4 in Cordoba and 2.9 years. For the female population the improvements result in the decrease of YL in almost 3.9, 3.5 e 4.5 years in Cordoba, Campinas y Medellin, respectively. The gains are lesser for the group of causes which do not exceed the year, except for neoplasia. In Medellin, women gain for this group of causes 1.3 years of life expectancy and men gain for external causes 3.1 years of life expectancy due to mortality changes between 1981 and 2004.

In general, neoplasias are losing YL impact and the major change is observed in Medellin – 0.71 y 1.34 years for male and female population respectively.

Contributions of each group of tumors to life expectancy change – 1980/1982 and 2003/2005

Through the decomposition of life expectancy for each group of causes, the analysis allows the impact study for each cause, gender and age. When analyzing the decomposition of life expectancy changes due to groups of tumors between 1981 and 2004 in the cities of Campinas, Cordoba and Medellin, the values of gain or lost life expectancy years were quite low. For this reason, it was decided that it would be multiplied by 365 to get this indicator in days of life gained.

According to tables 2 and 7 of the annex, due to the mortality changes for tumors between 1982 and 2004, the higher gain in days of life occurred in Medellin women, 490: while, the lesser gain in days was for Campinas men, 49 days of life.

Studying the changes by age groups, it can be appreciated that the gains in the first age group were rare or null. In this age group, the ones that gain the most were men from Cordoba, only 17 days of life – 14 days for lymphatic tumors. On the other hand, oddly enough, women from Cordoba lost 1 day of life expectancy due to these changes.

In the age group of 20 to 39 years, it was also noticed little gain, with the highest belonging to Medellin men who gain 35 days of life expectancy, of which 13 days are of digestive system. Minor gains occurred for women of the same age, with a maximum of 19 days for inhabitants of Cordoba, of which 12 are of genitourinary tumors.

The major gains of life expectancy were found in the age groups of 40 to 80 years, especially in Medellin. For example, in the group of 40 to 59 years there was a 176 days gain of life expectancy in Medellin women and of 174 days in men of the same city. Men from Cordoba gain 65 days of life due to change in tumor mortality at that age, while women keep the same situation of the year 1981. In the age group of 60 to 79 years, the gain of 125 days of life expectancy in Medellin women stands out; 80 days for men of the same city and 41 days for women of Campinas. It is important to highlight that because of mortality changes due to tumors, people older tan 80 years lose life time like men and women from Campinas, men from Cordoba and Medellin. While, women of Cordoba and Medellin gain life expectancy.

When doing the analysis according to the anatomical location of the tumor, it can be seen that the mortality change due to tumors in the digestive system was the origin of the biggest gains in life expectancy for both genders, in the three cities, except men from Cordoba whose biggest life expectancy was because mortality changes due to respiratory system, of 107 days of life expectancy gain. The biggest gains were for Medellin women, 246 days, and men of the same city, 142.

It is important to point out that the biggest positive contribution to the life expectancy increase was for respiratory system tumors in men from Cordoba, but they meant life expectancy lost for women of Cordoba and Campinas.

Mortality changes due to genitourinary system tumors have taken life time to men and have meant a gain for women of the three cities, Medellin is the place where they gain 120 days.

Changes in benign tumors in situ had a differential behavior according to cities and gender. The biggest gains occurred in men and women from Medellin, around 40 days of life; meanwhile, in Cordoba, mortality change of patterns of this tumor between 1981 and 2004 took 30 days of life from men and women.

It is important also to take into account skin and bone tumors which in Cordoba and Campinas were responsible of taking few day of life to women and men as well. The same happens with the lymphatic tumor changes that took days of life to women and men in Cordoba.

Discussion

The results suggest that the changes in the mortality profile in the three analyzed cities confirm other studies conducted in Latin America, which indicated by the end of the 80´s an advanced demographic transition in Argentina and a more diverse scenario in Brazil and Colombia. In these two countries, fertility was high till after 1960, and the epidemiologic transition had heterogeneous patterns. Between 1950 and 1990, in Colombia and Brazil there were significant improvements as regards infant mortality due to infectious and parasitic diseases. However, there was a strong increase in mortality due to external causes and the permanence of the innumerable importance of reduced causes, generating a "polarized" profile.

Frenk et al. (1996), quoting Miró (1984) point out the development and modernization model – rural and agricultural societies transformation into urban and industrial ones – as one of the most important factors for this epidemiologic transition pattern. The strong concentration of economic activity and population in urban centers would produce impoverishment in some society areas, which would increase socioeconomic inequality and access to supplies and services. This way, the significant breakthroughs in medical technology, in health care and health service, all of which reach the same development process and modernization, will not be enough if distributed in a fair manner to the whole population; it will not even be enough to the urban areas.

The analysis of the death causes impact on the observed changes in the life expectancy indicates that the medical breakthroughs and the higher offer and food diversity would have had a positive impact in mortality due to digestive system tumors in the period, since they neutralize risks related to " *food additive consumption, sault elevated tenor, which cases swelling of the gastric mucosa, besides the association with the Helicbacter Pylori infection. (Guerra et. al., 2005:230).*

Regarding the respiratory system tumors, the tendencies show discrepancy between genders and cities, with improvements for men and women from Medellin, but with lost of days of life for women in Campinas. Fawcett y Blakely (2007) check the similar trend in New Zeeland between 1981 and 1999. This showed an increase in the lung cancer mortality, mainly in women, stressing the fact that the cause of these incidence trends reflects the dominance of the last 20 years tobacco addiction.

In Campinas, respiratory cancers were responsible for the major lost of life expectancy on women of 60 years old or older, from 1981 to 2004. It is interesting to highlight the cohort of women who in 2004 had from 60 to 79 years old had their productive and reproductive life beginning (15 to 25 years ago) between 1950 and 1970: this period was rich in political, social and demographic transformations in Latin America.

The rapid modernization and industrialization, linked to the discovery and diffusion of the birth control pill, is part of the context in which sexual and reproductive changes are verify, increase of female participation in the labor market and public spaces. If, on the one hand these changes reflect major "empowerment" to women, on the other hand, they expose women to risk factors, which used to be qualified as "inherently male", for example, tobacco addiction, alcohol consumption, stress and poor diet due to work pressures and urban traffic.

The facts that can explain some not presented results which show that women of 40 to 50 years old had lesser gains tan those noticed in men of the same age, regarding circulatory diseases mortality.

In general, there were improvements as regards genitourinary tumors in women, especially in Medellin. But there are verified losses of life time for women from Cordoba and Campinas of 60 and 79 years old. In this group, breast cancer is the most recurrent, and it is considered at the moment as one of the biggest in the world, with main risk factors already checked such as low fertility, breastfeeding time, early menarche, and late menopause, obesity, tobacco addiction and alcohol consumption (Fawcett and Blakely, 2007 and Guerra, 2005). In this sense, in the second have of the 20th century, the average number of children per women went from 6.2 to 2.4 in Brazil, from 6.8 to 2.6 in Colombia, and from 3.2 to 2.4 in Argentina (Guzman et. al, 2006). In Campinas, it is estimated by 2006, a total fertility rate of 1,7 children per women, rate calculated for the San Pablo[3] State.

Men from the three cities lose life expectancy days due to the mortality behavior change due to genitourinary system tumors between 1981 and 2004, mainly because of prostate cancer.

In women from Cordoba and Campinas, changes did not produce any important life expectancy difference. However, in Medellin women there is gain in life expectancy since there is a decrease in mortality of such group of tumors.

In a research done in five rural communities in the Humid Pampa in Argentina, the obtained data was compared with the national average. The hormone dependant cancers (genitourinary) presented more incidence than the national average, especially in some of studied communities. It is concluded that there is a relation between the reproductive health conditions and the environmental factors in this region (Oliva et al., 2008, pp. 785).

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[3] Fundação SEADE http://comunicacao.sp.gov.br/spnoticias/lenoticia.php?id=92985

Conclusions

The preliminary results, added to the study of external causes performed by this team, reinforced the analysis of Frenk et al.(1996) on the processes diversity in the mortality transformation and the epidemiologic profile in Latin America. Up to today, practically twenty years later after comparative analysis between countries performed by those authors, there are patterns quite different from each other in the distribution of causes of death in the three cities that can be observed. There is still an important tumor and external cause's role, health problems related, in general, to the urbanization and modernization, in the different observed cities.

The chosen method for the mortality for causes analysis allowed to determine which group causes and in which cities they had a bigger impact in the life expectancy loss.

The mortality patterns by group of causes are differentials by city and gender. There is a high impact of external causes in men from Medellin and Campinas. In men from Cordoba, external causes were the third group of causes regarding the impact in the loss of YL in 2004. Circulatory system diseases were the cause with higher impact among men from Cordoba and the second one in Campinas and Medellin. In 2004, tumors were the second group of causes with higher impact in the life expectancy in men from Cordoba and the third group of causes in Medellin and Campinas.

Among women, tumors were the first group of causes in 2004 in Cordoba and Medellin and the second one in Campinas. Circulatory system diseases were the main group of causes in Campinas and the second one in Cordoba and Medellin. The third cause among women was respiratory system diseases in Medellin and Campinas and Congenital anomalies in Cordoba.

In the analysis on the contribution of each group of causes to the life expectancy change between 1981 and 2004, it was noticed that men from Medellin gained 7.3 years of life expectancy; 3.1 due to external cause's changes; 2.9 due to changes in circulatory system diseases mortality and 0.7 years due tumor mortality changes. Women from Medellin gain 9.4 years of life expectancy between 1981 and 2004, 4.5 in mortality changes for circulatory system diseases; 1.3 due to tumors and 0.8 due to external causes.

The change in mortality patterns in Campinas allowed men to gain 5.8 years of life expectancy of which 3.3 were due to mortality change due to circulatory system diseases; 0.8 due to changes in tumors in respiratory system diseases and 0.7 years due to change in mortality of infectious and parasitic diseases. On the other hand, changes for deceases due to external causes between 1981 and 2004 caused the lost of 0.4 years of life expectancy to men from Campinas. Women of this city gain 6.1 years of life expectancy due to mortality changes: 3.5 due to changes in deceased people by circulatory system diseases; 0.5 years due to decreases in mortality due to infectious and parasitic diseases and 0.5 years due to decreases in diseases of perinatal period.

In Cordoba city, mortality changes between 1981 and 2004 allowed men to gain 2.7 years: 2.4 due to changes in mortality of circulatory system diseases; 0.5 due to perinatal diseases and 0.4 due to digestive system diseases. It is striking the quality deterioration that makes a loss of 0.9 years of life expectancy from Cordoba men possible because of ill-defined causes, besides 0.3 years of life expectancy were lost due to increases in the decease impact of respiratory system diseases. Women from this city of Argentina gain 4.3 years of life expectancy between 1981 and 2004, 3.9 of which were because of mortality changes in circulatory system diseases; 0.5 due to changes in the deceases of digestive system and 0.3 years of life expectancy due to changes in mortality on infectious and

parasitic diseases. As men, ill-defined deaths and respiratory system diseases took 0,6 y 04 years of life expectancy to women, respectively.

In general, there are gains of life expectancy in the three cities and in both genders. The biggest gains are present in cities.

It is important to highlight that by analyzing mortality evolution because of tumors in the analyzed periods through the use of "standardized" rates, it is possible to notice a major mortality concentration by tumors in the three cities. However, when analyzing the impact changes in the life expectancy due to this tumor mortality, these showed that such impact decreased, allowing a gain in life time for tumors in the three cities. Such gain was higher in the city of Medellin, over the years in women and almost a year in men.

As expressed above, cancer is a disease that generates due to alterations which result from interactions between genetic factors and external agents. These agents can be: physical (ultraviolet light and ionizing radiation); chemicals (asbestos, pesticides, cyanide, arsenic, and many more used in industries and mining) and biologic (Hepatitis B virus, human papillomavirus, *Helicobacter pylori, schistosoma*). Therefore, it is quite difficult to link demographically the individual factors with environmental ones, which can be studied in an individual medical plane without falling in the "ecological fallacy" or "aggregation bias" (LAST, 2008) defined as "*it happens because an observed association between variants in a added level, not necessarily represents the association that exits in the individual space*"

The neoplasia disintegration according to its anatomic location and the trends of each group, can be a guide in the deepening of future medical investigations on this pathologies morbility and its risk factors.

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ANNEX

Table 1: International Classification Codes of the ninth and tenth revision, of each neoplasia group used

Neoplasia Type	ICD-10	ICD-9
Digestive system malignant tumor	C00-C26; C45.1; C48	150-159
Respiratory system malignant tumor	C30-C39; C45.0; C45.2	160-165
Skin, bone and soft tissue malignant tumor.	C40; C41; C43-C47; C49 (Excepto C45.0; C45.1; C45.2)	170-173
Genitourinary System malignant tumor	C50-C58; C60-C58	174-175; 179-189
Lymphatic tissue malignant tumor of the hematopoietic organs	C81-C95; C96	200-208, 273.3
In situ tumor; benignant and other unknown	D00-D48	210-239; 273.1; 289.8
Remaining of two tumors	C69-C80; C97	190-199

Source ICD 9 and ICD 10. WHO

Tables 2 to 7: Contribution of each group of tumors and group of ages in the life expectancy change between 1980/1982 and 2003/2004, by gender, groups of age and Neoplasia groups. Men. Cordoba (Argentina), Campinas (Brasil) and Medellin (Colombia).

Table 2

Contribution of each group of tumors and group of ages in the life expectancy change between 1980/1982 and 2003/2004. Campinas Men						
Group of Ages	**Total**	0-19	20-39	40-59	60-79	80+
IN SITU BENIGN	**13**	4	3	5	1	0
DIGESTIVE	**65**	0	-3	33	37	-2
GENITOURINARY	**-24**	0	1	0	-9	-17
LYMPHATIC	**8**	7	5	4	-5	-2
SKIN AND BONES	**-5**	-3	-3	-5	5	0
RESPIRATORY	**9**	0	2	2	1	4
TUMORS REMAININGS	**-17**	-3	0	-4	-15	5
Tumors TOTAL	**49**	**5**	**5**	**35**	**15**	**-11**

Table 3

Contribution of each group of tumors and group of ages in the life expectancy change between 1980/1982 and 2003/2004. Cordoba Men

Group of Ages	**Total**	0-19	20-39	40-59	60-79	80+
IN SITU BENIGN	**-34**	-1	-2	-15	-13	-2
DIGESTIVE	**43**	-2	0	29	14	1
GENITOURINARY	**-9**	2	5	-6	0	-9
LYMPHATIC	**-3**	14	0	-3	-9	-4
SKIN AND BONES	**-11**	-1	0	-2	-4	-3
RESPIRATORY	**107**	2	6	54	41	5
TUMORS REMAININGS	**4**	4	0	6	-2	-5
Tumors TOTAL	**98**	**17**	**9**	**64**	**26**	**-18**

Table 4

Contribution of each group of tumors and group of ages in the life expectancy change between 1980/1982 and 2003/2004 . Medellin Men

Group of Ages	**Total**	0-19	20-39	40-59	60-79	80+
IN SITU BENIGN	**39**	2	6	20	10	1
DIGESTIVE	**142**	0	13	81	52	-4
GENITOURINARY	**-13**	0	0	-3	-6	-4
LYMPHATIC	**14**	5	2	10	0	-2
SKIN AND BONES	**9**	0	2	7	1	0
RESPIRATORY	**85**	-1	6	57	27	-4
TUMORS REMAININGS	**2**	1	6	2	-4	-4
Tumors TOTAL	**279**	**7**	**35**	**174**	**80**	**-17**

Table 5

Contribution of each group of tumors and group of ages in the life expectancy change between 1980/1982 and 2003/2004 .Campinas Women

Group of Ages	**Total**	0-19	20-39	40-59	60-79	80+
IN SITU BENIGN	**1**	4	1	-1	1	-3
DIGESTIVE	**90**	1	9	16	70	-5
GENITOURINARY	**9**	0	-5	18	-4	0
LYMPHATIC	**-11**	0	-3	-4	-7	3
SKIN AND BONES	**-10**	0	-1	-1	0	-9
RESPIRATORY	**-21**	-1	2	1	-20	-3
TUMORS REMAININGS	**2**	3	-1	3	0	-4
Tumors TOTAL	**61**	**7**	**2**	**32**	**41**	**-20**

Table 6

Contribution of each group of tumors and group of ages in the life expectancy change between 1980/1982 and 2003/2004. Cordoba Women						
Group of Ages	**Total**	0-19	20-39	40-59	60-79	80+
IN SITU BENIGN	**-27**	0	0	-11	-11	-4
DIGESTIVE	**112**	1	3	5	55	48
GENITOURINARY	**5**	1	12	24	-17	-15
LYMPHATIC	**-14**	5	-3	-8	-3	-6
SKIN AND BONES	**0**	-3	1	1	-1	3
RESPIRATORY	**-6**	-1	2	-8	-1	2
TUMORS REMAININGS	**19**	-4	6	-3	15	5
Tumors TOTAL	**89**	**-1**	**19**	**0**	**38**	**33**

Table 7

Contribution of each group of tumors and group of ages in the life expectancy change between 1980/1982 and 2003/2004. Medellin Women						
Group of Ages	**Total**	0-19	20-39	40-59	60-79	80+
IN SITU BENIGN	**46**	3	4	10	20	10
DIGESTIVE	**246**	0	3	67	121	55
GENITOURINARY	**120**	2	7	70	37	4
LYMPHATIC	**7**	4	-2	0	4	1
SKIN AND BONES	**5**	-1	2	2	3	0
RESPIRATORY	**42**	0	5	17	16	4
TUMORS REMAININGS	**23**	0	-1	9	14	2
Tumors TOTAL	**490**	**7**	**17**	**176**	**215**	**75**

Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health, National Bureau of Statistics and Health Information . Colombia. National Administrative Department of Statistics. Registers of deaths . Elaboration of our own: NEPO/UNICAMP, CEA/UNC, UDEA-CES.

Table 8: Mortality Rate due to tumors adjusted by age (per hundred thousand), by location and gender. Campinas (Brasil), Cordoba (Argentina) and Medellin (Colombia), periods 1980-82 and 2003-2005

TRIENNIUM	CITY	Digestive system malignant tumor	Respiratory system malignant tumor	Skin, bone, and soft tissue malignant tumor	Genitourinary system malignant tumor	lymphatic Tissue of the organs hematopoy malignant tumors	Tumor in situ; benign and others unknown	Remaings of Two Tumors	Other causes	Tumors Total	Deaths Total
MEN											
1980 to 1982	CORDOBA	37.89	36.41	2.40	15.92	9.06	0.62	7.95	535.78	110.25	646.03
	MEDELLIN	44.59	25.30	3.36	12.09	9.18	5.72	8.67	701.99	108.91	810.90
	CAMPINAS	41.32	19.34	2.69	10.28	8.72	1.71	8.04	694.79	92.10	786.89
2003 to 2005	CORDOBA	46.96	34.65	4.96	25.65	12.71	6.04	10.73	598.94	141.69	740.63
	MEDELLIN	42.88	26.10	3.40	20.17	10.97	1.86	12.30	525.94	117.69	643.63
	CAMPINAS	48.65	26.56	3.78	20.60	10.15	0.55	13.51	576.32	123.80	700.11
WOMEN											
1980 to 1982	CORDOBA	30.67	5.59	2.15	32.11	6.02	0.79	8.01	388.52	85.34	473.86
	MEDELLIN	47.73	15.12	2.47	29.98	7.27	5.63	10.01	464.37	118.22	582.60
	CAMPINAS	30.76	5.11	1.99	23.77	6.12	0.87	8.47	482.84	77.09	559.94
2003 to 2005	CORDOBA	37.14	9.91	3.04	48.61	10.19	4.46	9.89	456.44	123.24	579.68
	MEDELLIN	44.59	19.31	3.06	31.15	9.09	2.45	12.72	375.07	122.37	497.44
	CAMPINAS	33.43	10.54	3.39	33.20	9.17	1.57	11.41	417.03	102.70	519.73

Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health, National Bureau of Statistics and Health Information . Colombia. National Administrative Department of Statistics. Registers of deaths . Elaboration of our own: NEPO/UNICAMP, CEA/UNC, UDEA-CES

Table 9

Years of Life Lost by Group of Causes and Group of Ages. 1981 Under the null mortality assumption from 0 to 80 years old.	**Campinas**		Cordoba		Medellin	
	Men	Women	**Men**	Women	**Men**	Women
Certain infectious and parasitic diseases	**1.40**	0.93	0.67	0.47	1.02	0.69
Tumors [neoplasias]	**1.86**	1.57	2.34	1.80	2.18	2.39
Endocrine, nutritional y metabolic diseases	**0.59**	0.57	0.35	0.35	0.78	0.81
Circulatory system Diseases	**4.75**	3.06	4.69	2.62	4.04	3.47
Respiratory System Diseases	**1.81**	1.21	0.76	0.47	1.10	0.97
Digestive system Diseases	**0.87**	0.43	0.89	0.50	0.55	0.39
Genitourinary System Diseases	**0.26**	0.20	0.23	0.18	0.21	0.22
Pregnancy, childbirth and puerperium	**0.00**	0.03	0.00	0.08	0.00	0.08
Congenital Malformations, deformity and chromosomic anomaly	**0.34**	0.32	0.41	0.34	0.39	0.33
Certain affections originated in the perinatal period	**1.29**	0.96	1.12	0.71	1.20	0.92
Symptom, signs and clinic abnormal and laboratory findings and, NCOP	**0.29**	0.17	0.06	0.04	0.25	0.19
External causes for morbility and mortality	**2.74**	0.67	1.81	0.63	6.82	1.21
Other Causes	**0.45**	0.30	0.00	0.28	0.00	0.39
Total	**16.64**	10.41	13.31	8.47	18.53	12.04

Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health, National Bureau of Statistics and Health Information . Colombia. National Administrative Department of Statistics. Registers of deaths . Elaboration of our own: NEPO/UNICAMP, CEA/UNC, UDEA-CES

Table 10

Years of Life Lost by Group of Causes and Group of Ages. 2004 Under the null mortality assumption from 0 to 80 years old.	**Campinas**		Cordoba		Medellin	
	Men	Women	**Men**	Women	**Men**	Women
Certain infectious and parasitic diseases	**0.66**	0.36	0.38	0.19	0.49	0.20
Tumors [neoplasias]	**1.86**	1.50	2.13	1.77	1.77	1.75
Endocrine, nutritional y metabolic diseases	**0.24**	0.21	0.53	0.33	0.39	0.36
Circulatory system Diseases	**2.68**	1.73	2.73	1.33	2.13	1.30
Respiratory System Diseases	**0.92**	0.52	0.81	0.43	0.82	0.70
Digestive system Diseases	**0.74**	0.31	0.57	0.22	0.42	0.24
Genitourinary System Diseases	**0.14**	0.10	0.19	0.12	0.20	0.15
Pregnancy, childbirth and puerperium	**0.00**	0.01	0.00	0.02	0.00	0.03
Congenital Malformations, deformity and chromosomic anomaly	**0.58**	0.45	0.61	0.54	0.55	0.45
Certain affections originated in the perinatal period	**0.32**	0.24	0.40	0.37	0.25	0.22
Symptom, signs and clinic abnormal and laboratory findings and, NCOP	**0.23**	0.14	1.04	0.48	0.12	0.06
External causes for morbility and mortality	**3.38**	0.50	1.43	0.36	3.64	0.58
Other Causes	**0.37**	0.21	0.30	0.32	0.31	0.26
Total	**12.12**	6.29	11.12	6.49	11.12	6.31

Source: Brazil. Ministry of Health. Mortality Information System. Argentina. Ministry of Health, National Bureau of Statistics and Health Information . Colombia. National Administrative Department of Statistics. Registers of deaths . Elaboration of our own: NEPO/UNICAMP, CEA/UNC, UDEA-CES