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# The Compression of Unhappiness: estimating the happy life expectancy in Latin America

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## Introduction

One of the most important achievements of the society in the last centuries is the rapid increase in life expectancy at birth (Wilmoth, 2011). The debate today is whether those additional years of life are lived in good health. This paper contributes to this literature by estimating happy life expectancy from age 20 and above and the compression of unhappiness using self-perception of happiness as a measure of quality of life (Graham, 2008; Yang, 2008; Veenhoven, 1997).

In general, health related measures are used as indicators of well-being, but the results are affected by the definition of health proposed by the researchers and might be limited because they do not capture the effect of other domains in the individual's well-being. Happiness is considered one of the best indicators of quality of life (Graham, 2008; Veenhoven, 1997; Yang, 2008; Easterlin, 2003) and encompasses different aspects such as physical and mental health, economic conditions and employment, and their effect on the life of each individual.

We use data from the World Values Survey (1990s and 2000s) and life tables produced by the United Nations to estimate happy life expectancy for males and females in Argentina, Brazil, Chile and Mexico. The aim is to investigate whether the increase in longevity is followed by an increase in time lived with quality of life. We investigate the evolution of happy life expectancy and the compression of unhappiness for both males and females between the middle of 1990's and 2005/2006.

We follow the methodology generally used to estimate health life expectancy, the Sullivan method (Sanders, 1964; Jagger, 1999; Camargos, 2004; Camargos *et al*, 2006; Yang, 2008; Yang & Waliji, 2009) and make extensive use of the World Values Survey. Since the duration of life is divided in different parts of happy and unhappy states, Sullivan's method allows estimating the duration of life lived in the two different conditions.

## Literature Review

In the last decades, it was observed in Latin America a significant increase in life expectancy at birth (World Bank, 2011). For both males and females, life expectancy at birth increase by nearly 20 years in less than half a century (World Bank, 2011). However, at the same time that life expectancy increased, one can argue that the increase in life expectancy is not an indicator of better life. We find in the literature several arguments that life expectancy no longer a sufficient indicator of living conditions and health (Robine *et al*, 1999; Perenboom *et al*, 2002, Olshansky *et al*, 2001). Given this scenario, studies that tried to understand how the welfare of the population is related to the increase of life expectancy at birth became more common (Yang, 2008). Most of these studies used absence or presence of certain diseases and/or self-perceived health as indicator of quality of life (Camargos, 2004). However, this way of studying the well-being of the population is not complete as it does not cover other aspects of life that could also affect the quality of life (Bullinger *et al*, 1993; Yang, 2008).

The main hypothesis of this paper is based on the idea of Fries (1980), which associates the increase in longevity with the improvement of health conditions, considering both processes simultaneously. We expect to find a positive relationship between increasing life expectancy and improved quality of life in the population, which is measured by the change of years, lived happily in absolute and relative terms. Therefore, it is believed that if we observe an increase in happy life expectancy and an increase in the proportion of happy life expectancy, there is evidence that the quality of life has improved as longevity has also increased. In the U.S., Yang (2008) found evidence that compression of unhappiness occurred between 1970 and 2000. The compression of unhappiness can be characterized by an increase, over time, in the proportion of time lived with happiness. The process of compression of morbidity consists of a greater increase in age at first occurrence of a chronic disease than in life expectancy at birth, with a reduction in the proportion of time lived under this health condition (Olshansky *et al*, 1991).

Compression of mortality is the process characterized by a reduction in the variability of age at death (Fries, 1980; Myers & Manton, 1984; Wilmoth & Horiuchi, 1999; Gonzaga, 2008), which occurs when there is an increase in the average age at death as there is a reduction in the dispersion of deaths around this age (Fries, 1980; Myers & Manton, 1984; Wilmoth & Horiuchi, 1999; Edwards & Tuljapurkar, 2005; Gonzaga, 2008;). The Table 1 presents a comparison between the concepts of compression of morbidity, mortality and unhappiness, with the purpose of clarifying these definitions.

Table 1: Comparison of the processes of compression of mortality, morbidity and unhappiness on the definition, the variability of age and the average time lived under each condition

| Compression Process | Definition | Variability | Time |
|---|---|---|---|
| Mortality | Process of displacement of the deaths to adult ages and old ages (Wilmoth & Horiuchi, 1999; Edwards & Tuljapurkar, 2005; Gonzaga, 2008) | Reduction in the dispersion of the distribution of deaths by age | - |
| Morbidity | Process in which the age of first occurrence of symptoms of chronic diseases of aging increases more rapidly than life expectancy (Fries, 1980) | Concentration of the distribution of disability diseases on advanced ages | Reduction of the proportion of time lived with chronic diseases of aging |
| Unhappiness | Process in which the gain of the average numbers of years lived happily is greater than the gain in life expectancy (Yang, 2008) | - | Reduction of the proportion of time lived with unhappiness |

Source: Fries (1980), Wilmoth & Horiuchi (1999), Edwards & Tuljapurkar (2005), Gonzaga (2008) and Yang (2008).

Also in the Table 1, there is information about the variability of age at which the event (death and morbidity) occurs and about the average time lived under each condition (morbidity and unhappiness). When the process of compression of mortality occurs, we also observed a reduction in the dispersion of the distribution of deaths by age. Similarly, the process of compression of morbidity consists of a greater increase in age at first occurrence of a chronic disease than in life expectancy at birth, with a reduction in the proportion of time lived under this health condition. Finally, the process of compression of unhappiness can be characterized by a higher proportion of time lived happily.

Fries (1980) also argued that there would biological limits to human longevity with life expectancy at birth of approximately 85 years for both sexes. There would be a downward trend in mortality levels, thus generating the process of compression of mortality at later ages. For him, such a biological limit would be necessary for the process of compression of mortality to occur.

Olshansky *et al* (1990) and Olshansky *et al* (2001) suggested that it is unlikely that life expectancy at birth exceeds the biological limit suggested by Fries (1980). Wilmoth (1997) argued it was not possible to determine whether or not there is a biological limit to human life, but if it exists, there is evidence that humanity is far from reaching it. For Wilmoth & Horiuchi (1999), the compression of mortality may occur without a biological limit to human life. The authors stress the stability of the process of compression of mortality. Rothenberg *et al* (1991) suggested that the process would occur is the expansion of mortality, with an increase in the variability of age at death. In their turn, Myers & Manton (1984) tested the hypothesis of Fries (1980) with data from the elderly and concluded that his hypothesis does not hold, indicating an expansion of mortality

In addition to the hypothesis of compression of mortality, Fries (1980) suggested that the process of compression of morbidity and mortality would be simultaneous. Thus, an improvement in the health of the population would make the life expectancy approaching their biological limit and the incidence of disease would be concentrated in

the period near death. According to Fries (1980), the reduction of mortality and the consequent increase in life expectancy would be a result of improved population health and reduction of the diseases' incidence. Thus, the greater the life expectancy at birth, the greater the proportion of time would be lived in good health by population, suggesting that trends in healthy life expectancy would follow the same directions of trends in total life expectancy. On a survey conducted for the United States, Fries (2002) showed that the decline of the rates of disability was greater than the decline in mortality rates, which would confirm, in the case of the United States, the compression of morbidity hypothesis.

Contrary to Fries (2002), Gruenberg (1977), Olshansky *et al* (1991) and Kramer (1980) indicated that there was strong positive correlation between the increase in total life expectancy and the increasing prevalence of chronic and disabling diseases, since less people would die for the cause of certain diseases, but would continue participating in the group that had the disease, thus increasing the prevalence.

The use on demographic studies of subjective measures involving health information verified by the perception has grown in recent years (Ahmed, 2003; Alves & Rodrigues 2005, Camargos *et al*, 2006). Although there are criticisms related to the subjectivity of health measures (Andrade, 2002), it is considered reliable and valid (Martikainen *et al*, 1999; Bailis *et al*, 2003). Moreover, it is significantly associated with the current and real state of one's health (Appels *et al*, 1996). Graham (2008) identified health as one of the most important determinants of well-being, in general higher levels of well-being are associated with better health. On the other hand, the use of health data as a proxy for quality of life is limited, because the quality of life is a very general term, which involves not only health, but covers a wide range of everyday conditions that can affect the perceptions, feelings and behavior of the individual (Bullinger *et al*, 1993). The perception of happiness, a different measure of individual well-being, covers the impact of physical and mental health, income, family, public policy, among others, to the individual's life. According to Lyubomirsky (2008), self-awareness is the best way to measure happiness because the information provided by the own person is best quality, after all, just the individual itself is capable to assess whether or not happy. It is a powerful tool in the study of the welfare population and is considered one of the best indicators of quality of life of a population (Veenhoven, 1997; Yang, 2008; Graham, 2008).

While the measurement of happiness is more subjective, like self-perception, the concept of happiness is specific to each individual and suffers variations according to culture and period of analysis (Lyubomirsky, 2008). According to Graham (2008), there are differences in the definition of happiness across cultures, being fundamental for the robustness of study that they do not try to define what happiness is.

In this sense, studies based on happiness allow a better understanding of the quality of life, as well as the measurement of effects such as poverty and inequality or drug abuse, smoking and obesity on the well-being (Graham, 2008). Graham (2008) notes that, in the same way that GDP is important to estimate the economic growth of a country; happiness is a valuable tool for assessing the trend of well-being.

It is known that self-perception of happiness is influenced by personal assessment. It could be expected that under similar conditions, individuals might declare different

levels of happiness. Also, one might considered its relative position in the society different from other, even if they have the same absolute positive, what might implicate in his/her response. However, contrary to what may seem, this does not invalidate this paper, because there are also other measures of health that are also self-declared and are used and tested in different scenarios. According to Frey & Stutzer (2002), happiness and health when they are self-declared are highly correlated. The authors' explanation is that the influence of personality affects both the self-assessment of happiness and self-assessment of health.

It is important to know the principal limitations of self-perception of happiness. Veenhoven (1997) and Corbi & Menezes-Filho (2006) recognized that there are considerations when using the self-perception of happiness, since most people would not have an opinion about happiness. Veenhoven (1997) also showed that eighty percent of Americans think about their own happiness once a week, and the ratio of "non-response and" do not know "to be close to 1%. So even if people can not define what is happiness, there is evidence that most of them know if it's happy or not.

The main criticism of Veenhoven (1997) and Menezes-Filho & Corbi (2006) is that many people may confuse the real happiness with what other people think about their happiness. Consequently, poor people claim to be less happy than it really is due to the prejudice of society that relates high-income and happiness. However, an empirical study in the Netherlands contradicts this argument, since the group that had a higher prevalence of happiness was not that which had the highest level of education and income. In fact, there is a relationship between income and happiness, but the financial situation is not the only determinant of happiness. According to Veenhoven (1996), situations related to this aspect are not very common but can occur.

Hadley Cantril (1965) demonstrated that, however much each person has their own concept of happiness, the main determinants of happiness experienced by people are family, health, financial situation and employment. For literature, the main determinants of happiness are[2]: income, employment status, educational level, marital status, sex, race, health, age, political and economic freedom, among others.

[2] Income (Diener *et al*, 1985; Inglehart, 1990; Clark & Oswald, 1994; Oswald, 1997; Ingleman & Klingemann, 2000; Frey & Stutzer, 2000 e 2002; Gardner & Oswald, 2001; Corbi & Menezes-Filho, 2006), employment status (Blanchflower, 1996; Oswald, 1997; Winkelmann & Winkelmann, 1998; Wottiez & Theeuwes, 1998; Frey & Stutzer, 2000; Di Tella *et al,* 2003; Corbi & Menezes-Filho, 2006), educational level (Clark & Oswald, 1996; Frey & Stutzer, 2000 e 2005; Easterlin,2003; DiTella *et al*, 2003), marital status (Clark & Oswald, 1994; Oswald, 1997; Frey & Stutzer, 2000;Easterlin, 2003; Corbi & Menezes-Filho, 2006), sex (Oswald, 1997; Frey & Stutzer, 2000; Easterlin, 2001; Blanchflower & Oswald, 2004; Corbi & Menezes-Filho, 2006; Plagnol & Easterlin, 2008; Yang, 2008; Stevenson & Wolfers, 2009), race (Easterlin, 2001, Yang, 2008), health (Oswald, 1997; Frey & Stutzer, 2000 e 2002; Ostir *et al*, 2001; Di Tella *et al*, 2003; Steptoe *et al*, 2005; Bray & Gunnell, 2006; Blanchflower & Oswald, 2007), age (Oswald, 1997; Frey & Stutzer, 2000; Corbi & Menezes-Filho, 2006), economic and political freedom (Veenhoven, 2000; Frey & Stutzer, 2000; Corbi & Menezes-Filho, 2007).

## Data and Methods

This paper focuses on the adult population in Argentina, Brazil, Chile and Mexico in 1990's and 2000's, and in all analysis, we attempt to compare trends between males and females. The welfare indicator used is the self-perception of happiness. We make extensive use of data from the World Values Survey (WORLD VALUES SURVEY, 2009).

### The World Values Survey

The World Values Surveys have been created from the European Values Survey group (EVS) and began in 1981 (Inglehart, 2000). There are five waves available: 1981, 1990, 1995, 2000 and 2005 and the sixth wave, 2010-2012, is just being finalized. The WVS provides information about social, economic, political and cultural life on more than 80 countries around the world (Inglehart, 2000).

The database is the best source of information about happiness on international scale nowadays (Frey & Stutzer, 2001 and 2002; Inglehart, 2000) and have not been much explored in Latin America (Corbi & Menezes-Filho, 2006).

The Table 2 presents a brief summary for the waves and the sample size for the four countries. We choose two points on time for each country. For Argentina, 1995 and 2006; for Brazil, 1997 and 2006; for Chile, 1996 and 2006; and for Mexico 1996 and 2005. We did not choose the year 1990 because the Brazilian data for that year are inconsistent in the age variable. From now, we just work with these selected waves.

Table 2: Sample size and year of the survey (World Values Survey) for Argentina, Brazil, Chile and Mexico

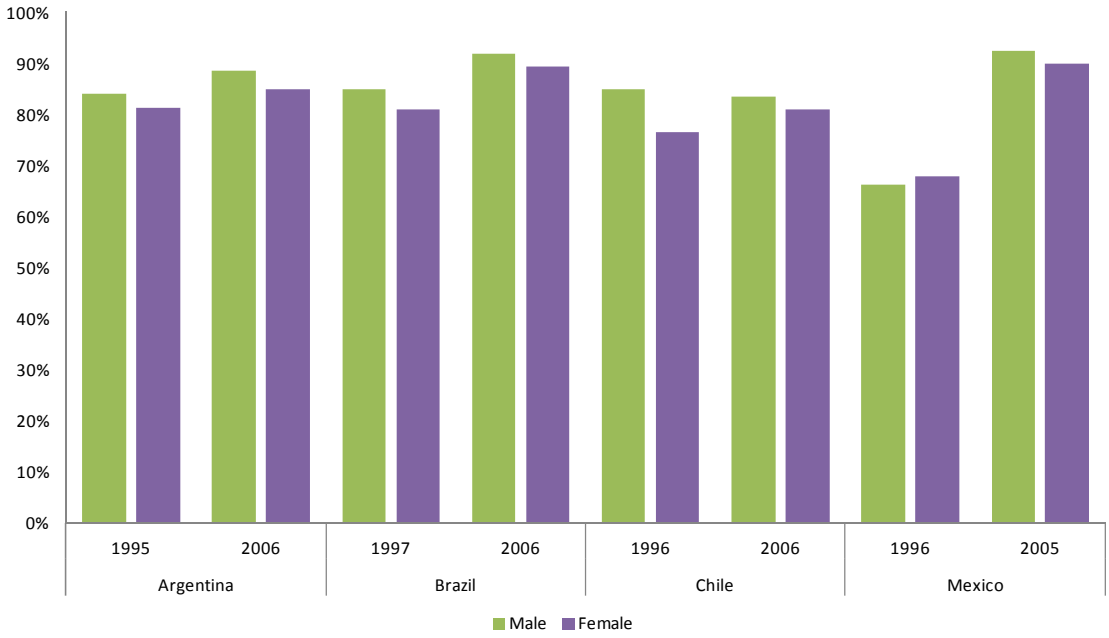
| Country | Year | Sample Size |
|---|---|---|
| Argentina | 1984 | 1005 |
| | 1991 | 1002 |
| | 1995 | 1079 |
| | 1999 | 1280 |
| | 2006 | 1002 |
| Brazil | 1990 | 1782 |
| | 1997 | 1149 |
| | 2006 | 1500 |
| Chile | 1990 | 1500 |
| | 1996 | 1000 |
| | 2000 | 1200 |
| | 2006 | 1000 |
| Mexico | 1981 | 1837 |
| | 1990 | 1531 |
| | 1996 | 2364 |
| | 2000 | 1535 |
| | 2005 | 1560 |

Source: World Values Survey (2012).

The Graph 1 presents the prevalence of happiness for men and women by year and country. We note that, in general, there is an increase in the prevalence of happiness over time for all countries. Except in the case of Chilean men, where there was

practically no variation, both men and women had increased their prevalence of happiness. We also noticed a substantial change in level of happiness of Mexico, which was about 60% in 1996 and went to 90% and 92% in 2005.

Graph 1: Prevalence of happiness in Argentina, Brazil, Chile and Mexico by year and sex




Source: World Values Survey (2012).

To estimate happy life expectancy, which is the average number of years lived happily from each exact age, we applied the Sullivan method. The method consists of an operation that modifies the conventional life table, by combining information on mortality (Jagger, 1999; Yang & Waliji, 2009) and health status, in our case the state of happiness. We used the life tables produced by the United Nations, which is more detailed below.

**Life Tables**

The life tables produced by the United Nations are five-year life tables, and we use two intervals at this paper: 1995-2000 and 2005-2010. The life expectancies at birth, at age 20 and at age 60 for Argentina, Brazil, Chile and Mexico for both periods by sex are on the Table 3.

This index provides an idea about the level of mortality in each country and how was the progress of the mortality. We noted that the Chilean women were those who had higher life expectancy at birth in both periods, and the Brazilian men were the ones with lower life expectancy at birth in both periods, although a higher growth. The difference between women and men is clear, and we noted an increase over time. The life expectancy of women is higher than that of men, and over time, this difference becomes larger.

Table 3: Life expectancies at birth, at age 20 and at age 60 for Argentina, Brazil, Chile and Mexico for 1995-2000 and 2005-2010 by sex

| Country | Five-Year Period | Sex | $e_0$ | $e_{20}$ | $e_{60}$ |
|---|---|---|---|---|---|
| Argentina | 1995-2000 | Male | 69,65 | 52,02 | 17,34 |
| | | Female | 76,95 | 58,96 | 22,09 |
| | 2005-2010 | Male | 71,56 | 53,22 | 18,17 |
| | | Female | 79,06 | 60,41 | 23,26 |
| Brazil | 1995-2000 | Male | 65,69 | 49,79 | 18,38 |
| | | Female | 73,33 | 56,54 | 21,15 |
| | 2005-2010 | Male | 68,85 | 51,91 | 19,50 |
| | | Female | 76,1 | 58,42 | 22,53 |
| Chile | 1995-2000 | Male | 72,75 | 54,31 | 19,06 |
| | | Female | 78,78 | 60,00 | 22,66 |
| | 2005-2010 | Male | 75,49 | 56,58 | 20,71 |
| | | Female | 81,53 | 62,36 | 24,52 |
| Mexico | 1995-2000 | Male | 71,26 | 54,51 | 20,23 |
| | | Female | 76,07 | 58,72 | 21,91 |
| | 2005-2010 | Male | 73,74 | 55,95 | 20,96 |
| | | Female | 78,61 | 60,30 | 23,03 |

Source: United Nations (2012).

## The Sullivan Method

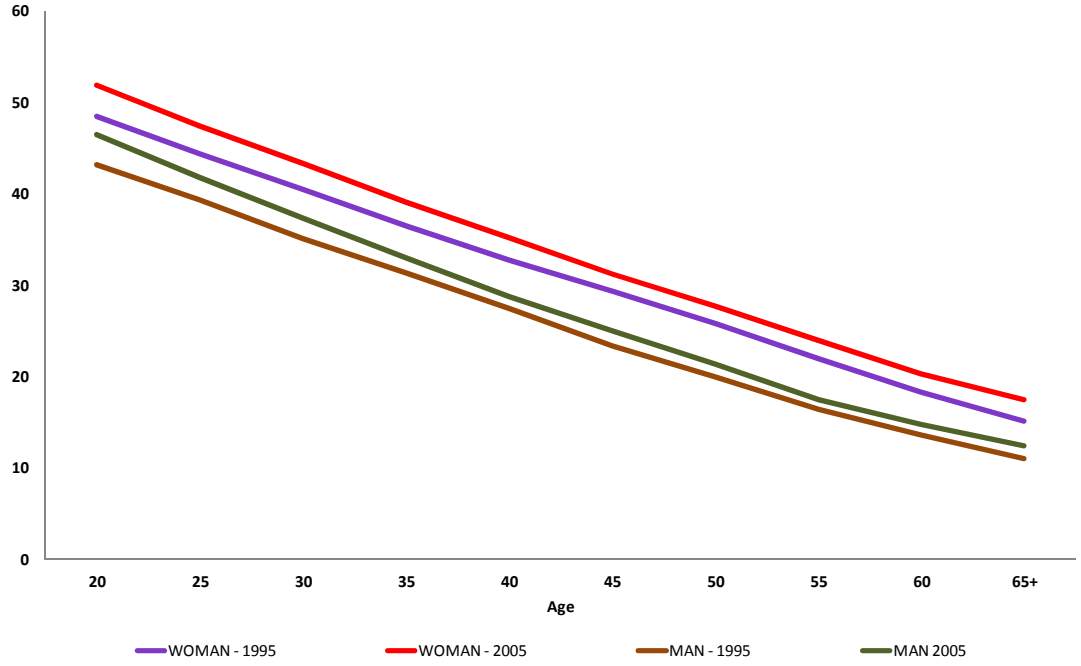
The Sullivan method makes a simple modification in the traditional life table and estimates the time lived by an average member of the population under a certain health condition (Sullivan, 1971; Yang, 2008). This method is advantageous because it is simple and easy to interpret (Jagger, 1999). In addition, if it is not observed large variations in prevalence and mortality over time, the estimates found are similar to those obtained when using longitudinal data (Mathers & Robine, 1997). The technique is the most used in calculation of healthy life expectancy and makes use of current data on the prevalence of specific health status (Portrait *et al*, 2001; Robine *et al*, 1999; Manton & Land, 2000; Jagger, 1999; Mathers & Robine, 1997). In this paper, we use the prevalence of happiness following work done previously by Perenboom *et al* (2002), Yang (2008) and Yang & Waliji (2009). We believe that the results are robust and consistent, even thought we have to assume that the prevalence observed in the period is valid for cohorts (Mathers & Robine, 1997; Jagger, 1999).

We consider the compression of unhappiness as a reduction in the relative time lived in an unhappy state. It is important to clarify that, depending on the nature of the data, when there is reference to the compression or expansion of happiness, there are not being evaluated if there was a decrease / increase on the variability of age at which events occur (Wilmoth and Horiuchi, 1999), but if there are being changes on the relative time lived under such conditions. The investigation of the occurrence of compression of unhappiness depends on analysis of variation in the proportion of happy life expectancy in relation to total life expectancy. In order to determine whether, in the recent demographic context, people would be living a better quality of life, our interest is to observe whether there is a compression of unhappiness.

## Results

We applied the Sullivan Method and we used data from World Values Survey and the United Nations to obtain happy and unhappy life expectancy. Graph 2 shows happy life expectancy at all ages for males and females for Argentina. Based on this result we noted that in 1995[3] and in 2005[4], happy life expectancy of women is higher than happy life expectancy of men at all ages. This difference does not seem to have a significant increase over time neither across the ages. Happy life expectancy of women in 1995 is higher than happy life expectancy of men in 2005 at all ages.

Graph 2: Happy Life Expectancy by Age and Sex. Argentina, 1995 and 2005



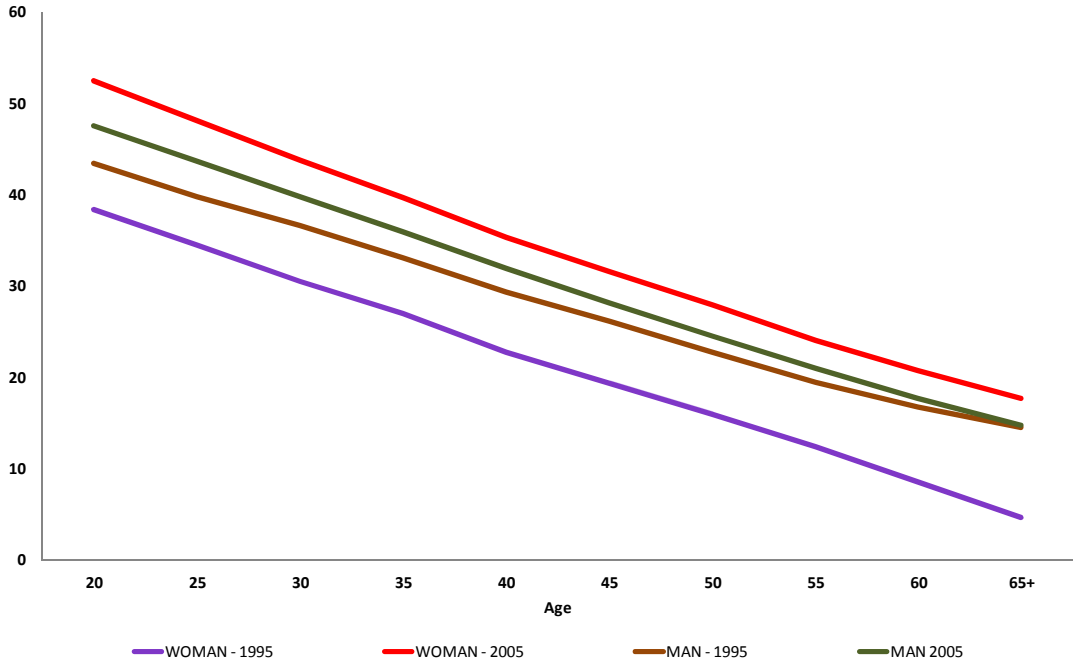

Source: World Values Survey (2012), UN (2012).

Graph 3 shows happy life expectancy at all ages for males and females for Brazil. In this case, from 1995 to 2005 we can see a larger increase in happy life expectancy of women than in happy life expectancy of men. In 1995, men had higher happy life expectancy than women at all ages. The prevalence of happiness probably explains it, because the total life expectancy of women is higher than the total life expectancy of men at all ages in 1995 and in 2005. In 2005, happy life expectancy of men is lower than happy life expectancy of women at all ages.

[3] When we say that the year is 1995, we mean that the mortality is the observed between 1995 and 2000; and the prevalence of happiness is the prevalence observed in 1995 in Argentina, in 1996 in Chile and Mexico and in 1997 in Brazil.

[4] When we say that the year is 2005, we mean that the mortality is the observed between 2005 and 2010; and the prevalence of happiness is the prevalence observed in 2006 in Argentina, Brazil and Chile and in 2005 in Mexico.

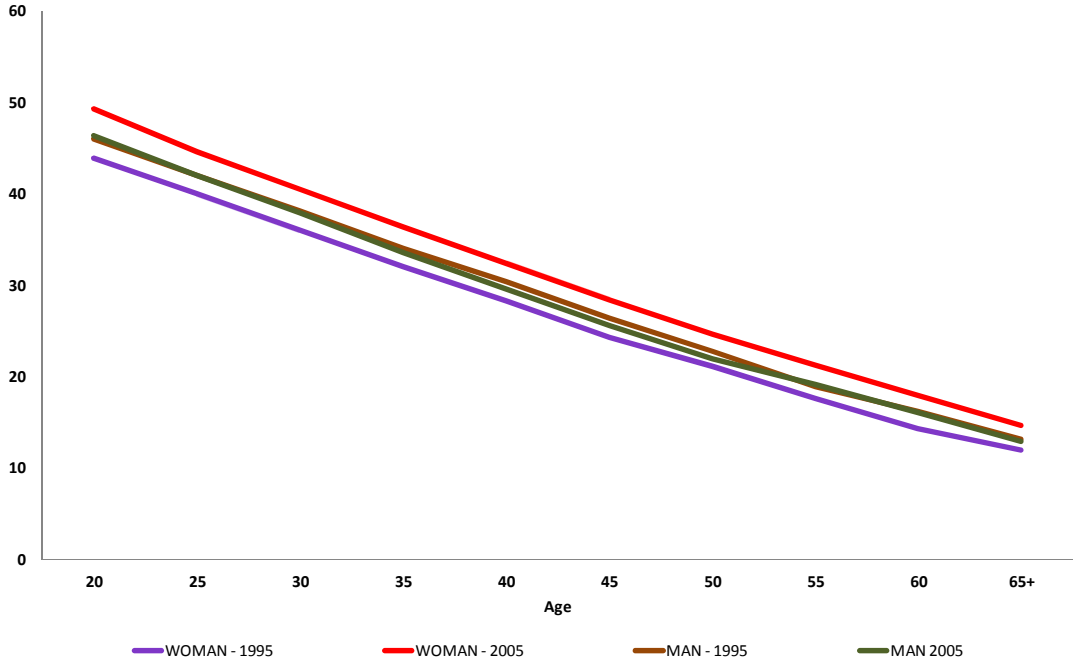
Graph 3: Happy Life Expectancy by Age and Sex. Brazil, 1995 and 2005




Source: World Values Survey (2012), UN (2012).

Graph 4 shows happy life expectancy at all ages for males and females for Chile. For Chilean men we couldn't note a significant variation over time and for women, there was an increase in happy life expectancy at all ages. This increase was higher than in Argentina and lower than in Brazil.

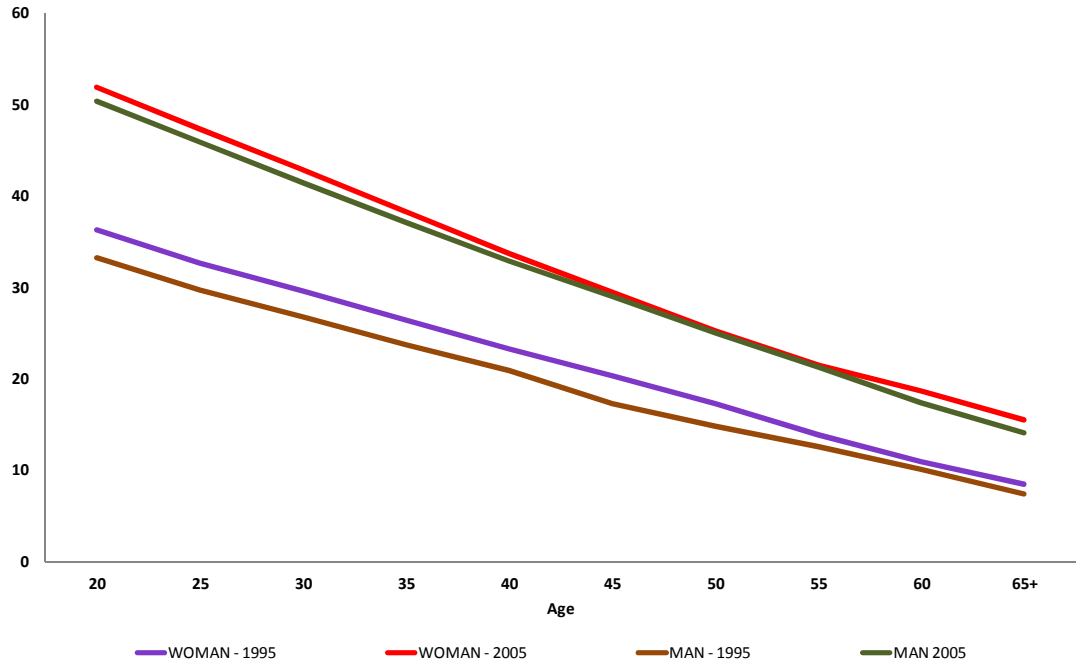
Graph 4: Happy Life Expectancy by Age and Sex. Chile, 1995 and 2005




Source: World Values Survey (2012), UN (2012).

Graph 5 shows happy life expectancy at all ages for males and females for Mexico. For this country, the increase of happy life expectancy of men is larger than the increase of happy life expectancy of women at almost all ages, except at 60 and at 65. The values for men are lower than the values for women. The four countries have gained happy years of life at all ages. The complete tables, with happy and unhappy life expectancy for all countries by sex are on the Annex.

Graph 5: Happy Life Expectancy by Age and Sex. Mexico, 1995 and 2005




Source: World Values Survey (2012), UN (2012).

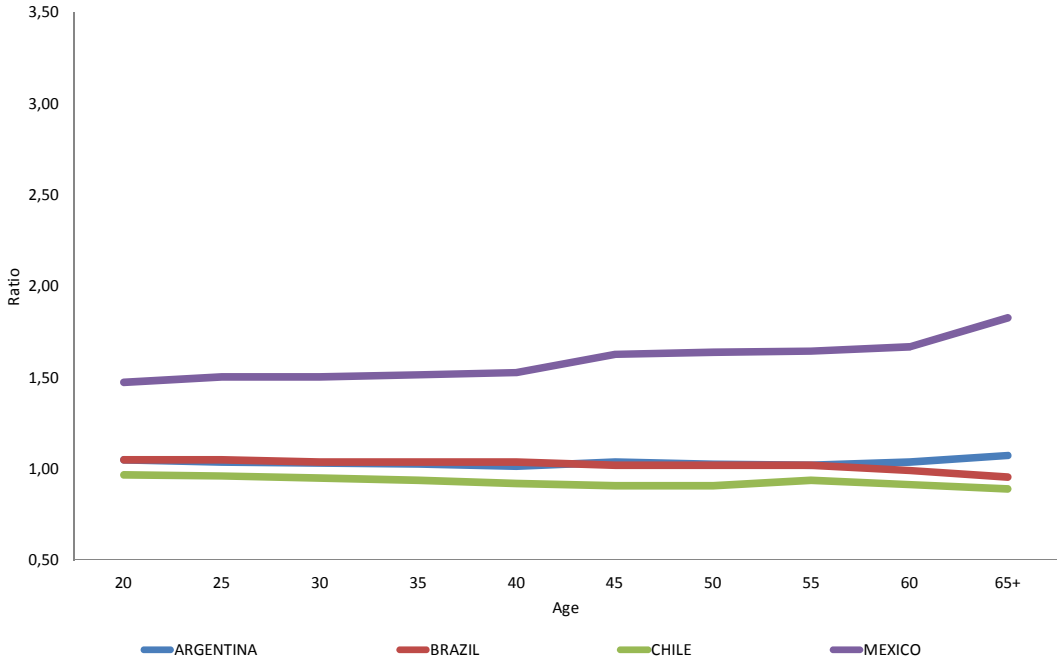
What we see is that there was an increase in years lived with happiness. Furthermore, the known increase in total life expectancy. The way we propose to examine whether there is a compression of unhappiness is by analyzing the ratio of the proportion of time of life spent with happiness in 1995 and in 2005. The ratio of the proportion of happy life expectancy captures the variation in the proportion of time to be lived happily.

When the gain of years lived with happiness is higher than the gain of life expectancy, we observe the process of compression of unhappiness (Yang, 2008). The utility of analyzing these ratios is in its interpretation. We present these ratios related to happiness in Graph 6, below, for males for the four countries. When its value is above one (1), the ratio shows there was a gain in proportion to the average number of years lived happily between 1995 and 2005.

It happened for men from Argentina and Mexico at all ages. These results are very important, since they provide information that can suggest the occurrence of the process of compression of unhappiness for men in Argentina and Mexico between 1995 and 2005. In Brazil, the ratio is over one at all ages, except at ages 60 (the ratio is 0.99) and 65 (the ratio is 0.95). The compression of unhappiness is not probably occurring for the Chilean men, because the ratios at all ages are below one (1). It

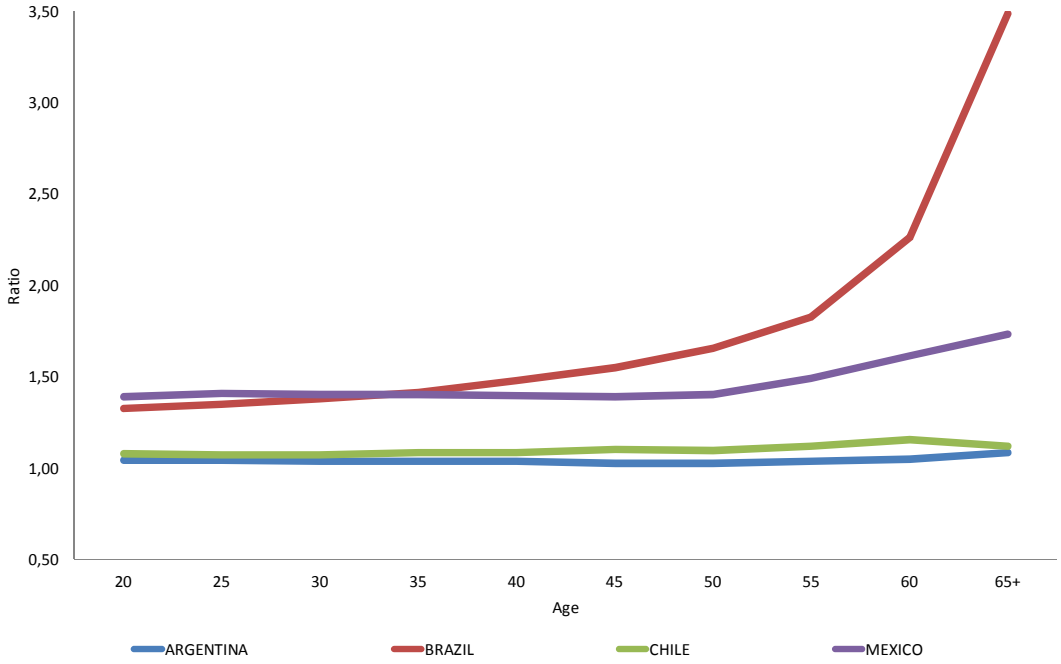
suggests an increase in proportion of time lived with unhappiness between 1995 and 2005 by them.

Graph 6: Ratio of the Proportion of the Expected Year Lived with Happiness for males in Argentina, Brazil, Chile and Mexico. 1995 and 2005 $(\frac{e_x^{happy,2006}}{e_x^{happy,1997}})$




Source: World Values Survey (2012) and UN (2012)

Graph 7: Ratio of the Proportion of the Expected Year Lived with Happiness for females in Argentina, Brazil, Chile and Mexico. 1995 and 2005 $(\frac{e_x^{happy,2006}}{e_x^{happy,1997}})$




Source: World Values Survey (2012) and UN (2012)

The ratios related to women are in Graph 7 for the four countries. Again, when its value is above one (1), the ratio shows there was a gain in proportion to the average number of years lived happily between 1995 and 2005.

We noted that at all ages and for all countries the ratios are above one (1). This also indicates a possible occurrence of the process of compression of unhappiness for women in Argentina, Brazil, Chile and Mexico between 1995 and 2005.

We noted the possible occurrence of the process of compression of unhappiness for women of Argentina, Brazil, Chile and Mexico and for men of Argentina and Mexico between 1995 and 2005. Yang (2008) also found the occurrence of the process of compression of unhappiness in the US between 1970 and 2000. It means that these people are living longer and the proportion of the years lived with happiness is larger over time.

## Conclusions and Limitations

We conclude that we have strong evidences that the process of compression of unhappiness happened for women of Argentina, Brazil, Chile and Mexico and for men of Argentina and Mexico between 1995 and 2005. There is evidence that the quality of life has improved as longevity has also increased.

Although, it is important to highlight that we assumed happiness as a good measure of quality of life and that we do not have strong bias at this index. Another possible limitation of this paper is that the data from World Values Survey only contain information about literate people. In Latin America, the illiteracy rate is not insignificant and is correlated to economic situation. Then, probably, the sample from World Values Survey may have a lower mortality, that is, the mortality may be overestimated for this sample.

However, even with limitations, it is worth noting the relevance of the results of this work, which is part of the discussion on quality and longevity of life and contributes to a better understanding of trends in well-being in Latin America.

This way of analyzing trends in happiness can help us understand trends and gender differentials in quality of life, since the compression process of interpretation of unhappiness is simple and is related to the study of morbidity.

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## Annex

Table I: Happy and Unhappy Life Expectancy by Age and Sex. Argentina, Brazil, Chile and Mexico, 1995

| x | MALE | | | | | | | | FEMALE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ARGENTINA | | BRAZIL | | CHILE | | MEXICO | | ARGENTINA | | BRAZIL | | CHILE | | MEXICO | |
| | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy |
| **20** | 43,3 | 8,8 | 43,4 | 6,4 | 46,0 | 8,3 | 33,2 | 21,3 | 48,5 | 10,4 | 38,4 | 18,2 | 43,9 | 16,1 | 36,3 | 22,4 |
| **25** | 39,4 | 8,0 | 39,8 | 5,7 | 42,0 | 7,7 | 29,7 | 20,2 | 44,4 | 9,7 | 34,5 | 17,3 | 40,0 | 15,1 | 32,7 | 21,2 |
| **30** | 35,1 | 7,6 | 36,6 | 4,8 | 38,1 | 6,9 | 26,8 | 18,7 | 40,5 | 8,8 | 30,6 | 16,5 | 36,0 | 14,2 | 29,6 | 19,4 |
| **35** | 31,3 | 6,8 | 33,1 | 4,2 | 34,1 | 6,4 | 23,8 | 17,2 | 36,5 | 8,0 | 27,0 | 15,4 | 32,1 | 13,4 | 26,4 | 17,9 |
| **40** | 27,5 | 6,2 | 29,3 | 3,8 | 30,4 | 5,5 | 20,9 | 15,8 | 32,8 | 7,0 | 22,8 | 15,0 | 28,3 | 12,3 | 23,3 | 16,3 |
| **45** | 23,4 | 5,9 | 26,2 | 2,9 | 26,5 | 5,0 | 17,3 | 15,0 | 29,3 | 5,8 | 19,4 | 14,0 | 24,3 | 11,6 | 20,4 | 14,5 |
| **50** | 20,0 | 5,0 | 22,7 | 2,6 | 22,7 | 4,3 | 14,8 | 13,3 | 25,9 | 4,8 | 16,0 | 13,1 | 21,1 | 10,2 | 17,2 | 13,2 |
| **55** | 16,4 | 4,6 | 19,5 | 2,2 | 19,0 | 4,0 | 12,5 | 11,5 | 22,0 | 4,3 | 12,5 | 12,6 | 17,6 | 9,3 | 13,8 | 12,2 |
| **60** | 13,6 | 3,7 | 16,8 | 1,6 | 16,2 | 2,9 | 10,1 | 10,2 | 18,4 | 3,7 | 8,6 | 12,5 | 14,4 | 8,3 | 11,0 | 11,0 |
| **65+** | 11,1 | 3,0 | 14,5 | 0,8 | 13,1 | 2,4 | 7,4 | 9,2 | 15,2 | 3,0 | 4,7 | 12,8 | 12,0 | 6,7 | 8,5 | 9,6 |

Source: United Nations (2012) and WVS (2012).

Table II: Happy and Unhappy Life Expectancy by Age and Sex. Argentina, Brazil, Chile and Mexico, 2005

| x | MALE | | | | | | | | FEMALE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ARGENTINA | | BRAZIL | | CHILE | | MEXICO | | ARGENTINA | | BRAZIL | | CHILE | | MEXICO | |
| | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy | $e_x$ Happy | $e_x$ Unhappy |
| **20** | 46,5 | 6,8 | 47,6 | 4,4 | 46,3 | 10,2 | 50,4 | 5,6 | 51,9 | 8,5 | 52,5 | 5,9 | 49,3 | 13,1 | 51,9 | 8,4 |
| **25** | 41,8 | 6,7 | 43,6 | 3,9 | 42,1 | 9,8 | 45,9 | 5,4 | 47,5 | 8,1 | 48,2 | 5,4 | 44,7 | 12,8 | 47,3 | 8,1 |
| **30** | 37,3 | 6,6 | 39,8 | 3,5 | 38,0 | 9,2 | 41,5 | 5,2 | 43,3 | 7,4 | 43,8 | 5,0 | 40,5 | 12,0 | 42,8 | 7,7 |
| **35** | 33,0 | 6,3 | 35,9 | 3,1 | 33,6 | 8,9 | 37,1 | 5,1 | 39,1 | 6,8 | 39,7 | 4,5 | 36,5 | 11,2 | 38,3 | 7,4 |
| **40** | 28,8 | 5,9 | 31,9 | 2,9 | 29,6 | 8,3 | 32,8 | 4,9 | 35,2 | 6,0 | 35,4 | 4,2 | 32,4 | 10,4 | 33,8 | 7,2 |
| **45** | 25,1 | 5,2 | 28,2 | 2,5 | 25,6 | 7,8 | 29,0 | 4,3 | 31,3 | 5,2 | 31,6 | 3,5 | 28,4 | 9,6 | 29,5 | 6,8 |
| **50** | 21,3 | 4,6 | 24,6 | 2,2 | 22,0 | 6,9 | 25,0 | 4,0 | 27,7 | 4,2 | 27,9 | 2,8 | 24,7 | 8,7 | 25,2 | 6,5 |
| **55** | 17,5 | 4,4 | 21,1 | 1,9 | 19,1 | 5,6 | 21,3 | 3,6 | 23,9 | 3,6 | 24,1 | 2,4 | 21,2 | 7,7 | 21,5 | 5,7 |
| **60** | 14,8 | 3,4 | 17,7 | 1,8 | 16,1 | 4,6 | 17,4 | 3,6 | 20,4 | 2,9 | 20,8 | 1,8 | 18,0 | 6,5 | 18,6 | 4,4 |
| **65+** | 12,5 | 2,3 | 14,8 | 1,5 | 12,9 | 4,2 | 14,1 | 3,2 | 17,5 | 1,7 | 17,7 | 1,1 | 14,7 | 5,7 | 15,5 | 3,6 |

Source: United Nations (2012) and WVS (2012).