Positive Attitude and Wellbeing: A Life Cycle Analysis of Individual's Healthy and Happy Life Expectancy for Brazil and Mexico

Gilvan R. Guedes

Dept. of Demography & Cedeplar – Universidade Federal de Minas Gerais

Cristina G. Rodrigues

Dept. of Accounting and Actuary - Universidade de São Paulo

Luisa P. Terra

Dept. of Actuary – Universidade Federal de Alfenas

Draft Version
Comments welcome

XXVII IUSSP International Population Conference 2013
Busan, Republic of Korea

Positive Attitude and Wellbeing: A Life Cycle Analysis of Individual's Healthy and Happy Life Expectancy for Brazil and Mexico

Abstract

This article investigates the relationship between positive attitude and the remaining time lived healthily and happily over individual's life cycle. Building on principles derived from theories of reasoned action and subjective norms coupled with the multidimensional concept of attitude from Cacioppo & Berntson (1994), we estimate an empirical measure of multidimensional attitude based on three levels of perception: the self, the relations to social networks, and the surrounding environment. Our empirical measure of multidimensional attitude (approached by means of latent class models) is then used to evaluate differences in healthy (HLE) and happy life expectancy (GLE) over the individual's life cycle (estimated by the Sullivan Method) according to the degree of one's positive attitude. At last, using estimations of HLE and GLE in two different points in time, we decompose the observed change in indicators into prevalence and mortality effects. These decompositions may illuminate some trends in wellbeing compression for recent years. Based on representative samples of individuals aged 18-84 years for Brazil and Mexico, we find descriptive evidence that positive attitude is associated with HLE and GLE for both countries, although the association is not linear over individual's life cycle for health. The association between attitude and HLE/GLE is consistently higher in Brazil. Although Brazilians live a higher proportion of the remaining years happier and healthier than Mexicans, regardless of age, the gap is closing over time. Our findings suggest that initiatives to promote individual optimism may increase general wellbeing in the population, including health status, which is likely to reduce demand for health services and alleviate budget requests.

Introduction

Happiness has recently gained scientific attention in Economics, Demography, and other disciplines of Social Sciences as a proxy for quality of life (Graham & Pettinatto, 2002; Easterlin, 2006; Margolis & Myrskyla, 2011). The growing number of studies was possible due to the availability of survey data on happiness for a large number of contexts. This is the case of the World Values Survey (WVS), which allows empirical researchers to show the importance of this multidimensional concept to individuals' wellbeing.

Happiness is a very general and broad concept, representing a general life state, often not directly related to specific material conditions and social structures, such as family relations or insertion on the job market. According to Bradburn (1969), happiness is the degree by which positive feelings overcome the negative ones. Thus, measurement of this net balance is usually done by the evaluation of scores based on individual's responses about life satisfaction, positive and negative affection, and levels of depression. The General Wellbeing Schedule (Fazio, 1977), the Affectometer 2 (Kamman & Flett, 1983), the PANAS (Watson & Klark, 1991), and the Depression-Happiness Scale (Joseph & Lewis, 1998) are among the most well known methods to empirically approach happiness.

Since the understanding and collective evaluation of happiness may differ across societies, Graham (2008) suggests that the best way to assure cross-contextual comparability is try not to impose a precise definition to the meaning of being happy. According to this approach, happiness must be a socially and culturally constructed concept. Regardless of cultural specificities, the empirical literature on self-reported happiness points to its link to the quality of family values and norms, including quality of unions (Dush et al., 2008), health status, financial and job security, as well as educational level, civil status, sex and race (Cantril, 1995).

When we look to health and happiness at the population level, results show that positive affections are related to lower rates of mortality in different populations (Pressman & Cohen, 2005), as well as to lower rates of suicide and depression (Di Tella et al, 2003; Bray & Gunnell, 2006; Ostir et al, 2001) and to cardio diseases (Ostir et al, 2001; Blanchflower & Oswald, 2007). At the same time, there is empirical support to the high correlation between self-reported health and happiness (Frei & Stutzer, 2002). Therefore, the literature on health and happiness points to measures of happiness as a population-level indicator of mental health, representing an interesting alternative to traditional indices based on psychological disturbances, which highlight that negative dimension of health (Bray & Gunnel, 2006).

In Brazil, a recent study using data from WVS found that men are more likely to be happy than women (Corbi e Menezes-Filho, 2006). Although there is no time series on happiness for the country, evidence from the United States suggest that the sexual gap in happiness is reducing over time (Easterlin, 2001b). Looking from a life cycle perspective, women declare to be happier than men in the early adult life, with a reserve trend for later stages of the life cycle (Marcelli & Easterlin, 2007 *apud* Plagnol & Easterlin, 2008). According to the authors, this age-dependent sex gap may be due to the different aspirations on wealth and family by sex. On average, women give more weight to the consolidation of a family, which usually takes place in the early ages of adulthood, while men prefer to accumulate wealth, which is a positive function of age.

If we look at the age pattern of happiness, regression-based estimates suggest a U-shape curve, regardless of data used (Blanchflower & Oswald, 2008). In general, the lowest point in the curve occurs for the middle aged, likely reflecting competing tasks, aspirations, and realizations (Clark & Oswald, 1994; Gerlach & Stephan, 1996; Winkelmann & Winkelmann, 1998; DiTella et al, 2001 e 2003). In Brazil, the lowest level of happiness observed was among individuals aged 53-54 (Corbi & Menezes-Filho, 2006), compared to the unhappiest aged 30 to 40 among Americans and the British (Frey & Stutzer, 2000).

Most demographic studies focus on determinants of health and happiness, but none of them, as far as we know, addresses the relation between attitude and healthy life in developing countries. Building on theories of longevity and social psychology, this study is an effort to bring empirical evidence on how happy and healthy life expectancy may be selective on age and attitude in developing countries.

Attitude, Behavior, and Outcomes

Social psychological models of behavior, such as reasoned action and planed action models, predict that actions are taken due to the influence of perceived behavioral control, social norms, and attitude on willingness to behave, which in turn affects future action (Ajzen and Driver, 1991; Ajzen and Fishbein, 1980). At the same time, outcomes are the result of a combination of actions (behaviors) and other individual and contextual factors (Cacioppo and Hawkley, 2003). These models are represented by means of the following relational functions:

$$O_i \approx f\left(B_o; Z_i; Z\right) \qquad (1)$$

$$B_o \approx f\left(I_B; PBC\right) \qquad (2)$$

$$I_B \approx f\left(A_{B_{w1}}; SN_{B_{w2}}; PBC\right) \qquad \text{(3)}$$

where O_i stands for the outcome for individual i as a function of action (behavior) (B_O), individual (Z_i) and contextual (Z) factors. Action B_O, in turn, is influenced by the intention (I_B) to perform B and by the perceived control over action B. At last, intention I_B is affected by the evaluation of taking action B (A_B), social norms (SN_B) regulating the actions and the perceived control over it.

Albarracin et al. (2001), for example, find that intention to use condom is significantly related to one's perceived control over use in the 96 study cases reviewed by means of meta-analysis procedures. Authors find that, contrary to the theory prediction, some direct attitudes and perceived behavioral control do not affect actual behavior. The lack of direct influence of attitude and perceived control on behavior is suggestive of the non-trivial relationship between attitude and behavior proposed by some authors (Cacioppo et al., 1997). That is, regardless of the influence exerted by social norms and the ability to control the behavior, action is influenced by the way different evaluation of behavior has on transforming intention to actual behavior (Cacioppo & Berntson, 1994).

Empirical relationship between attitude, behavior, and outcomes abound in the literature. Perception and evaluation about life experience and purpose are found to be associated with healthy behavior and decreased frequency of medical symptoms (Kass et al., 1991) as well as with higher proportion of good/excellent health status being reported (Idler et al., 1999). Danner et al. (2001) also find a positive association between positive emotional evaluation in early stages of life cycle and higher life expectancy in later life stages. Posadski et al. (2010) report that the stronger the sense of coherence, level of optimism, and self-efficacy, the higher the levels of health indicators among younger adults, validating the construct of positive health attitude.

The importance of attitude for social psychology and the social sciences in general is widely recognized in the literature (Norris et al., 2010; Greenwald & Banaji, 1995) because, among other reasons, 'attitudes (a) are a pervasive aspect of mental and social life, (b) influence a wide range of decisions and behaviors, (c) act as a summary statistic for knowledge about and reactions to stimuli, and (d) reduce the effort or stress of decision making' (Cacioppo et al., 1997: 4).

Defining Attitude

Attitude has been traditionally defined as the degree to which one has a positive versus negative evaluation of the behavior measured by bipolar semantic differential scales (Fishbein et al., 1992), making the bipolar rating scale the matter of choice (Larsen et al., 2003). Other authors define attitude slightly different, focusing on evaluation of a target instead of evaluation of the behavior itself. Although considered less instrumental for direct measures of behavior (Eagly & Chaiken, 1993), definitions of attitude toward objects/targets have the advantage to predict indirect behaviors.

This definition is important when approaching attitude as a driver of outcomes (for example, health status, healthy life expectancy) mediated by non-observable behaviors (such as visits to doctors, higher levels of social integration, participation in peer-related activities, active involvement in community needs). In this study we take attitude as a multidimensional phenomenon, involving perception and complex evaluative processes in different spheres of influence. This broader definition differs from the concept of attitude as the degree to which one has a positive versus negative evaluation of the behavior measured by bipolar semantic differential scales (Eagly & Chaiken, 1993), but rather considers that it must be viewed as a continuum of evaluative processes (Cacioppo & Berntson, 1994).

In addition to approaching attitude as a result of reciprocal interactions between positive and negative evaluations, it is important to know in what circumstances these two extreme states are reciprocally activated in order to come up with a potential behavior (and outcome). These circumstances regard the plurality of spheres where a person develops her experiences: the self, her social networks, and her surrounding environment (Norris et al., 2010; Larsen et al., 2009). These spheres are an active part of her identity and directly shape the way she evaluates how to behave. Therefore, as suggested by recent findings in behavioral psychology, positive and negative attitudes coexist in different dimensions and affect the way people plan their actions and experience the outcome of their actual behavior (Cacioppo & Hawkley, 2003).

Determining the conditions for processes activation is not trivial but evidences start to emerge, suggesting that the way we evaluate situations and processes depend not only on our perception of the event but also on social norms mediating it (Berntson & Cacioppo, 2008). Ankler et al. (2010), for instance, discuss that the ability of attitudes to predict stable behavioral patterns largely depends on its ability to correctly address the multiple dimensions of attitude, such as its cognitive and affective components. Rooting on authors' insights, we argue that

the relationship between attitude and outcomes, mediated by implicit behaviors, can be bridged by a complex web of relationships between perception of the immediate sphere of evaluation (the self) and other hierarchical spheres of perception (the social networks and the surrounding environment).

Attitude and Wellbeing

The influence of social context on wellbeing has gained increasing scientific attention and support, especially among scientists studying molecular genetics. Studies show that individuals with higher genetic susceptibility to specific diseases sometimes do not manifest those pathologies (Ryff and Singer, 2005). A possible explanation given is that there are operative social mechanisms acting as protective factors. Evidence point to positive environments affecting neurobiological processes, ultimately increasing the risk of development of chronic disease and deaths caused by cardiovascular diseases (Burleson et al., 2003).

General optimism is also associated with higher survivorship rates (Denner et al., 2001). Positive self evaluations translate into higher levels of happiness and altruism, willingness to engage in social activities, higher likelihood to meet aims, and lower levels of depression (Kwan et al., 2003). Studies show that the underlying mechanism linking optimism and wellbeing can be mapped to neural connections in the human brain. Urry et al. (2004), for instance, show that increase in psychological wellbeing is positively associated with increased left-side brain activity. This finding is relevant because the activation of left-side brain activity is associated with the ability to recover from negative episodes and easiness to overcome negative emotions wit large.

The scientific findings just described suggest that the relation between attitude and wellbeing opperates through different evaluative shperes. Following Ankler *et al.* (2010) and Posadski *et al.* (2010) approaches to attitude and behavior/outcome dyads, we perform an empirical exercise to measure multidimensional attitude towards the three evaluative spheres described above. We thus use the empirical multidimensional attitude measure to analyze its relationship with healthy and happy life expectancy (outcomes) along different stages of the individual's life cycle. This exercise renders descriptive evidence on the association between attitude and wellbeing, but lack any basis for causality arguments, since only cross-section data is applied.

The Contexts Compared – Brazil and Mexico

Mexico and Brazil are countries with similar wellbeing indicators, such as GDP, life satisfaction, and ecological footprint. According to the 2012 Happy Planet Index, both countries are tied in the 21th position (out of 151 countries). The index is composed of three sub-indices: life expectancy, experienced wellbeing, and carbon footprint, measuring the extent to which countries deliver long, happy, sustainable lives for the people that live in them. It represents how many long and happy lives a country produces per unit of environmental input. The 2012 results showed that 8 of the 9 best-ranked countries are in Latin America, ranking way ahead of many developed countries.

Figure 1: Ranking of Countries according to the Happy Planet Index in 2012
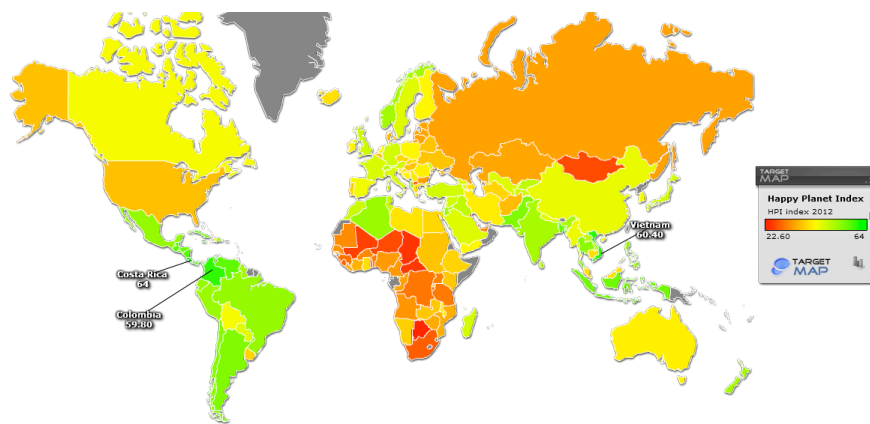
Source: Happy Planet Index (2013)

If we look at indices that measure life satisfaction more closely, both countries also show very similar levels. For instance, according to the ladder of life question in the Gallup World Poll, Mexico and Brazil report the same average 6.8 points in a 0-10 scale (HPI, 2013). Table 1 shows different happiness indicators available at the World Happiness Database (Veenhoven, 2013). With the exception of Happy Life Years, all other indicators are virtually identical, suggesting that most of difference in the life extension of happiness comes from the difference in mortality levels between the two countries.

Table 1: Happiness Indicators - Brazil and Mexico

Happiness	Average Happiness	Happy Life Years	Inequality of Happiness	Inequality Adjusted Happiness
Possible ranges	0 - 10	0 - 100	0 - 3.5	0 - 100

Highest score	8.5 Costa Rica	66.7 Costa Rica	1.42 Netherlands	73 Denmark
Brazil	**7.5**	**53.5**	**2.19**	**61**
Mexico	**7.9**	**59.7**	**2.19**	**64**
Lowest score	2.6	12.5	3.19	16

Source: World Happiness Database (2013)

The countries are also similar in terms of healthy life expectancies. A recent publication on The Lancet (Solomon et al., 2012) estimates that Brazil and Mexico have very similar levels of Health-adjusted life expectancies at age 50 for both sexes. The difference (in years) between life expectancy and healthy life expectancy at birth, as well as in the proportion of remaining years healthy at age 50 is also small (Table 2).

Table 2: Selected Healthy-Adjusted Life Expectancy by Sex and Year – Brazil and Mexico

Country	Male			Female		
	e_{50}	$\%HLE_{50}$	$e_{50} - HLE_{50}$	e_{50}	$\%HLE_{50}$	$e_{50} - HLE_{50}$
			1990			
Brazil	24.9	79.1	8.8	29	77.9	10.7
Mexico	26.9	81.4	7.8	30.6	80.7	9.4
			2010			
Brazil	26.8	79.5	9.4	31.1	78.8	11.1
Mexico	28	82.5	7.8	31.4	81.8	9.3

Source: Adapted from Solomon et al. (2012)

Despite of countries similarities in global wellbeing indicators, both objective and subjective, we ask if individual attitude is uniquely, country-specific related to wellbeing. As shown in the results section, gradients in optimism and attitude are more strongly associated with differences in healthy life status for Brazil, especially for the young and adults. For happy life expectancy, individuals with higher levels of optimism and positive attitude are expected to live a higher proportion of the remaining years in a happy status in both countries, regardless of age. Finally, our results also show that despite living longer, Mexicans spent a shorter proportion of the remaining years as healthy and happy individuals than Brazilians. The gap between countries, however, is closing, especially for happiness indicators. For both countries, most of the increase in wellbeing indicators is explained by change in prevalence of positive levels of health and happiness reported.

Modeling Strategy

The conceptual definition of attitude used in this study roots on the multidimensional relations of perception and evaluation about the self, the social networks, and the surrounding environment an individual is immersed. We find that, because of the theoretical feedbacks between positive and negative attitude extremes regarding evaluative processes towards potential behavior, methodological approaches based on fuzzy logic is an attractive way of operationalizing it. We argue that the interactive influence of positive and negative evaluations occur not only at the same level of one's perception, but also across levels. For instance, someone may perceive herself as a person with high degree of control over her life although isolated from social networks. The diverse possibility of evaluations across levels of perception matches the assumptions of latent models based on fuzzy logic.

Amongst a diverse range of multivariate techniques, we selected the *Grade of Membership* model due to the following reasons: a) it produces an empirical measure of heterogeneity among sample units based on unobserved association between categories of variables; b) this empirical measure, based on fuzzy sets, expresses the degree of membership to reference groups of elements, which in models of dimension K=2 can be translated into a degree of pertinence to overall multidimensional (multiscalar) perceived attitude; c) the measure of heterogeneity estimated improves with the number of variables and is not sensitive to endogenous relation between them; d) it allows positive and negative answers to belong to the same individual, measuring the distance of each individual positiviness and negativeness to positive and negative reference groups (Woodburry et al., 1978; Manton et al., 1994).

GoM is a mathematical methodology based on fuzzy logic used to delineate clusters of elements within a heterogeneous and multidimensional dataset. It is classified as a fuzzy cluster technique because the same individual is allowed to have a certain level of pertinence to multiple sets. The model estimates two parameters: a locational parameter, λ_{kjl}, and a fuzzy partition parameter, g_{ik}. The locational parameter corresponds to the conditional probability of answer for category l, of variable j, in a reference profile k. The fuzzy partition measures the degree to which each element (observation) i manifests the joint characteristics of reference profile k. Parameter g_{ik}, therefore, corresponds to the individual-level heterogeneity based on fuzzy membership functions. Both parameters are constrained to vary from 0 to 1 (Manton et al., 1994).

Table 3: Variables Used in the Multidimensional Attitude Scalar

Initial Variables	Final Variables
The Self	
Level of satisfaction with your life	X

How important to you to have a good life?	X
Degree of control over the person's own life and destiny	X
Degree of control over the person's own fate	
How often do you think about the purpose of your life?	
Social Networks	
Importance of family in your life	X
Importance of friends in your life	X
Do you think that tolerance and respect must be part of children's character?	
Do you think that determination and perseverance must be part of children's character?	
Do you think that unselfishness must be part of children's character?	
How much people can be trusted?	
How much do you think people will be fair to you?	
How important to you to help people nearby?	X
Do you feel socially isolated?	X
The Environment	
In your opinion, what should be the objectives of your country?	
How important to you looking after the environment?	X
In what extent do you agree that the government should reduce environmental pollution?	
In what extent do you agree that the world is a better place because of science and technology?	
How proud are you of being Brazilian/Mexican?	X
Degree of interviewee's interest during interview	

Note: Criteria for final selection: Wald p-value<0.05 and use in empirical literature
Source: WVS - Brazil (2006); WVS – Mexico (2005)

To set up the empirical GoM model, we started by selecting 20 variables related to preferences, perception, values, and attitude reported by individuals between 18 and 84 years old for each country (Table 3). We then used a latent class cluster model with active covariates (sex and age) to analyze significant multivariate (mixed-mode) association between indicators (Vermunt, 2003). The semi-parametric, group-based method uses a multinomial modeling strategy to map group characterization as latent classes in the data (Land, 2001). Because the idea that the entire population will fall into one of the perception and attitudinal classes is not likely, the method allows for fuzziness by estimating posterior class-membership probabilities to the different classes for each individual. The membership to a specific class is defined as the modal membership, that is, the individual belongs to a class that her posterior conditional probability across classes is the highest. A parametric model can be assumed for the perception and attitudinal construct, as follows:

$$f\left(\mathbf{y}_i \mid \mathbf{z}_i^{\text{cov}}\right) = \sum_{x=1}^{K} P\left(x \mid \mathbf{z}_i^{\text{cov}}\right) \prod_{t=1}^{T} f\left(y_{it} \mid x\right) \qquad (4)$$

In Equation (4), $P(x \mid z)$ is the probability of an individual belong to class x, conditional on the observed

covariates. We use in our model age and sex as demographic covariates to control for observed heterogeneity. Other covariates were not included, since we are more interested in finding statistically significant indicators of the index, rather than the size of the classes. As suggested by the above equation, indicators are affected by the class but not by the covariates, which only influence the estimated class size. The portion $f(y|x)$ is the conditional density function for indicator, assumed to be independent across indicators, t, given class membership (local independence). This assumption can be relaxed by means of direct effects of the type indicators-indicators or covariate-indicator, using the bivariate residuals larger than 2 (Vermunt, 2003).

Applying a latent class cluster model with covariates, we run a series of models from 1 to 5 clusters or classes and chose the model on the basis of a number of criteria including overall (chi-square test statistic L^2 and bootstrap p-value) and component (BIC-LL) model fit and analysis of residuals (bivariate residuals). The latent class models were performed in Latent Gold 4.5 (Vermunt and Magidson, 2007). Table 4 suggests that a 2-class model for Brazil and a 3-class model for Mexico best describe the association observed among the indicators. Because of data sparseness, we use the Bootstrap L^2 to test the validity of model parameters[1]. According to the Bootstrap L^2 significance, a latent class variable representing the multidimensional attitude would have at least 2 classes (a valid model is picked by a non-significant p-value). To select the model that best represents the data used, we chose the number of classes based on the BIC criterion.

Table 4: Selected Fit Statistics for Latent Class Models with Covariates – Brazil (2006) and Mexico (2005)

Brazil	BIC(LL)	BIC(L^2)	CAIC(L^2)	Npar	df	Class.Err.	Bootstrap L^2 p-value	s.e.
1-Cluster	31387.7	9849.8	8499.8	45	1350	0.0000	2.7e-3119	-
2-Cluster	**31214.9**	**9677.0**	**8352.0**	70	1325	0.1006	0.3580	0.0214
3-Cluster	31265.9	9728.0	8428.0	95	1300	0.2233	0.3280	0.0210
4-Cluster	31302.1	9764.2	8489.2	120	1275	0.2248	0.3440	0.0212
5-Cluster	31388.6	9850.7	8600.7	145	1250	0.2647	0.2960	0.0204
Mexico	BIC(LL)	BIC(L^2)	CAIC(L^2)	Npar	df	Class.Err.	Bootstrap L^2 p-value	s.e.

[1] When data is sparce, L^2 does not follow a chi-square distribution, and the calculated p-value would be incorrect (Vermunt and Magidson, 2007).
[2] For the 1997 Brazilian estimates of UHLE and UGLE we use the 1998 Complete Life Table for both sexes. This is the first complete table available for download provided by the Brazilian Bureau of Geography and Statistics (IBGE).
[3] We tried different approaches to estimate the period life tables for Mexico, including averaging the number of deaths reported over a 3 and 5-years window to reduce heaps in period reports, and different estimates of mid-year population by age (using data from Economic Commission on Latin America, as well as directly from the 1990, 2000, and 2010 Census from IPUMS). The estimation of the years contributed by the dead for each age group, nax, was based on the iterative procedure suggested by

1-Cluster	30985.2	7353.0	5999.0	45	1354	0.0000	2.5e-2689	-
2-Cluster	30775.0	7142.9	5804.9	61	1338	0.1005	0.3260	0.0210
3-Cluster	**30750.3**	**7118.2**	**5796.2**	77	1322	0.1026	0.2700	0.0199
4-Cluster	30766.3	7134.2	5828.2	93	1306	0.2074	0.2700	0.0199
5-Cluster	30801.2	7169.1	5879.1	109	1290	0.2108	0.2160	0.0184

Source: World Values Survey (Brazil, 2006; Mexico, 2005)

After this initial screening, we compared the selected variables suggested by the latent class models with the ones used in the literature and then discarded additional variables to approximate more consistent sub-dimensions of the latent construct 'multidimensional perception and attitude'. Table 5 shows the Wald test and associated p-value for each final indicator used to create the multidimensional attitude in the selected latent class models. Virtually all the indicators, in both countries, have statistically significant different log-linear parameters across classes of the latent variable, validating the selection of the final indicators in Table 3. These indicators were then applied to a 2-profile GoM model with a fixed probability matrix as explained above.

Table 5: Test Statistics for Indicators of Multidimensional Attitude in the Brazil's and Mexico's Selected Models

Indicator	Brazil		Mexico	
	Wald	p-value	Wald	p-value
Importance of family in your life	11.681	0.001	9.113	0.011
Importance of friends in your life	29.035	0.000	26.725	0.000
Level of satisfaction with your life	15.395	0.000	14.776	0.001
Important to have a good time	12.847	0.000	39.289	0.000
Important to help people nearby	67.782	0.000	47.318	0.000
Important to look after the environment	63.026	0.000	82.153	0.000
Degree of control over life and destiny	5.902	0.015	0.708	0.700
How proud of your nationality	25.615	0.000	22.634	0.000
Are you an isolated person	22.008	0.000	25.547	0.000

Source: World Values Survey (Brazil, 2006; Mexico, 2005)

In this paper we define a person with positive multidimensional attitude (PMA) if he/she belongs to the fourth or fifth quintile of the cumulated degree of membership (g_{ik}) to the positive attitude profile, and a person with negative multidimensional attitude (NMA) if he/she belongs to the first or second quintile. After classifying individuals in our sample according to their attitude, we estimated the proportion of individuals in each decennial age group that reported themselves in good health (good + very good) and in poor health (fair + poor) by attitudinal status. For happy life expectancy, we defined happy as "very happy" + "quite happy" and not happy as "not happy"

+ "not happy at all".

Measuring Healthy and Happy Life Expectancy

The healthy (HLE) and happy (GLE) life expectancies were calculated by means of the Sullivan Method (Sullivan, 1971). We use data from the World Values Survey for Brazil (1997 and 2006) and Mexico (1996 and 2005). Life tables for Brazil were estimated by the Brazilian Institute of Geography and Statistics[2] (IBGE). For Mexico, we estimated our own Abridged Life Tables[3], applying reported deaths and population from the Latin American Human Mortality Database (LAHMD). Estimations of HLE and GLE were obtained by applying the prevalence of the attribute (health status or degree of happiness with life) by decennial intervals beginning at 15 years of age. The use of single-year prevalence is not desirable because of problems with small numbers of cases as well as the influence of age misreporting (Romero et al., 2005). The healthy (happy) life expectancy (HLE_a / GLE_a) and unhealthy (unhappy) life expectancy ($UHLE_a$ / $UGLE_a$) are estimated according to the following formulas:

$$HLE_a = \frac{\sum_{a=15}^{75}\left(_n\pi_a *_n L_a\right)}{l_a} \; ; \quad UHLE_a = \frac{\sum_{a=15}^{75}\left[\left(1-_n\pi_a\right)*_n L_a\right]}{l_a}$$

where:

- $_n\pi_a$ is the prevalence rate of healthy (happy) individuals from age a to $a+n$;

- $(1-_n\pi_a)$ is the prevalence rate of unhealthy (unhappy) individuals over the same age group;

- l_a is the number of survivors at exact age a;

- $\sum(_n\pi_a *_n L_a)$ is the total number of years lived in healthy (happy) status between the ages a and $a+n$ by a cohort, and

---

[2] For the 1997 Brazilian estimates of UHLE and UGLE we use the 1998 Complete Life Table for both sexes. This is the first complete table available for download provided by the Brazilian Bureau of Geography and Statistics (IBGE).
[3] We tried different approaches to estimate the period life tables for Mexico, including averaging the number of deaths reported over a 3 and 5-years window to reduce heaps in period reports, and different estimates of mid-year population by age (using data from Economic Commission on Latin America, as well as directly from the 1990, 2000, and 2010 Census from IPUMS). The estimation of the years contributed by the dead for each age group, nax, was based on the iterative procedure suggested by Preston et al. (2001). To calibrate the results, we compared our estimates with the life expectancy at birth reported by the United Nations for Mexico. For 1995, we found a 0.1 year difference, and for 2005 a 0.5 year difference. We consider these minor deviations for the purpose of this study.

- $\sum\left[\left(1 - {}_{n}\pi_{a}\right) * {}_{n}L_{a}\right]$ is the total number of years lived in unhealthy (unhappy) status in the age group (a, a+n) by a cohort.

The formulas used to estimate UHLE$_a$ (UGLE$_a$) and HLE$_a$ (GLE$_a$) have two independent components: mortality (${}_{n}L_a$) and health [happiness] (1-${}_{n}\pi$ $_a$). At last, simulations of stationary scenarios of mortality and prevalence of health [happiness] were made in order to measure how much of the observed change in the %HLE$_a$ and %GLE$_a$ from time 1 to time 2 was due to the change in prevalence over the period. Because the information used to create the multidimensional perception and attitude measure was not fully available for the first wave of data (1995 for Mexico and 1997 for Brazil), we applied the decomposition for the happy and healthy measures by age only. The analytical decomposition sample for Brazil is 1,496 observations for the 2006 wave and 1,148 for the 1997 wave, while for Mexico the numbers are 1,550 for the 2005 wave and 2,310 for the 1995 wave.

Findings

Attitude and Health

We begin by looking at the prevalence of healthy individuals by age group and attitudinal status. As shown in Table 6, a smaller proportion of individuals remain healthy as they age, although this proportion is consistently higher for the ones showing positive attitude for all ages. The difference in healthy proportions by attitudinal status is statistically significant at 1% for all age groups. This difference increases by age among Brazilians, the opposite holding among Mexicans. On average, 89.1% of Brazilians with positive attitude also reported as being healthy, against only 65.4% among the ones with negative attitude. Among Mexicans, 68.9% of individuals with positive attitude report themselves as healthy, against 65.2% among the ones with negative attitude.

Table 6: Proportion of Healthy Individuals by Age Group and Attitudinal Status - Brazil (2006)

Country	Age Group	Positive Attitude	Negative Attitude	P-value*
Brazil	15-24	97.5	81.6	0.0000
	25-34	95.0	80.7	0.0004
	35-44	89.5	67.8	0.0000
	45-54	86.3	53.8	0.0000

	55-64	65.0	44.1	0.0252
	65 +	76.2	33.3	0.0000
	Total	89.1	65.4	0.0000
Mexico	15-24	77.9	80.3	-
	25-34	76.6	71.9	-
	35-44	69.3	60.0	-
	45-54	74.7	59.0	-
	55-64	47.8	45.2	-
	65 +	40.9	38.5	-
	Total	68.9	65.2	-

*: Two-tailed test of proportions between groups.

Source: World Values Survey (Brazil, 2006)

When prevalence is combined with mortality levels by age, we observe a very similar trend. In Brazil, the difference between the proportion of years to be lived healthily by attitudinal status increases with age. Thus, as people age, attitudinal status seems to be increasingly more important to live a healthier life (assuming a synthetic cohort perspective). In Mexico, the opposite holds. As individuals age, attitude seems to play a diminishing role in affecting how healthy (and to what extent) one would live her remaining years. Finally, it is worth nothing that the effect of attitude on healthy life expectancy is higher among Brazilians. From this type of analysis (using cross-section data) is hard to tell which comes first: attitude leading to better health, or the other way around. For instance, people with positive attitude may do more physical exercises and show stronger social connections than individuals with negative attitudes. At the same way, individuals with better health can feel happier and more willing to help people. But even in a highly endogenous scenario, Brazilians seems to benefit more from having a positive attitude and perception towards life.

Figure 2. Proportion of Remaining Years Lived with Good Health by Level of Multidimensional Attitude. Brazil and Mexico, 2006
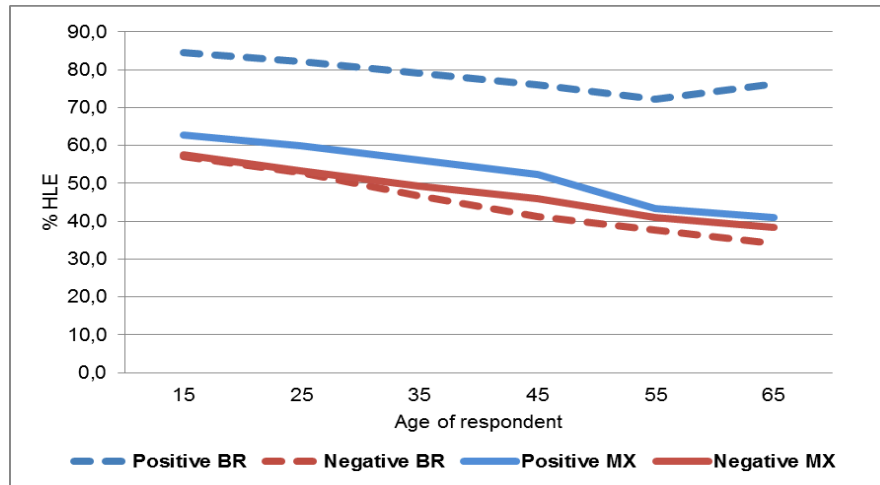
Source: WVS (Brazil, 2006; Mexico, 2005); IBGE (2006); ECLA (2005)

Attitude and Happiness

Now we turn to the prevalence of happy individuals by age group and attitudinal status. As shown in Table 7, the proportion of happy individuals do not vary significantly over the life cycle, with a slight decline as people age. Interestingly, the proportions by age among Brazilians show an inverted shape depending on the attitudinal status. While individuals with positive attitude show increasing proportion of reported happiness up to 55 years and then decline, the opposite holds among the individuals with negative attitude. This trend is not observed among Mexicans. Despite the small age gradient of happiness, the difference by attitudinal status is statistically significant for all ages among Brazilians. On average, 97.9% of Brazilians with positive attitude also reported as being happy, against only 85.2% among the ones with negative attitude. Among Mexicans, the average gap is slightly smaller (95.0% for positive against 89.4% for negative attitudinal status).

Table 7: Proportion of Happy Individuals by Age Group and Attitudinal Status - Brazil (2006)

Country	Age Group	Positive Attitude	Negative Attitude	P-value*
Brazil	15-24	97.5	86.4	0.0011
	25-34	98.3	85.8	0.0003
	35-44	99.1	84.2	0.0001
	45-54	99.0	82.6	0.0001

	55-64	95.0	84.3	0.0851
	65 +	95.2	91.2	0.4417
	Total	97.9	85.2	0.0000
Mexico	15-24	97.9	92.6	-
	25-34	96.8	93.2	-
	35-44	95.0	84.7	-
	45-54	92.6	90.6	-
	55-64	92.5	78.4	-
	65 +	90.9	86.5	-
	Total	95.0	89.4	-

: Two-tailed test of proportions between groups.

Source: World Values Survey (Brazil, 2006)

When prevalence of happiness is combined with mortality levels by age, we observe a very similar trend. While good health seems to be more sensitive to attitudinal life cycle effects, happiness is only responsive to attitude, but not to age. Maybe this can be related to what was noted by Easterlin (1974), who suggests that the happiness level is not a life cycle effect due to the counterbalance of difference in aspirations by age. Probably because of better mortality indices, Mexicans show higher proportions of years to be lived happy for all ages than Brazilians, regardless of attitudinal status.

Figure 3. Proportion of Time Lived Very Happily by Multidimensional Attitude. Brazil and Mexico, 2006
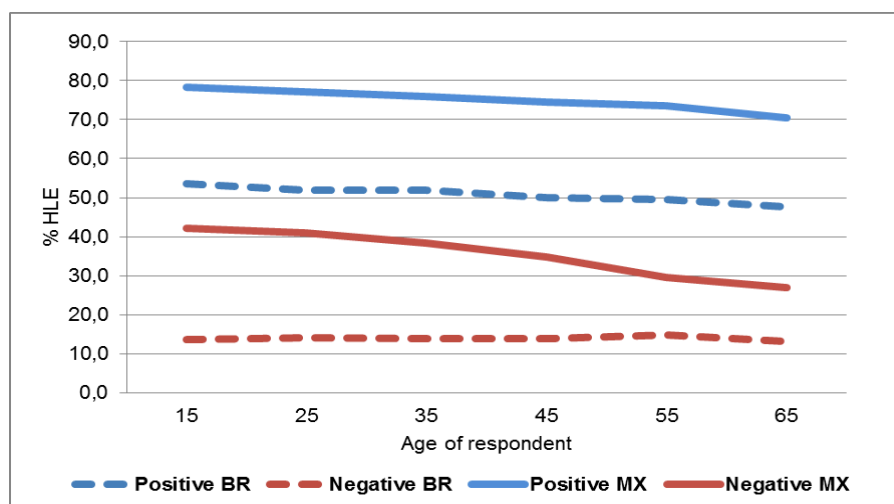
Source: WVS - Brazil (2006); Mexico (2005); IBGE (2006); ECLA (2005)

Change in HLE and GLE – Evidence on wellbeing compression by attitudinal status?

We now turn our attention to how the observed difference in the proportion of remaining years to be lived healthily and happy may be explained by two complementary effects: the mortality effect and the prevalence effect. In order to estimate these effects, we estimate the HLE and GLE by age for the one additional wave of data for each country (1995 for Mexico and 1997 for Brazil). Then, we applied standard demographic decomposition techniques, assuming stationary scenarios of mortality and prevalence (freeze-rates method), in order to provide insights on wellbeing compression in each country.

Table 4: Happy and Healthy Life Expectancy by Age – Mexico (1995, 2005) and Brazil (1997, 2006)

Country	Exact age	e_x		GLE_x		$\%GLE_x$		HLE_x		$\%HLE_x$	
		T_1	T_2	T_1	T_2	T_1	T_2	T_1	T_2	T_1	T_2
Brazil	15	56.3	59.7	47.2	54.2	83.9	90.7	36.7	41.1	65.3	68.9
	25	47.0	50.5	39.6	45.7	84.2	90.5	29.3	32.8	62.4	65.0
	35	38.0	41.5	32.3	37.6	85.0	90.6	21.9	25.0	57.6	60.3
	45	29.3	32.8	25.1	29.7	85.5	90.5	15.9	18.1	54.3	55.3
	55	21.3	24.7	18.3	22.4	86.0	90.9	10.8	12.4	50.8	50.5
	65	14.1	17.5	12.3	16.2	86.8	92.6	7.8	8.7	55.3	50.0
Mexico	15	59.5	62.5	37.9	55.7	63.7	89.2	29.5	36.4	49.6	58.2
	25	50.0	53.0	31.0	46.8	61.9	88.4	22.8	28.8	45.6	54.3
	35	40.8	43.6	24.8	37.9	60.9	87.0	17.2	21.8	42.2	50.1
	45	31.8	34.5	18.6	29.5	58.5	85.5	12.1	16.0	38.1	46.4
	55	23.3	25.9	13.1	21.7	56.0	83.8	8.5	10.3	36.6	39.8
	65	15.6	18.3	7.8	15.3	50.0	83.7	5.4	7.1	34.3	38.8

Source: Authors' estimation based on IBGE (2013); Latin American Human Mortality Database (2013); World Values Survey (2013)

Note: Mexico Period Life Tables using the gradient method for the average number of years lived by the dead. Brazilian Life Tables estimated by

IBGE (1998, 2006).

As can be seen in Table 4, individuals in both countries are living longer and a higher proportion of the remaining years happier and healthier. Although Mexicans live, on average, longer than Brazilians in all ages, they are expected to spend a smaller proportion of the remaining years happier. The country gap for happiness, however, is closing over time. Another interesting difference between countries is that while the proportion of GLE increases with age among Brazilians, the opposite holds among Mexicans. As for happiness, Brazilians live on average a larger proportion of time healthier than Mexicans. The difference between countries is also reducing over time for all ages. As for happiness, results suggest that morbidity compression is in place, especially in Mexico.

If the change in the proportion of the remaining years to be lived in a happy and healthy status is decomposed into mortality and prevalence effects, we observe that increase in the prevalence of happiness and good health dominates for all ages. For Mexico, the increase in survivorship by age would actually decrease wellbeing indicators over time, had the prevalence of happiness and health remained as observed in 1997. Comparisson of wellbeing compression using self-reported indicators must be used with caution, since subjective interpretation may vary in cross-section probabilistic samples.

Table 5: Decomposition of the Proportion of Happy and Healthy Life Expectancies by Age into Prevalence and Mortality Effects (Δ%) – Mexico (1995, 2005) and Brazil (1997, 2006)

Indicator	Exact age	Brazil			Mexico		
		Total effect	Prevalence effect	Mortality effect	Total effect	Prevalence effect	Mortality effect
GLE	15	6.8	6.6	0.2	25.5	26.1	-0.6
	25	6.3	6.1	0.2	26.5	27.1	-0.6
	35	5.6	5.4	0.1	26.1	26.7	-0.6
	45	5.1	5.0	0.1	27.0	27.7	-0.6
	55	4.8	4.7	0.1	27.8	28.4	-0.6
	65	5.7	5.7	0.0	33.7	33.7	0.0
HLE	15	3.6	4.1	-0.5	8.7	9.3	-0.6
	25	2.7	3.1	-0.4	8.7	9.2	-0.5
	35	2.8	3.0	-0.2	7.9	8.3	-0.4
	45	1.0	1.0	0.0	8.3	8.6	-0.3
	55	-0.3	0.3	-0.6	3.2	3.5	-0.2
	65	-5.3	-5.3	0.0	4.5	4.5	0.0

Source: Authors' estimation based on IBGE (2013); Latin American Human Mortality Database (2013); World Values Survey (2013)

Note: Demographic decomposition using stationary scenarios of mortality (with varying prevalence) and prevalence (with varying mortality) between year 1 and years 2. Brazil (1997 to 2006). Mexico (1995 to 2005).

Concluding remarks: attitude, health, and happiness in Brazil and Mexico

In this paper we estimate healthy and happy life expectancy by age and multidimensional attitude, using the World Values Survey for Brazil and Mexico. Combining different methods, we ask if persons with positive attitude live happier and in better health. At last, comparing trends over time, we estimate the contribution of mortality and

morbidity to the observed change in the proportion of time to be lived happy and in good health, adding empirical evidence to whether these two countries are experiencing some degree of contemporary morbidity compression.

To measure the healthy life expectancy, we use self-reported health status for Brazil and Mexico. Despite criticisms about the subjective nature of this type of health information at the population level, studies suggest that self-reported health is a key factor predicting future mortality (Shadbolt et al., 2002; Jylha, 2009). Measurements of happiness in large surveys are intrinsically subjective but, as for self-rated health, many studies show consistent correlation between happiness, mortality, and mental health (Ryff and Singer, 2005; Bray and Gunnell, 2006; Easterlin, 2006; Ditella et al., 2003). There is also evidence that happiness and health are as important as economic indicators to express efficient input-output functions in modern societies (HPI, 2013; Graham, 2008; Frey and Stutzer, 2002; Ditella et al., 2001).

Our estimates of happiness and health by levels of multidimensional attitude in Brazil show descriptive evidence of a positive association between positive attitude and wellbeing life indices. However, this association is not linear over individual's life cycle for health: the gap in the proportion of the remaining years to be lived in good health increases with age when one compares individuals with positive and negative attitude towards the three dimensions of life. The opposite holds in the case of Mexico. An intriguing finding is the tipping point in the curve of proportion of years to be lived in good health among Brazilians with positive attitude at age 60. We speculate that this may reflect the positive reaction of these individuals towards life cycle events, such as retirement. That is, people with high levels of optimism and positive attitude face retirement from the job market as a new opportunity to fulfill personal aspirations that were not possible to accomplish earlier in the life cycle due to time and financial constraints (such as long work hours and raising of kids). Individuals with negative attitude, on the other hand, may face these life change markers as signs of senescence and social isolation.

Because we rely on cross-sectional data only, it is hard to disentangle causality, but we speculate that while there is a cumulative effect of attitude on health over the life cycle among Brazilians, positive selection seems to dominate the Mexican figure. Regarding happiness, our findings confirm what has been documented in the international literature (Easterlin 1974). We found a flat association between positive attitude and happy life expectancy over individual's life cycle for both countries. However, the proportion of the remaining years to be lived happily is consistently higher among Brazilians, regardless of the attitudinal response. Again, due to endogeneity it is

risky to draw causality inferences from the results, but it seems that Brazilians have a higher return to overall positive attitude on quality of life, while among Mexicans selectivity seems to be a latent driver (explaining the declining gap with age for health).

In all, our results show that people with positive attitude have better health and are happier, experiencing longer life morbidity-free. These findings suggest that policies that promote the components of positive attitude can create an enabling environment for people to feel motivated to respond positively to stressful events. Finally, this type of public policy towards positive affirmation and mental resilience should consider the differences between genders, especially because it includes the promotion of a longer and healthier life for those who react negatively to external factors. Cohort studies are also welcome to disentangle causality issues necessary to advance theory on attitude and wellbeing over the life cycle.

References

Anker, A. E.; Feeley, T. H.; & Kim, H. (2010). 'Examining the Attitude–Behavior Relationship in Prosocial Donation Domains'. *Journal of Applied Social Psychology*, 40(6): 1293-1324.

Blanchflower, D.G.; Oswald, A. J. (2000). 'The rising well-being of the young'. In: Blanchflower, D.G.; Freeman, R.B. (Ed.). *Youth employment and joblessness in advanced countries*. Chicago: University of Chicago Press.

Bradburn, N. M. (1969). *The structure of psychological well-being*. Chicago: Aldine.

Bray, I.; Gunnell, D. (2006). 'Suicide rates, life satisfaction and happiness as markers for population mental health'. *Social Psychiatry and Psychiatric Epidemiology*, 41(5): 333-337.

Cacioppo, J. T.; Berntson, G. G. (1994). 'Relationship Between Attitudes and Evaluative Space: A Critical Review, With Emphasis on the Separability of Positive and Negative Substrates', *Psychological Bulletin*, 115(3): 401-423.

Cantril, H. 'The pattern of human concerns'. (1965). New Brunswick: *Rutgers University Press*.

Clark, A.E.; Oswald, A.J. (1994). 'Unhappiness and unemployment'. The *Economic Journal*, 104(424): 648-659.

Corbi, R.B.; Menezes-Filho, N.A. (2006). 'Os determinantes empíricos da felicidade no Brasil'. *Revista de Economia Política*, 26(4): 120-140.

Ditella, R.; Macculloch, R.; Oswald, A. J. (2003). 'The macroeconomics of happiness'. *Review of Economics and Statistics*, 85(4): 809-827, Nov. 2003.

Ditella, R.; Macculloch, R.J.; Oswald, A.J. (2001). 'Preferences over inflation and unemployment: evidence from surveys of happiness'. *American Economic Review*, 91(1): 335-341.

Easterlin, R. (1974). A. 'Does economic growth improve the human lot? Some empirical evidence'. In: David, P. A.; Reder, M. W. (Ed.). *Nations and households in economic growth: essays in honour of Moses Abramowitz*. New York: Academic Press. Pp. 89-125.

Easterlin, R.A. (2001). 'Income and happiness: towards a unified theory'. *The Economic Journal*, 111(473): 465-484.

Easterlin, R.A. (2006) 'Life cycle happiness and its sources: intersections of psychology, economics and demography'. *Journal of Economic Psychology*, 27(4): 46-482.

Fazio, A.F. (1977). 'A concurrent validation study of the NCHS' general well-being schedule'. Hyattssville: US Government Printing Office. (DHEW Publication, (HRA) p. 78–1347.

Frey, B. S.; Stutzer, A. (2001). *What can economists learn from happiness research?* Munich: CESifo Group Munich. (CESifo Working Paper, 503).

Frey, B.S.; Stutzer A. (2000). 'Happiness: economy and institutions'. *The Economic Journal*, 110(446): 918-938.

Frey, B.S.; Stutzer, A. (2002). *Happiness and economics*. Princeton: Princeton.

Gerlach, K.; Stephan, G. (1996). 'A paper on unhappiness and unemployment in Germany'. *Economics Letters*, 52(3): 325-330.

Graham, C. (2008). 'Measuring quality of life in Latin America: what happiness research can (and cannot) contribute'. Washington: Inter-American Development Bank, Research Department. (*Working Paper, 652*).

Graham, C.; Pettinato, S. (2002). 'Happiness and hardship: opportunity and insecurity in new market economies'. Washington: *The Brookings Institution*.

Happy Planet Index (HPI). (2013). *Happy Planet Index: 2012 Report – A global index of sustainable well-being.* Available at www.healthyplanetindex.org on August, 13, 2013.

Joseph, S.; Lewis, C.A. (1998). 'The depression happiness scale: reliability and validity of a bipolar self-report scale'. *Journal of Clinical Psychology*, 54(4): 537- 544.

Jylha, M. (2009). 'What is self-rated health and why does it predict mortality? Towards a unified conceptual model'. *Social Science and Medicine*, 69: 307-316.

Kamman, R.; Flett, R. (1983). 'Affectometer 2: a scale to measure current level of general happiness'. *Australian of Journal of Psychology*, 35(2): 259-265.

Land, K. C. (2001). 'Introduction to the special issue on finite mixture models'. *Sociological Methods and Research*, 29, 275–281.

Latin American Human Mortality Database. (2013). B. Piedad Urdinola and Bernardo L. Queiroz. Available at www.lamortalidad.org (MEX, Deaths by age and sex / MEX, Population by age, sex and region on August, 13, 2013).

Margolis, R.; Myrskyla, M. (2011). 'A global perspective on happiness and fertility'. *Population and Development Review*, 37(1): 29-56, 2011.

Ostir, G.V.; Markides, K.S.; Peek, M.K.; Goodwin, J.S. (2001). 'The association between emotional well-being and the incidence of stroke in older adults'. *Psychosomatic Medicine*, 63(2): 210-215.

Plagnol, A.C.; Easterlin, R.A. (2008). 'Aspirations, attainments, and satisfaction: life cycle differences between american women and men'. *Journal of Happiness Studies*, 9(4): 601–619.

Posadzki, P.; Stockl, A.; Musonda, P.; Tsouroufli, M. (2010). 'A mixed-method approach to sense of coherence, health behaviors, self-efficacy and optimism: Towards the operationalization of positive health attitudes'. *Scandinavian Journal of Psychology* 51(3): 246-252.

Pressman, S.D.; Cohen, S. (2005). 'Does positive affect influence Health?'. *Psychological Bulletin*, 131(6): 925-971.

Preston S. H., Heuvelline P., Guillot M. (2001). *Demography - measuring and modeling population process*. Malden: Blackwell Publishers.

Ryff, C. D.; Singer, B. (2005). 'Social environments and the genetics of aging: Advancing knowledge of protective health mechanisms'. *Journal of Gerontology*, 60B (Special Issue 1): 12-23.

Salomon J. A., Wang H., Freeman M. K., Vos T., Flaxman A. D., Lopez A. D., Murray C. J. L. (2012). 'Healthy life expectancy for 187 countries, 1990–2010: a systematic analysis for the Global Burden Disease Study 2010'. *The Lancet* 380: 2144–2162.

Shadbolt B., Barresi J., Craft P. (2002). 'Self-rated health as a predictor of survival among patients with advanced cancer'. *Journal of Clinical Oncology*, 20(10): 2514-2519.

Sullivan D. F. (1971). 'A single index of mortality and morbidity'. *HSMHA Health Rep*, 86: 347–54.

Veenhoven, R. (2013). *Happiness in Nations.* World Database of Happiness, Erasmus University Rotterdam, The Netherlands. Assessed on August, 13, 2013 at: http://worlddatabaseofhappiness.eur.nl/hap_nat/nat_fp.php?mode=1.

Vermunt, J. K. (2003). 'Multilevel Latent Class Models'. *Sociological Methodology*, *33*(1), 213-239.

Vermunt, J. K., Magidson, J. (2007). 'Latent class analysis with sampling weights: A maximum likelihood approach'. *Sociological Methods and Research*, *36*(1), 87-111.

Watson, D.; Clark, L.A.; Tellegen, A. (1988). 'Development and validation of brief measures of positive and negative affect: the PANAS scales'. *Journal of Personality and Social Psychology*, 54(6): 1063-1070.

Winkelmann, L.; Winkelmann, R. (1998). 'Why are unemployed people so unhappy? Evidence from Panel Data'. *Economica*, 65(257): 1-15.