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Estimate of Mortality for Individuals from Low-Income Families

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Introduction

The objective of this research is to estimate a Complete Mortality Table by gender for members of low income families in Brazil, namely those with *per capita* income from 1 (one), up to two (2) or even 3 (three) times the minimum wage.

The current literature has stressed the growing concern about the impact that economic development and income distribution have on specific rates of mortality in the countries, whether in the field of sciences related to health, or in the formulation and implementation of oriented public policies.

Measuring the individual impact of determinant factors, when considering the differentials in patterns and levels of mortality in several countries around the world, is a difficult task to perform. The following variables directly influence the pattern and level of mortality:

- Constant **advances in medicine** and its increasing availability;
- **Educational level** of individuals;
- **Income distribution** of the population;
- **Infrastructure** of the locality (sanitation, access to clean water, treatment and refuse collection, etc.).

Sorlie *et al.* (1995, p.949) emphasize that the current health status of the individual is probably a result of the factors listed above, among others, including behavioral factors that obviously influence future opportunities. Aspects of economic status are thus characterized by income, education, occupation and employment. At the most basic and simple level, the income is a measure of the financial resources of a person. Education is a measure of knowledge gained and economic potential. Occupation is a measure of the status of the individual in the society, his/her skills, financial gains and specific occupation; while employment is the measure of the current economic viability. The demographic variables of age and gender clearly exemplify characteristics associated with mortality and they also need to be considered. The characteristics of race reflect the intersection between biological, cultural, socio-economic, political and legal determinants as well as the issue of racism. The characteristics of marital status, family structure and size of residence reflect the number of people expected to use available economic resources, as well as the social factors related to relationships between individuals, marriage, widowhood, separations and divorces.

In his work from 2008, Silva also mentioned these variables:

> "Generally speaking, the reduction of the mortality rates is usually the result of an evolution in the standards of living of the population, derived from a set of factors, such as: advances in medicine and improvement of public health as a whole, progress in the generation and distribution of wealth for the population, better basic sanitation and water treatment, more control over and vaccination against diseases, rubbish treatment, etc.. Besides these factors, he also highlights increased individual awareness in what concerns his/her lifestyle. Factors such as regular physical exercises and a rich and balanced diet with regular meals, normal-weight, moderate alcohol consumption and average rest of 7 hours a day are attitudes that prolong people's lives." (Silva, 2008, pp.81-82).

All the above mentioned factors tend to be interrelated with each other and also with many other aspects related to economic development, which makes it difficult to analyze them in isolation. Moreover, taking Brazil as an example, there ought to be an effort for health programs to be more intensive and to concentrate in less affluent places, like the northeastern and northern regions, and the periphery of large cities, for obvious reasons, as these differences may cause a bias in the relations observed. In fact, a higher supply of health services is found precisely in those large urban centers where there is a better infrastructure.

According to Rodgers (2002, p.533), the identification of the impacts of such factors, which are directly associated with the individual's health, are valid in the formulation of public policies, but may not be decisive for the description of changes in mortality in the process of development. Behind these specific variables, the economic status of individuals seems to dominate any changes in their level of health. From the question concerning people's nutrition to the relation with other aspects of consumption, the economic status of the individual is highly correlated and critical to many specific variables above-mentioned. Good wages may be a precondition for healthier environments and better access to health services, given the competitive demands of resources – this is evident on a national, local or even individual level. Consequently, for an empirical general analysis, it is pertinent to investigate a number of factors that relate income and mortality.

Rodgers (2002, pp.533-534) notices that observations made in developed countries suggest that the relationship between income and life expectancy is increasing asymptotically, i.e., gains are decreasing with income. Thus, the relationship between income and life expectancy is, therefore, non-linear and concave. Thus, given a set of income levels, the average life expectancy associated with these levels is necessarily lower than the life expectancy associated with the average level of income. In practice, the precise format of the function Income × Life Expectancy also depends on other variables[1].

Backlund *et al.* (1996, p.12) reviewed the literature on the relationship between income distribution and mortality. For example, Wilkinson (1986, 1992) showed that income distribution is much more predictive of life expectancy than the GDP *per capita*. These studies have shown that countries with a more egalitarian distribution of income have lower mortality rates. As the income distribution emerges to be an important determinant of differences between international mortality rates, both Rodgers (2002) and Wilkinson (1986.1992) theorized that the strong inverse gradient of mortality depending on income, observed in several countries is more pronounced for lower levels of income than for higher ones. Therefore, the effect of economic development over national

[1] The asymptotes of the curve would be dislocated upwards, for example, in the light of new discoveries in medicine (such as a cure for cancer) and a better structure for the provision of health services, or they could be dislocated downwards due to major epidemics (as in the case of swine flu, for example).

mortality rates is dependent, in part, on the form of the relationship between income and mortality, based on which the benefits to income groups increase as income increases. Despite its importance, detailed investigations on the form of the relationship between income and mortality are rare.

In the work of Backlund *et al.* (1996), the authors demonstrated that the gradient of mortality-income is much lower in the higher income levels than in lower or moderate levels, in populations with economically active ages (25 to 64 years old) and elderly (over 65 years old) for both men and women, before and after adjustment to other socio-economic variables. Moreover, a much greater differential was found for women of low to moderate income. The gradient of income-mortality was much smaller for the elderly than for the population in economically active age. The study also examined the ability to adjust various mathematical functions of income, in order to delineate the relationship between income and mortality. The study suggests that the health benefits associated with income decrease as the income increases.

The research of Kitagawa and Hauser (1973) showed that the mortality for men and women of working age, at lower income levels, declines rapidly as a function of education. With regards to higher income levels, the variation is substantially lower. Another interesting study, which confirms the earlier findings, was the work of Blaxter (1990) that, using the survey data of Health and Lifestyle in England, concluded there was a strong inverse relationship between income and health for those who earn less than 200 pounds, having this relationship a much lower intensity or zero or even reversed, for those who earn more than 200 or 250 pounds. From the Graphics presented in this study, it was also concluded that the initial decrease in mortality for those earning up to 50 or 100 pounds is much bigger than for those who earn more.

In summary, several authors have shown an inverse relationship between socio-economic status (using a proxy such as education or income) and health (and consequently mortality), presenting a convex shape, i.e. higher decline among less affluent individuals and smaller gradients between individuals from higher income levels.

The biggest gradient associated with higher levels of extreme poverty appears to be reasonable, as the extreme poverty is associated with deprivation and social alienation, such as poor nutrition and precarious conditions of sanitation and housing.

This report consists of 6 sections. The first is this introduction. The second shows the databases used. The third presents the methodology of calculation. The fourth section presents the obtained results. The fifth presents final considerations. The last section is the bibliography used. The annexes are the tables of estimated mortality for each gender separately, for individuals in households with income *per capita* of up to 1 (one), two (2) or 3 (three) times the minimum wage and the selected functions calculated for these tables.

Databases

Brazilian data, either from the Civil Register (IBGE), or from SIM (DATASUS/ Ministry of Health) do not allow a direct breakdown by income. Therefore, it is not possible to directly calculate a table for the target populations. It is possible, however, to break down the data by geographic areas (cities, states and large regions). The ideal situation would be to find a geographical breakdown with an income profile similar to the target population. In order to do that, the initial idea of the study was to use data related to the population of the north and northeast (the Brazilian regions with the lowest average incomes – see Table 1). Some states in these regions have a *per capita* income closer to the target population, but we believe that the use of the aggregate in these regions, due to its larger size, would provide better conditions for the necessary estimates.

Table 1 – Area, life expectancy at birth in 2000 and proportion of households with *per capita* income of up to 1 (one), 2 (two) and 3 (three) MW (in 2007) and total number of households in 2000

Area	e_0	<1MW (%)	<2 MW (%)	<3 MW (%)	Total of Households
BR	**70,43**	**53,5**	**78,9**	**85,3**	**55.001.941**
North	**69,45**	**68,7**	**87,7**	**91,9**	**3.869.573**
RO	68,97	64,0	85,3	89,2	438.606
AC	69,24	67,1	84,1	89,5	167.472
AM	69,46	68,5	89,4	92,7	789.013
RR	67,57	63,2	84,7	89,6	108.610
PA	69,87	71,1	88,7	92,4	1.831.626
AP	67,60	62,9	84,1	91,7	154.201
TO	69,11	67,9	85,7	92,4	380.045
Northeast	**67,13**	**75,4**	**90,6**	**93,2**	**14.078.788**
MA	64,64	77,9	92,2	96,1	1.566.793
PI	66,25	76,1	90,1	91,5	801.776
CE	67,77	76,4	91,2	93,4	2.229.503
RN	67,97	70,1	88,2	91,8	828.715

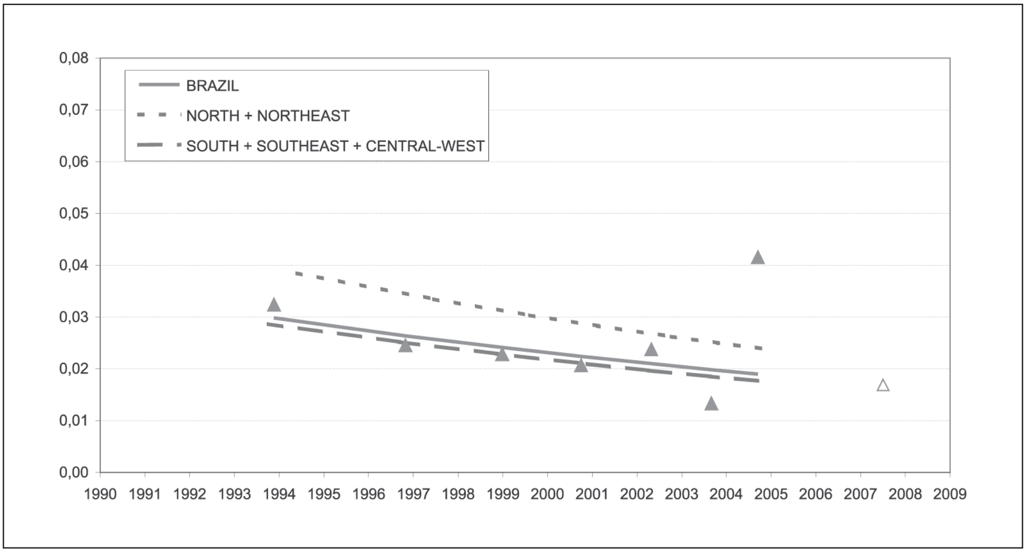
Area	e_0	<1MW (%)	<2 MW (%)	<3 MW (%)	Total of Households
PB	66,41	75,8	89,8	92,4	997.519
PE	65,58	76,4	91,2	92,9	2.357.269
AL	63,87	78,1	91,0	95,2	829.903
SE	68,58	70,0	88,8	92,1	556.971
BA	70,01	74,4	90,2	92,8	3.910.339
Southeast	**72,03**	**43,4**	**73,3**	**80,6**	**24.146.351**
MG	72,77	55,0	81,3	88,6	5.889.188
ES	71,64	52,9	80,6	87,2	1.052.778
RJ	70,95	43,1	73,6	75,6	4.742.570
SP	72,18	37,3	68,8	78,5	12.461.815
South	**72,80**	**40,7**	**72,9**	**83,5**	**8.785.067**
PR	71,95	43,8	74,1	83,6	3.260.923
SC	73,49	34,1	69,9	82,2	1.898.470
RS	73,27	41,3	73,3	84,0	3.625.674
Central-West	**71,69**	**51,3**	**76,7**	**84,1**	**4.122.162**
MS	71,61	52,8	77,9	86,5	732.908
MT	70,84	57,8	82,5	88,3	878.012
GO	71,34	53,6	80,9	89,0	1.810.594
DF	73,83	35,9	57,2	64,2	700.648

However, the choice of the northeastern or northern regions as a proxy for the Brazilian low-income population stumbles upon a serious problem, which is that the conditions of the poor in these regions differ too much from the poor in other regions: sanitation infrastructure, access to health services, dissemination of information, etc. In order to show this point, we can compare the mortality of the same economic layer with that of different regions. To use the lower layers of the population, such as families with *per capita* income of up to 1 minimum wage, could still raise doubts even if a difference in mortality was detected, given the great imbalance in income distribution. We decided therefore to do the comparison using a more affluent layer, namely the families whose income is between 2 and 3 minimum wages.

By applying the technique of "Surviving Children" proposed by Brass (1975), the mortality was calculated, $q(5)$ for both male and female and for three (3) areas:

Brazil as a whole, the northern and northeastern regions together and other regions (south, southeast and central-west). Chart 1 shows estimates of the probability of death up to age 5, *q*(5), taking as its basis the West Model Table for people of both sexes, using micro data from the National Household Sample Survey (PNAD's) for the years 2004, 2005, 2006 and 2007. The results pointed to a much higher mortality in the northeastern and northern regions (short dashed line) compared with mortality in Brazil as a whole (solid line), and another one observed in the group of the southern, southeastern and central-western regions (long dashed line), confirming the hypothesis that there are other factors associated with physical location (infrastructure, for example) that directly influence the level of specific rates. It is worth noticing that the estimated mortality for Brazil as a whole is very close to the estimated mortality for the south, southeast and central-west. This is consistent, given the larger size of the population in these areas *vis-a-vis* the other areas north and northeast.

Chart 1 – Probability of Death up to the Exact Age of 5, q(5) Estimated and Adjusted Figures Using the Surviving Children Method and the West Model Table – Household Income *Per Capita* Between 2 and 3 MW – Both Sexes – Brazil – Selected Areas – PNADS 200



Source: IBGE, micro data from PNADs 2004, 2005, 2006 and 2007

We decided therefore, to allow for the aggravation of the estimated table for the Brazilian population as a whole, rather than the aggravation of the estimated table for the poorest regions.

After determining the target population for the calculation of rates, the following databases were used:

- **For the calculation of infant mortality**: information on children born alive (FTNV) and the surviving children (FS) was used, both for male and female, and women from 15 to 49 years of age divided into 7 age groups (15-19, 20-24, 25-29, 30-34, 35-39, 40-44 and 45-49 years of age) based on data from PNAD's 2004, 2005, 2006 and 2007;
- **For the calculation of adult mortality**: the numerator for the calculation of mortality rates was the deaths of males and females in the year of 2007 by age group, gathered from the statistics of the Civil Registry. For the denominator of the mortality rate calculation the information of the counted and estimated population in 2007 for both males and females was used, according to data from the 2007 population count of the IBGE.

Methodology

The primary IBGE statistics do not allow the construction of mortality tables directly, not even for the Brazilian population as a whole. Deaths as recorded in the Civil Registry (RC) have problems of under-enumeration. Not all deaths in the country reach the RC. There are ways to estimate this type of error and correct it. To this end, a combination of some methods found in the literature was used, namely the method of "Growth Balance Equation" (UN, 1983), or the Courbage & Fargues (1979), the Preston & Coale (1980) and the Bennett & Horiuchi (1981) methods.

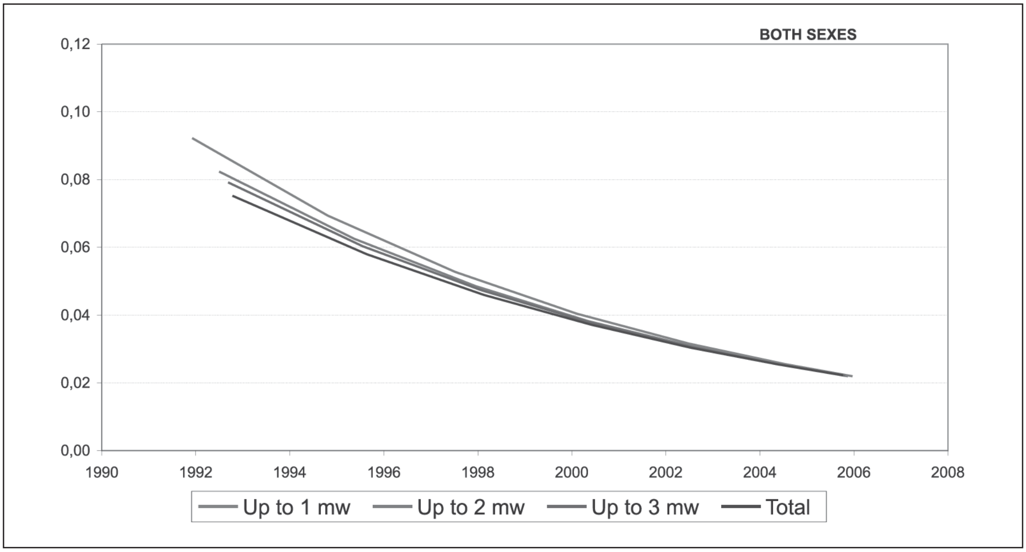
This correction cannot be used for children, since it is believed that the errors in the records of this group affect both the numerator (deaths) and the denominator (exposed population). For this group an indirect method proposed by Brass (1973, 1975) is usually used, or a variant proposed by Trussell (UN, 1983), the "Surviving Children", which directly estimates the probability of death before a certain age (usually 1 or 5 years of age, in the case of this study, 5 years of age). This method assumes that the mortality pattern of the studied population belongs to a particular family, and that at least in the range of the considered ages, this family is monotonic (rates by age among the different levels of the tables vary in only one direction). The advantage of this method is the possibility of obtaining a series of estimates of mortality with a concomitant temporal allocation of information from a single search (Census, PNAD or similar), allowing for historical trends to be inferred.

In this paper, for reasons already explained, it was decided to calculate both the statistics for families with incomes of up to 1, 2 and 3 MW over the total population and the differences found to load the table estimated by IBGE for the population as a whole. The method of surviving children, as proposed by Brass (1975), associates each age group of mothers with a "typical" age for the information concerning the children. For example, mothers with 15 to 20 years of age in the research reporting the mortality of their children led to an estimate corresponding to around 1 year of age. Mothers in the second fertile age group, those between 20 and 25 years of age, led to an estimate corresponding to around 2 years of age. Those from the third group lead to an estimate to 3 years and the forth group to 5 years of age. From this latter group onwards, the ages of children vary every 5 years, *pari passu,* according to the age group of mothers.

In any case, it is necessary that all rates refer to the same age (for instance, 1 or 5 years) in order to obtain an assessment of the evolution of mortality. In the method proposed by Brass this passage is made through an interpolation using the family model of mortality from the initial hypothesis (in the case of this study, the Brazilian Family Model).

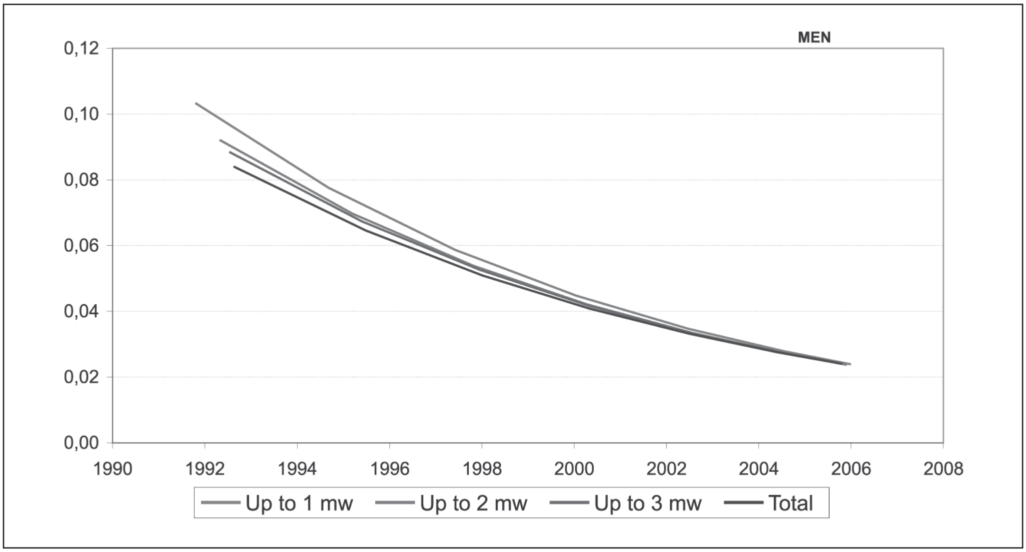
Chart 2, Chart 3 and Chart 4 show, respectively, estimates of mortality to the exact age of 5, $q(5)$, for people of both sexes, men and women, corresponding to different age groups of mothers and temporal allocations using the Brazilian Family Model (see United Nations, 1983). What is observed is that for older mothers, corresponding to older children, there is a greater difference between apparent mortality rates.

Chart 2 – Probability of Death up to the Exact Age of 5, q(5) Estimated and Adjusted Figures Using the Surviving Children Method and the Brazilian Model Table – Brazil Average PNAD 2005/07 According to Household Income *Per Capita*



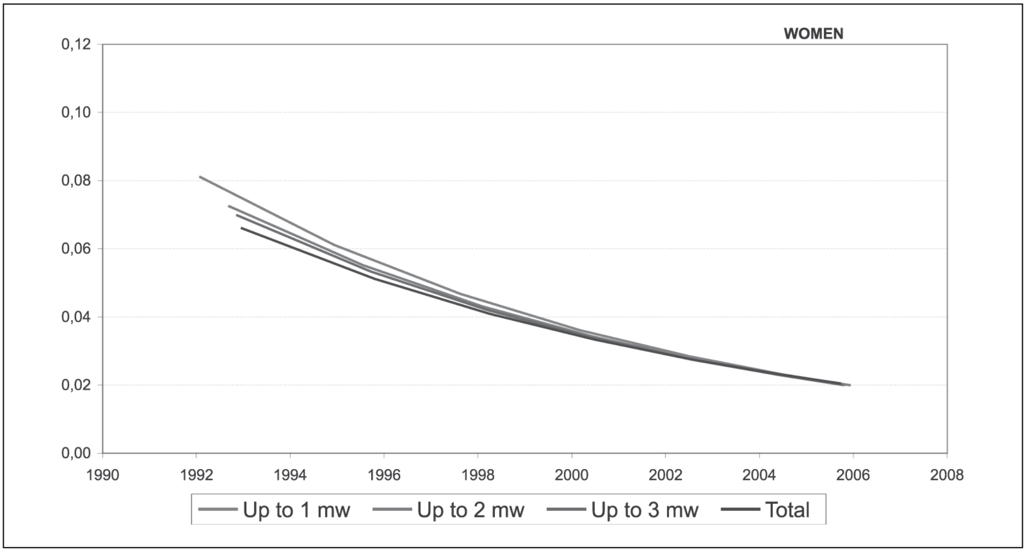
Source: IBGE, micro data from PNADs 2004, 2005, 2006 and 2007.

Chart 3 – Probability of Death up to the Exact Age of 5, q(5) Estimated and Adjusted Figures Using the Surviving Children Method and the Brazilian Model Table – Brazil Average PNAD 2005/07 According to Household Income *Per capita*



Source: IBGE, micro data from PNADs 2004, 2005, 2006 and 2007.

Chart 4 – Probability of Death up to the Exact Age of 5, q(5) Estimated and Adjusted Figures Using the Surviving Children Method and the Brazilian Model Table – Brazil Average PNAD 2005/07 According to Household Income *Per Capita*



Source: IBGE, micro data from PNADs 2004, 2005, 2006 and 2007.

Taking into account that the recent evolution of mortality in different Brazilian regions, as well as in Brazil as a whole has not met the condition of monotonicity, there is a controversy about the use of families of model-tables in general. Usually, the measures associated with the first two groups of mothers have shown a flaw related to the overthrow of the hypothesis concerning the independence of the probability of death of the child in relation to the mother's age used in the method. Furthermore, with data from the Brazilian census of 1991, only the states of Rio de Janeiro and Sao Paulo showed this behavior. In 1980, all states showed this behavior. In 2000, this feature was more frequent among different states. As available tables do not incorporate a bump due to increased mortality among young male adult (and in some states in the southeastern region to young female adults), there is also an over-estimation of infant mortality (and a corresponding underestimation of life expectancy at birth) for the children of older mothers.

Assuming that this increase in mortality has been observed for the population over 15 years of age, it is possible that the information on women of the last group not affected by this problem, would be the one of 35-40 years, which is the approximate age of 10 years old for the child. Having this mother's age group as a reference, estimates would incorporate differences related to deaths by external causes and it would be expected that differences between social classes were increased. Since the method estimates figures for different ages and different points in time, it is possible, in the event of little changes in the relative position of the target population (family income below 1, 2 or 3 minimum wages) and of the total population, to obtain an estimate for the difference between the mortality of the two populations for groups less affected by external causes, such as the average of the difference between rates of the first groups which would be more precise than any of the individual estimates corresponding to a particular age group of mothers.

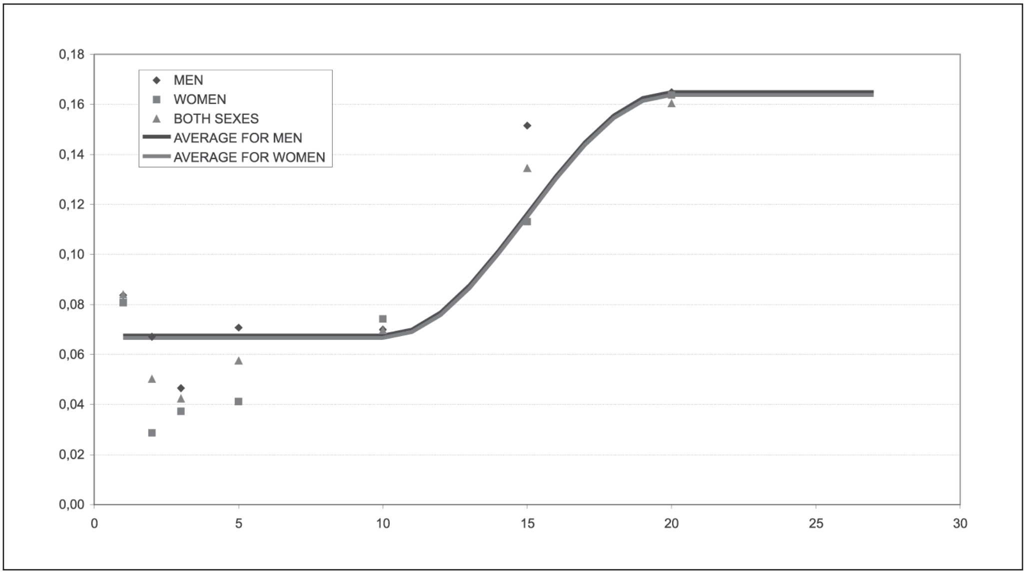
Chart 5 and Chart 6 show the difference between the logits of the probability of death up to the exact age of 5, q(5), of the total population and that with a family income *per capita* of less than 1 (one) and two (2) minimum wages respectively. The x-axis presents the information on the original age of the method. These charts also show the average value corresponding to the estimates related to children up to 10 years of age (five first estimated ages: 1, 2, 3, 5 and 10 years old). The estimate of the first level was made by eliminating only those observations known to have a bias due to mortality from external causes, corresponding to the children of older mothers. This information was incorporated in the transition to a bigger difference for children with 20 years of age and more. These differences will be used as the aggravation of the table, of the population as a whole, to obtain the tables of target populations.

Chart 5 shows the average value of the differences of logits of the estimates for the target population with *per capita* income of up to 1 minimum wage and the population as a whole for the lowest age groups. This difference was equal to 0.0676 for men and 0.0666 for women. The difference from 20 years of age onwards goes, for men and women, to 0.1649 and 0.1638, respectively.

Chart 6 shows the corresponding value for the target population with family income *per capita* of up to 2 minimum wages and for the population as a whole. This difference for the lowest age groups was equal to 0.0290 for men and 0.0330 for women. The difference from 20 years of age onwards goes to 0.0796 and 0.0836, for men and women respectively.

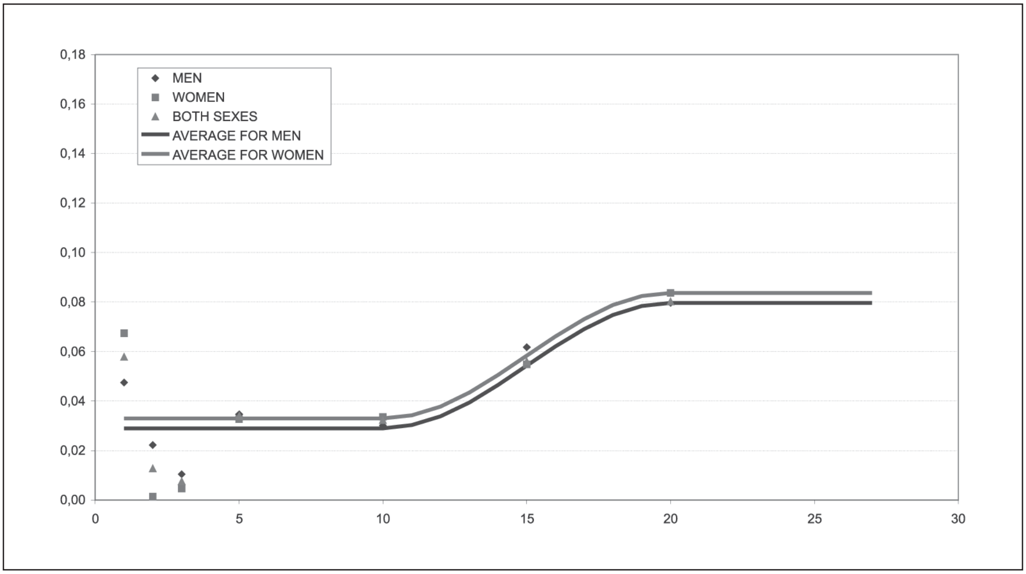
As for Graph 7, it shows the average value of differences in the estimate logits for the target population with per capita income of up to 3 minimum wages and for the population as a whole. This difference for the lowest age groups was equal to 0.0167 for men and 0.0203 for women. The difference from 20 years of age onwards goes to 0.0510 and 0.0546, for men and women respectively.

Chart 5 – Difference Between the Estimate Logits of Mortality up to the Exact Age of 5 for the Total Population and the Population with Family Income *Per Capita* of up to 1 Minimum Wage – by Gender and Age



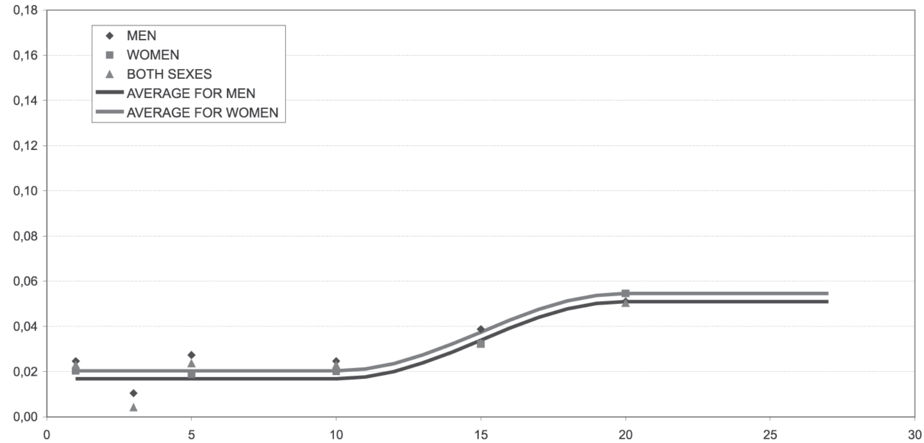
Source: IBGE, micro data from PNADs 2004, 2005, 2006 and 2007.

Chart 6 – Difference Between the Estimate Logits of Mortality up to the Exact Age of 5 for the Total Population and the Population with Family Income *Per Capita* of up to 2 Minimum Wages – by Gender and Age



Source: IBGE, micro data from PNADs 2004, 2005, 2006 and 2007.

Chart 7 – Difference Between the Estimate Logits of Mortality up to the Exact Age of 5 for the Total Population and the Population with Family Income *Per Capita* of up to 3 Minimum Wages – by Gender and Age



Source: IBGE, micro data from PNADs 2004, 2005, 2006 and 2007.

From the information on the corrected number of deaths, infant mortality and population at risk it is then possible to calculate a table for the population as a whole. As already mentioned, deaths are not reported together with the income, and it is necessary to perform an aggravation of the table estimated for the population as a whole to obtain a table for the sub-groups in question: population with *per capita* family income of up to 1 (one), 2 (two) or three (3) minimum wages.

The aggravation was made from the dimensioning of the level parameter (αs) and assuming that the shape parameter (βs) would be equal to the unity in the logit equation, in relation to the table of Brazil as a whole built by the IBGE for 2007 (IBGE, 2008):

- For those who earn up to 1 minimum wage:

$$\text{logito}\,(q_s^1 x)) = \alpha_{x,s}^1 + \text{logito}(q_s^p(x))$$

- For those who earn up to 2 minimum wages:

$$\text{logito}\,(q_s^2 x)) = \alpha_{x,s}^2 + \text{logito}(q_s^p(x))$$

- For those who earn up to 3 minimum wages:

$$\text{logito}\,(q_s^3 x)) = \alpha_{x,s}^3 + \text{logito}(q_s^p(x))$$

Where:
$q_s^1(x)$ is the adjusted rate of mortality for the target population, with family income *per capita* of less than 1 minimum wage, age *x* and sex *s*;
$q_s^2(x)$ is the adjusted rate of mortality for the target population, with family income *per capita* of less than 2 minimum wages, age *x* and sex *s*;
$q_s^3(x)$ is the adjusted rate of mortality for the target population, with family income *per capita* of less than 3 minimum wages, age *x* and sex *s*;
$q_s^p(x)$ is the adjusted rate of mortality for the Brazilian population as a whole, sex *s*, age *x*; and
$\alpha_{x,s}^i$ is the difference of the logits of individuals in the target population with per capita income of up to *i* MW and in the total population with sex *s* and age *x*.

The Reversion of the logit formula provides an adjustment for the mortality rate between exact ages from the equation:

$$q_s^1(x) = 1 - \frac{1}{1 + \exp\left[\text{logito}\left(q_s^p(x)\right) + \alpha_{x,s}^1\right]},$$

$$q_s^2(x) = 1 - \frac{1}{1 + \exp\left[\text{logito}\left(q_s^p(x)\right) + \alpha_{x,s}^2\right]} \text{ and}$$

$$q_s^3(x) = 1 - \frac{1}{1 + \exp\left[\text{logito}\left(q_s^p(x)\right) + \alpha_{x,s}^3\right]}.$$

One problem that arises is the estimation of mortality for ages above 80 years old, since the table for the Brazilian population published by the IBGE is limited to this age. In order to extend it to older individuals, we chose a parametric approach by adjusting the rates published by the IBGE to the formulation proposed by Heligman & Pollard (1975):

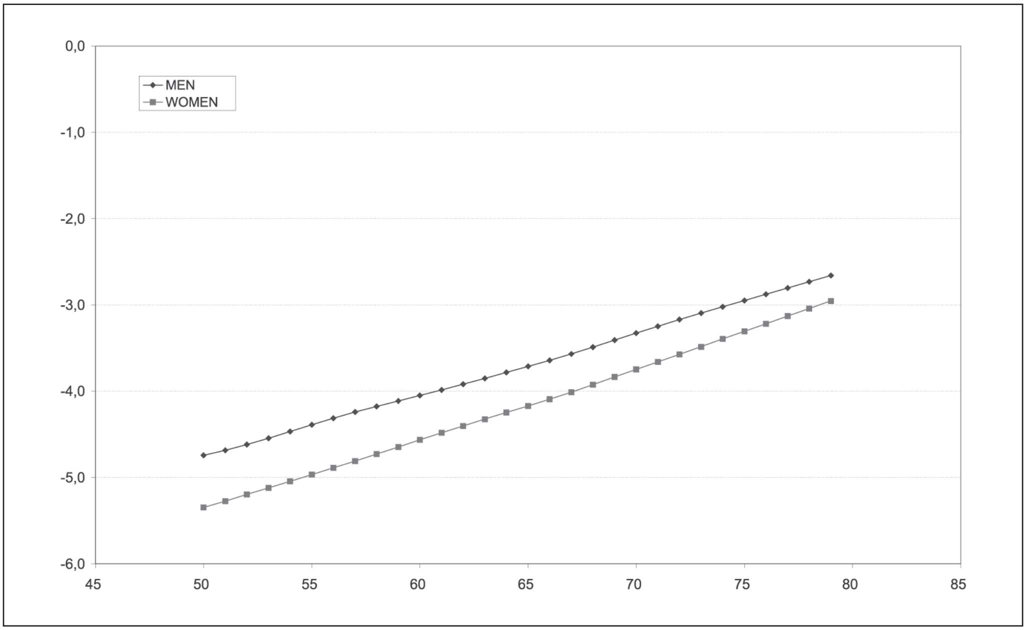
$$q_s(x) = A^{(x+B)^C} + De^{-E(\ln x - \ln F)^2} + \frac{GH^x}{(1+KGH^x)}.$$

Bearing in mind that our problem is restricted to advanced ages, for this extrapolation is sufficient to use a simplified model that does not take into account the infant mortality nor the bump due to mortality by external causes:

$$q_s(x) = D + \frac{GH^x}{(1+KGH^x)}.$$

Chart 8 shows the logarithm of probability between exact ages x and x +1 for the table estimated by IBGE for the Brazilian population as a whole for the year 2007. In this excerpt, this probability basically appears as a straight line and the estimate of the parameters D, G and H for any range between 50 and 80 years results in similar figures. The estimate for these parameters, considering the interval [69, 79] is in Table 2. From these estimates, the parameter *K* was calculated to reproduce the value of *T*(*x*) as found in the published table[2]. This value is the last line of the same table. Using these parameter figures and the model Heligman & Pollard, it was possible to extend the mortality rate for ages above 80 old.

Chart 8 – Logarithm of the Probability of Deaths Between the Exact Ages x to x +1, by Gender – Brazil – 2007



Source: IBGE, micro data from PNADs 2004, 2005, 2006 and 2007.

[2] See section "Results Obtained" for definition of the functions of the mortality table.

Table 2 – Estimated parameters for the Heligman & Pollard model for the Brazilian population as a whole – 2007

	Men	**Women**
G	0,0001945	0,0000488
H	1,0774	1,0923
D	0,011077	0,005149
K	2,759526196	2,101599165

Results Obtained

This section presents the results obtained in the form of main functions of the mortality tables and shows graphs corresponding to the target populations. Numerical data are presented in the Appendix. Table 4 lists a summary of the functions presented.

Probability of Death between the Exact Ages x and $x+n$ $({}_nq_x)$

Description: It represents the probability of a person with the exact age x dying within n years after his/her birthday, i.e. before reaching $x+n$ years of age.

It can be calculated from the equation:

$$ {}_nq_x = \frac{l_x - l_{x+n}}{l_x} = \frac{{}_nd_x}{l_x}. $$

In the particular case of n=1, the notation may also be simplified to:

$$ q_x = \frac{l_x - l_{x+1}}{l_x} = \frac{d_x}{l_x}. $$

In the particular case of x=0, the notation gives the probability of death before the n-th birthday,

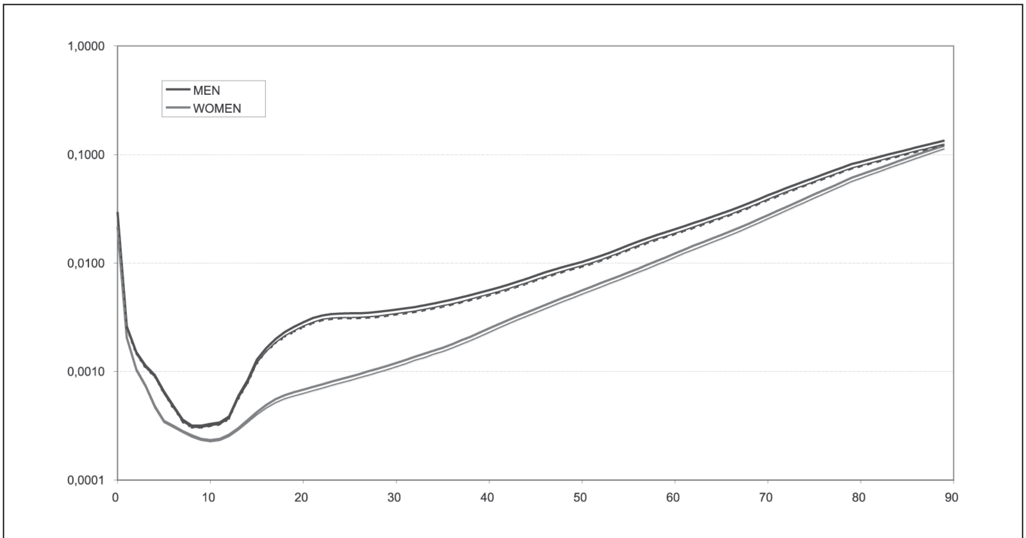
$$ {}_nq_0 = \frac{l_0 - l_n}{l_0} = \frac{{}_nd_0}{l_0}. $$

For n=1 and x=0, we have the infant mortality rate

$$ q_0 = \frac{l_0 - l_1}{l_0} = \frac{d_1}{l_0}. $$

One of the foundations of a table of survival is this set of death probabilities ${}_nq_x$. A summarized table, usually employs five-year groupings, i.e., n = 5. As for a complete table, individual ages, i.e., *n*=1 are used. Chart 9 shows the specific rate of mortality between exact ages *x* and *x+1* for the Brazilian population with *per capita* income of up to 1 (one) mw, with bold solid lines, two (2) minimum wages, with solid lines and 3 (three) times the minimum wage, with dotted lines, according to gender (men and women in blue in red). The male rates always have higher figures than female rates and a prominent bump for young adults (aged from 15 to 40 years), and this bump is explained by external causes. These deaths due to external cause include homicides, suicides, accidents by transportation, etc. Among women, the bump is only suggested and typically occurs in younger ages. As might be expected, mortality rates are consistently lower for individuals with higher income.

Chart 9 – Probability of Death Between Exact Ages x and x+1 By Gender – *Per Capita* Income of up to 1 MW (Bold Solid Line), 2 MW (Solid Line) and 3 MW (Dotted Line) – Brazil – 2007



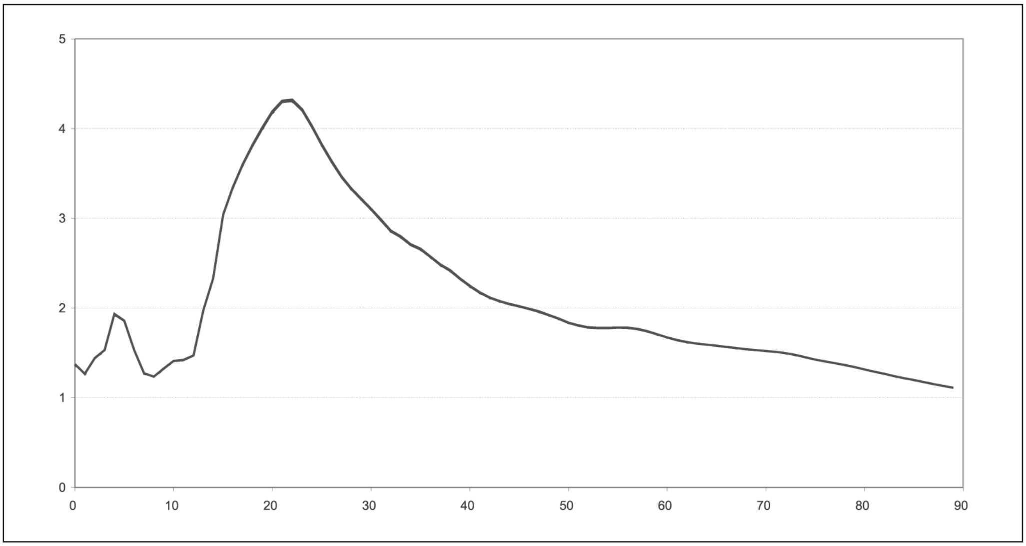
Source: IBGE, 2009

Chart 10 shows the male over-mortality[3] for target populations: *per capita* income of up to 1, 2 and 3 minimum wages. The form is the expected one, with figures always greater than unity and with a larger differential for young adults, reaching 4.32 for the

3 Ratio between male (numerator) and female (denominator) mortality rates.

age of 22 years for those with *per capita* income of up to 1 MW and 4.30 for the same age, in the case of those with *per capita* income of up to 2 and 3 MW.

Chart 10 – Male Over-Mortality *Per Capita* Income of up to 1 MW (Bold Solid Line), 2 MW (Solid Line) and 3 MW (Dotted Line) – Brazil – 2007



Fonte: Elaborado pelos autores.

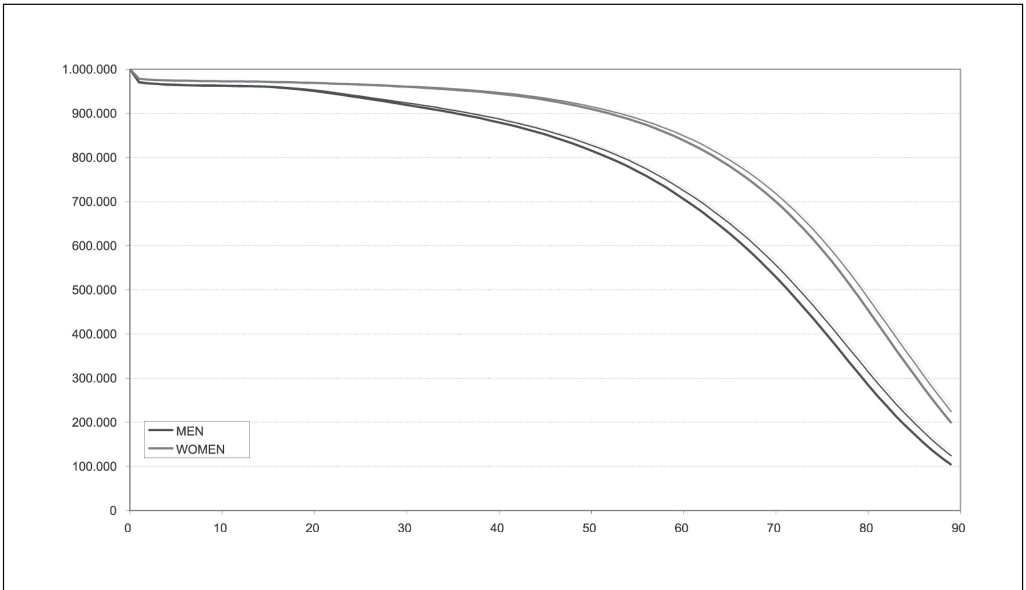
Survivors at the Exact Age x (l_x)

Description: It represents the number of people who reach the exact age x with life, i.e. they reach his/her x-th birthday, coming from an initial group l_0, called the root of the table (or root of a table of survival). This root is usually 100,000, 1,000,000 or another multiple of 10, to facilitate interpretation. The tables usually begin with age 0, but can start at older ages. For example, if the group under observation is composed of workers, it is common that the table begins with 18 or 20 years of age. It is worth noticing that l_x, as a function of age, is monotonically decreasing. It can be calculated from the equation:

$$l_{x+n} = l_x * (1 - {}_nq_x) = l_x - {}_nd_x .$$

Chart 11 presents the information on l_x for men and women of the population of up to 1 (solid line in bold), 2 (solid line) and 3 (dashed line) MW. Considering that women have lower mortality rates than men, the women's l_x curve is consistently higher than that of men, for all ages considered. The l_x curve for individuals with higher incomes is consistently higher than those for lower income.

Chart 11 – Survivors at the Exact Age *x* – Population With Root *l*(0) = 1,000,000 by Gender – *Per Capita* Income of up to 1 MW (Solid Bold Line), 2 MW (Solid Line) and 3 MW (Dashed Line) – Brazil – 2007



Source: IBGE, 2009

Deaths between the Exact Ages *x* and *x+n* ($_nd_x$)

Description: It represents the number of deaths among people that reached the exact age *x* with life and who die in the next *n* years, i.e. before reaching *x*+*n* years. It can be calculated from the equation:

$$_nd_x = l_x - l_{x+n} \text{ or from } {}_nd_x = l_x * {}_nq_x .$$

In the particular case of *n*=1, the notation can be simplified to

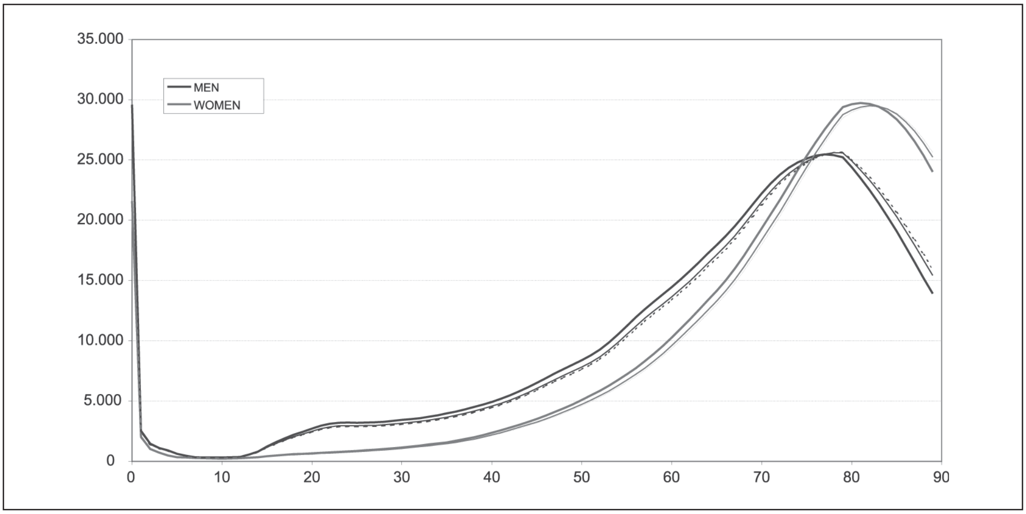
$$d_x = {}_1d_x = l_x - l_{x+1} .$$

Notice that for any exact age x, the total number of individuals of this age in the group under observation, l_x, must be equal to deaths at all ages equal to or higher than x, i.e.,

$$l_x = \sum_{k=x}^{\omega} d_x.$$

See Chart 12 for graphical representation of the function d_x for the target population by gender and income group. At ages less than 75/76 years, the chart shows more male deaths. From this age, with the decrease of population exposed, more female deaths begin to be observed.

Chart 12 – Number of Deaths Between Exact Ages x and x+1 – Population with Root l(0) = 1,000,000 by Gender – *Per Capita* Income of up to 1 MW (Solid Bold Line), 2 MW (Solid Line) and 3 MW (Dashed Line) – Brazil – 2007



Source: IBGE, 2009

Probability of Survival between the Exact Ages *x* e *x+n* ($_np_x$)

Description: It represents the probability that a person with the exact age x will survive n years from his/her birthday, i.e., until he/she completes $x+n$ years. Given that each individual in the l_x group survives or dies at age $x+n$, necessarily the sum of the two functions must be equal to the unit. It can be calculated from the equation:

$$_np_x = \frac{l_{x+n}}{l_x} = 1 - {}_nq_x\,.$$

In the particular case of n=1, the notation is:

$$p_x = \frac{l_{x+1}}{l_x} = 1 - q_x .$$

In the particular case of x=0, the probability of survival until the n-th birthday is obtained from the equation:

$$_n p_0 = \frac{l_n}{l_0} = 1 - {}_n q_0 .$$

For any age x and n=0, $_0 p_x = 1$ and for any age x and n=ω-x, we have:

$$_{\omega - x} p_x = 0 .$$

An interesting property of the survival function is the accumulation:

$$_n p_x * {}_m p_{x+n} = \frac{l_{x+n}}{l_x} * \frac{l_{x+n+m}}{l_{x+n}} = \frac{l_{x+n+m}}{l_x} = {}_{n+m} p_x ,$$

a property not shared with the probability of death.

Time Lived between Ages x and $x+n$ Years, or Equivalent, in a Stable Population, People with Age between x Years (Inclusive) and $x+n$ Years (Exclusive) ($_nL_x$)

Description: It represents the number of person-years lived by the population with exact age x in the next n years from his/her birthday, i.e., before reaching $x+n$ years. It can be calculated from the equation:

$$_n L_x = \int_x^{x+n} l_a \, da.$$

For example, in Chart 11, the value $_5L_{50}$ corresponds to the area below the l_x curve between the abscissas 50 and 55.

For almost all ages above 5 and interval size less than or equal to 5, the value of the integral can be approximated from the area of the trapezoid, i.e.:

$$_n L_x = \int_x^{x+n} l_a \, da \cong \frac{(l_x + l_{x+n})}{2} \times n \cdot$$

For the open group corresponding to ${}_{\omega\text{-}x}L_x$ and ages over 75, Ortega (1987) suggests the following formulas to estimate this magnitude:

L_{75+}	$(5{,}731+0{,}0000654*l_{75})*l_{75}$
L_{80+}	$(4{,}769+0{,}0000536*l_{80})*l_{80}$
L_{85+}	$(3{,}862+0{,}0000466*l_{85})*l_{85}$

Tables of the United Nations with the open group of 85 and + use the equation:

$$L_{85+} = l_{85} \times \ln(l_{85}).$$

Tables of Coale and Demeny (1966) with the open group of 80 and + estimate the value of the open group as:

$$L_{80+} = (3{,}725 + 0{,}0000625 * l_{80})* l_{80}.$$

It should be noticed that for all these tables, the root, l_0 is equal to 100,000 individuals.

Central Rate of Mortality (${}_nm_x$)

Description: It represents the probability of a person aged *x* dying within *n* years after his/her birthday, i.e., before reaching the age *x*+*n* years old. It can be calculated from the formula:

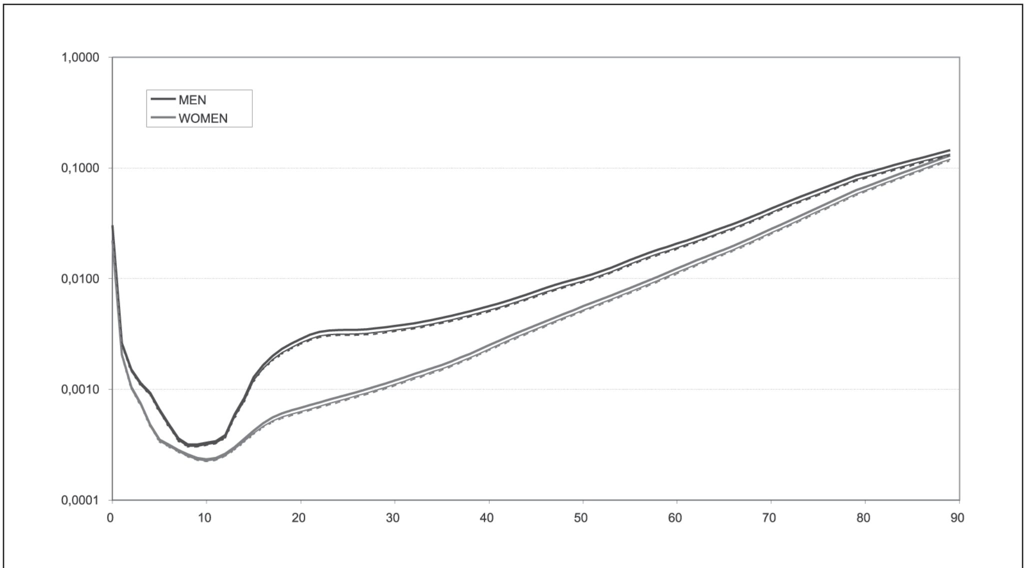
$${}_nm_x = \frac{l_x - l_{x+n}}{{}_nL_x} = \frac{{}_nd_x}{{}_nL_x}.$$

In the particular case of *n*=1, the notation can also be simplified to:

$$m_x = \frac{l_x - l_{x+1}}{{}_1L_x} = \frac{d_x}{L_x}.$$

Chart 13 shows the central rate of mortality for age *x* for the Brazilian population with *per capita* income of up to 1 (one), two (2) and 3 (three) times the minimum wage by gender. Similar to what happened to the mortality rate between exact ages, male rates have figures always higher than female rates and a prominent bump for young adults (ages between 15 and 40 years), being this bump explained by external causes. Also, here deaths due to external causes include homicides, suicides, accidents by transportation, etc. Among women, the bump is only suggested and typically occurs when they are younger. Individuals from the lowest income group (up to 1 MW) have higher rates than those with higher income.

Chart 13 – Central Rate of Mortality by Gender – *Per Capita* Income of up to 1 MW (Solid Bold Line), 2 MW (Solid Line) and 3 MW (Dashed Line) – Brazil – 2007



Source: IBGE, 2009

Time Lived between Ages *x* and *ω*, i.e. Time Lived since the Age *x* Years until the Group Extinction, or Equivalently Population with Age above *x* Years (T_x)

Description: It represents the number of person-years lived by the population with exact age x in the years following this anniversary until the total extinction of the group. It can be calculated from the equation:

$$T_x = {}_{\omega}L_x = \int_x^{\omega} l_a d \; = \sum_{a=x}^{\omega-1} L_a \; .$$

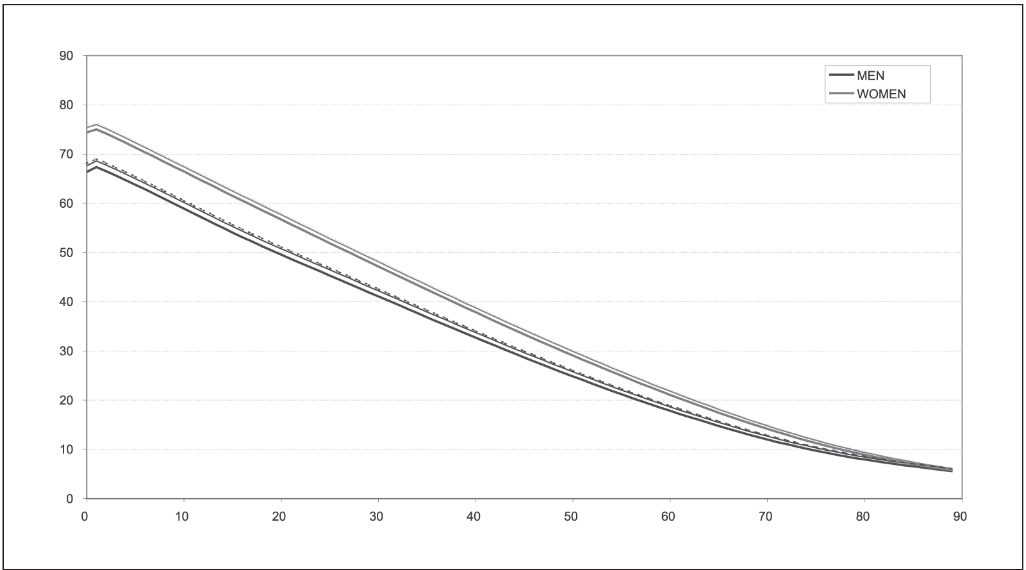
Life Expectancy at Exact Age x (e_x)

Description: It represents the average number of years lived by individuals under the group in study from the exact age *x*. It can be calculated as the ratio of the number of years lived by the population from the age *x* and the population at the same age, i.e.:

$$e_x = \frac{T_x}{l_x} = \frac{\int_x^{\omega} l_a d}{l_x} = \frac{\sum_{a=x}^{\omega} L_a}{l_x}$$

The life expectancy at exact age *x*, e_x is positively the resume function more widespread. The most known value of this function is e_o, life expectancy at birth. Chat 14 shows the expectancy of survival for the target population by gender. The gender gap in life expectancy at birth is just over 8.0 years for the population with *per capita* income of up to 1 minimum wage; just over 7.8 years for the population with *per capita* income of up to 2 minimum wages; and a little over 7.7 years for the population with *per capita* income of up to 3 minimum wages. It is worth noticing that the function is not monotonically decreasing (in the early ages).

Chart 14 – Expectancy of Survival at Exact Age *x* by Gender – *Per Capita* Income of up to 1 MW (Solid Bold Line), 2 MW (Solid Line) and 3 MW (Dashed Line) – Brazil – 2007



Source: IBGE, 2009

In order to have an idea of the relative position of the target populations *vis-a-vis* the complementary population, we present the life expectancy in Table 3 corresponding for each of the cuts. Because of the relative size of the population with less than 3 MW *per capita* (85.3%), the life expectancy of the male population with income below this threshold has a small difference (less than one year) with the population as a whole, with life expectancies of respectively 68.07 and 68.82 years. For the female population, the figures are respectively 76.20 and 76.44, also with a difference less than one year. By using a simple Rule of Three to estimate the life expectancy of the population over 3 MW *per capita* we obtain a life expectancy of 74.01 and 78.07 years respectively for men and women. The differences between the target population with the cutting of 2 MW *per capita* and the total population is a little higher. Life expectancy below and above the cut shall be respectively 67.64 and 73.26 years for men and 75.39 and 80.37 for women, a difference between life expectancies of the two groups of a little more than 5 ½ years for men and almost 5 years for women. By using the limit of 1 MW *per capita*, these differences are smaller, respectively, 5.3 and 4.4 years.

Table 3 – Life expectancy at birth for selected population group and for total population – Brazil – 2007

Population	**Male**	**Female**
Less than 1 MW *per capita*	66,35	74,38
More than 1 MG *per capita*	71,66	78,82
Less than 2 MG *per capita*	67,64	75,39
More than 2 MG *per capita*	73,26	80,37
Less than 3 MG *per capita*	68,07	75,76
More than 3 MG *per capita*	74,01	81,13
Total	**68,82**	**76,44**

Separation Factors of Age x, (${}_nf_x$ or ${}_na_x$)

Description: It represents the number of person-years lived by the population with exact age x in the following n years of his/her birthday, but died before reaching $x+n$ years. It can be calculated from the equation:

$$ {}_na_x = \frac{{}_nL_x - n * l_{x+n}}{{}_nd_x} $$

Separation factors are very important for extreme ages (or age groups), children and elderly. Usually the determination of ${}_{n}a_{x}$ is made for certain sets of model-tables. For example, Coale & Demeny suggest using, respectively, for men and women the following figures:

$$f_0 = \begin{cases} 0{,}330 & {}_1q_0 \geq 0{,}1 \\ 0{,}0425 + 2{,}875 * {}_1q_0 & {}_1q_0 < 0{,}1 \end{cases} \quad \text{e} \quad f_0 = \begin{cases} 0{,}350 & {}_1q_0 \geq 0{,}1 \\ 0{,}05 + 3{,}0 * {}_1q_0 & {}_1q_0 < 0{,}1 \end{cases}.$$

From this information the figures of the population under 1 year of age are built,

$${}_1L_0 = f_0 * l_0 + (1 - f_0) * l_1 .$$

Table 4 – Summary of the functions of the mortality table submitted

Notation	Description
l_x	Persons with the exact age *x* in the group under observation
${}_nL_x$	Persons with age between *x* (inclusive) and *x*+*n* (exclusive) in the group under observation
${}_nd_x$	Number of deaths in the observation group between ages *x* (inclusive) and *x*+*n* (exclusive)
${}_nq_x$	Probability of death in the observation group with ages between *x* (inclusive) and *x*+*n* (exclusive), given that he/she survived until the exact age *x*
${}_np_x$	Probability of survival in the observation group between ages *x* (inclusive) and *x*+*n* (exclusive), given that he/she survived until the exact age *x*
T_x	Number of person-years lived by the population under observation from the exact age *x*
e_x	Average number of years lived by an individual in the population under observation from the exact age *x*
${}_na_x$	Separation factor

Final Comments

The results obtained through this research are consistent with several studies that examined the relationship between Income × Mortality (or life expectancy or health of the individual), and others where mortality has an inverse relationship with income possibly mediated by other factors linked to the local infrastructure of sanitation and access to health services and level of information. That is, it cannot be said that a person who earns one (1) minimum wage in the northeastern and northern regions has the same expectation of survival than a person with the same income level, but residing in the southern, southeastern and center-western regions.

The tables presented have been obtained by aggravating (differentiated by gender and age) the table obtained by the IBGE for the population as a whole.

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Annex 1 – Complete Mortality Table – Male Population with Income <=1 MW

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
0	0,03033	0,181	0,02959	1.000.000	29.591	975.772	0,97577	66.353.019	66,35
1	0,00261	0,500	0,00261	970.409	2.530	969.144	0,99794	65.377.247	67,37
2	0,00151	0,500	0,00151	967.879	1.464	967.147	0,99867	64.408.103	66,55
3	0,00114	0,500	0,00114	966.415	1.100	965.865	0,99897	63.440.956	65,65
4	0,00093	0,500	0,00093	965.314	897	964.866	0,99921	62.475.091	64,72
5	0,00065	0,500	0,00065	964.417	629	964.103	0,99943	61.510.225	63,78
6	0,00048	0,500	0,00048	963.788	464	963.556	0,99958	60.546.123	62,82
7	0,00036	0,500	0,00036	963.324	347	963.151	0,99966	59.582.567	61,85
8	0,00032	0,500	0,00032	962.977	306	962.824	0,99968	58.619.416	60,87
9	0,00032	0,500	0,00032	962.671	306	962.518	0,99968	57.656.592	59,89
10	0,00033	0,500	0,00033	962.365	316	962.207	0,99967	56.694.074	58,91
11	0,00034	0,500	0,00034	962.049	327	961.886	0,99964	55.731.866	57,93
12	0,00039	0,500	0,00039	961.722	371	961.537	0,99951	54.769.981	56,95
13	0,00060	0,500	0,00060	961.351	572	961.065	0,99929	53.808.444	55,97
14	0,00083	0,500	0,00083	960.779	797	960.381	0,99894	52.847.379	55,00
15	0,00129	0,500	0,00128	959.982	1.233	959.365	0,99853	51.886.998	54,05
16	0,00165	0,500	0,00165	958.749	1.580	957.959	0,99818	50.927.633	53,12
17	0,00200	0,500	0,00200	957.169	1.914	956.212	0,99784	49.969.674	52,21
18	0,00231	0,500	0,00231	955.255	2.209	954.150	0,99755	49.013.462	51,31
19	0,00259	0,500	0,00258	953.046	2.461	951.815	0,99728	48.059.312	50,43
20	0,00285	0,500	0,00285	950.585	2.708	949.231	0,99702	47.107.497	49,56
21	0,00311	0,500	0,00310	947.877	2.942	946.406	0,99680	46.158.266	48,70
22	0,00330	0,500	0,00329	944.935	3.109	943.380	0,99666	45.211.860	47,85
23	0,00340	0,500	0,00339	941.825	3.192	940.229	0,99659	44.268.480	47,00
24	0,00343	0,500	0,00342	938.633	3.213	937.027	0,99657	43.328.250	46,16
25	0,00344	0,500	0,00343	935.421	3.208	933.817	0,99656	42.391.223	45,32
26	0,00345	0,500	0,00344	932.213	3.211	930.607	0,99654	41.457.407	44,47
27	0,00348	0,500	0,00348	929.002	3.229	927.387	0,99649	40.526.799	43,62
28	0,00355	0,500	0,00354	925.772	3.276	924.134	0,99642	39.599.412	42,77
29	0,00363	0,500	0,00363	922.496	3.347	920.823	0,99632	38.675.278	41,92
30	0,00373	0,500	0,00372	919.149	3.423	917.437	0,99623	37.754.456	41,08

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
31	0,00383	0,500	0,00382	915.726	3.499	913.976	0,99613	36.837.018	40,23
32	0,00393	0,500	0,00393	912.227	3.581	910.436	0,99600	35.923.042	39,38
33	0,00408	0,500	0,00407	908.646	3.698	906.797	0,99585	35.012.605	38,53
34	0,00423	0,500	0,00423	904.948	3.824	903.036	0,99569	34.105.808	37,69
35	0,00441	0,500	0,00440	901.124	3.966	899.141	0,99550	33.202.772	36,85
36	0,00461	0,500	0,00460	897.158	4.124	895.097	0,99530	32.303.631	36,01
37	0,00483	0,500	0,00481	893.035	4.299	890.885	0,99507	31.408.535	35,17
38	0,00507	0,500	0,00506	888.736	4.493	886.489	0,99481	30.517.649	34,34
39	0,00534	0,500	0,00532	884.243	4.706	881.890	0,99453	29.631.160	33,51
40	0,00563	0,500	0,00561	879.537	4.935	877.070	0,99423	28.749.270	32,69
41	0,00595	0,500	0,00593	874.602	5.185	872.010	0,99389	27.872.200	31,87
42	0,00631	0,500	0,00629	869.418	5.466	866.685	0,99351	27.000.190	31,06
43	0,00672	0,500	0,00669	863.952	5.784	861.060	0,99308	26.133.505	30,25
44	0,00717	0,500	0,00714	858.168	6.131	855.102	0,99261	25.272.445	29,45
45	0,00767	0,500	0,00764	852.037	6.513	848.780	0,99209	24.417.343	28,66
46	0,00820	0,500	0,00817	845.524	6.909	842.070	0,99157	23.568.562	27,87
47	0,00874	0,500	0,00870	838.615	7.295	834.968	0,99105	22.726.493	27,10
48	0,00926	0,500	0,00921	831.320	7.659	827.491	0,99053	21.891.525	26,33
49	0,00978	0,500	0,00974	823.661	8.019	819.652	0,99000	21.064.034	25,57
50	0,01033	0,500	0,01028	815.642	8.382	811.451	0,98942	20.244.382	24,82
51	0,01094	0,500	0,01089	807.260	8.787	802.867	0,98875	19.432.931	24,07
52	0,01168	0,500	0,01161	798.473	9.272	793.837	0,98795	18.630.064	23,33
53	0,01257	0,500	0,01249	789.201	9.859	784.271	0,98701	17.836.227	22,60
54	0,01359	0,500	0,01350	779.342	10.522	774.081	0,98595	17.051.956	21,88
55	0,01471	0,500	0,01461	768.819	11.229	763.205	0,98483	16.277.875	21,17
56	0,01588	0,500	0,01575	757.590	11.933	751.624	0,98367	15.514.670	20,48
57	0,01706	0,500	0,01691	745.657	12.613	739.351	0,98251	14.763.047	19,80
58	0,01823	0,500	0,01807	733.044	13.245	726.422	0,98135	14.023.696	19,13
59	0,01943	0,500	0,01924	719.800	13.848	712.876	0,98015	13.297.274	18,47
60	0,02069	0,500	0,02048	705.952	14.458	698.723	0,97885	12.584.399	17,83
61	0,02208	0,500	0,02184	691.494	15.102	683.943	0,97743	11.885.676	17,19
62	0,02360	0,500	0,02333	676.392	15.777	668.504	0,97586	11.201.733	16,56
63	0,02528	0,500	0,02496	660.615	16.492	652.369	0,97415	10.533.229	15,94
64	0,02713	0,500	0,02677	644.123	17.240	635.503	0,97230	9.880.860	15,34
65	0,02908	0,500	0,02867	626.883	17.970	617.897	0,97033	9.245.357	14,75

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
66	0,03119	0,500	0,03071	608.912	18.702	599.562	0,96814	8.627.460	14,17
67	0,03360	0,500	0,03304	590.211	19.503	580.459	0,96563	8.027.898	13,60
68	0,03638	0,500	0,03573	570.707	20.394	560.511	0,96278	7.447.439	13,05
69	0,03952	0,500	0,03875	550.314	21.327	539.650	0,95964	6.886.928	12,51
70	0,04294	0,500	0,04204	528.986	22.236	517.868	0,95627	6.347.278	12,00
71	0,04656	0,500	0,04550	506.750	23.059	495.221	0,95271	5.829.410	11,50
72	0,05039	0,500	0,04915	483.692	23.775	471.804	0,94899	5.334.189	11,03
73	0,05439	0,500	0,05295	459.917	24.354	447.739	0,94511	4.862.385	10,57
74	0,05861	0,500	0,05694	435.562	24.800	423.162	0,94100	4.414.646	10,14
75	0,06312	0,500	0,06119	410.762	25.135	398.195	0,93659	3.991.483	9,72
76	0,06801	0,500	0,06577	385.627	25.363	372.946	0,93186	3.593.289	9,32
77	0,07326	0,500	0,07067	360.264	25.460	347.534	0,92680	3.220.343	8,94
78	0,07891	0,500	0,07592	334.804	25.417	322.096	0,92138	2.872.809	8,58
79	0,08501	0,500	0,08155	309.387	25.229	296.772	0,91638	2.550.713	8,24
80	0,08974	0,500	0,08588	284.158	24.405	271.956	0,91194	2.253.941	7,93
81	0,09471	0,500	0,09043	259.753	23.490	248.008	0,90730	1.981.985	7,63
82	0,09995	0,500	0,09519	236.263	22.491	225.018	0,90244	1.733.977	7,34
83	0,10545	0,500	0,10017	213.773	21.413	203.066	0,89738	1.508.959	7,06
84	0,11121	0,500	0,10536	192.360	20.266	182.226	0,89209	1.305.893	6,79
85	0,11725	0,500	0,11076	172.093	19.060	162.563	0,88660	1.123.666	6,53
86	0,12356	0,500	0,11637	153.033	17.808	144.129	0,88090	961.103	6,28
87	0,13013	0,500	0,12218	135.225	16.522	126.964	0,87500	816.974	6,04
88	0,13698	0,500	0,12820	118.703	15.218	111.094	0,86891	690.010	5,81
89	0,14409	0,500	0,13441	103.485	13.909	96.531	0,83326	578.916	5,59
90+			1,00000	89.576	89.576	482.386		482.386	5,39

Annex 2 – Complete Mortality Table – Female Population with Income <=1 MW

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
0	0,02198	0,165	0,02158	1.000.000	21.582	981.979	0,98198	74.378.832	74,38
1	0,00206	0,500	0,00206	978.418	2.017	977.410	0,99844	73.396.854	75,02
2	0,00105	0,500	0,00105	976.401	1.025	975.889	0,99910	72.419.444	74,17
3	0,00074	0,500	0,00074	975.376	726	975.014	0,99939	71.443.555	73,25
4	0,00048	0,500	0,00048	974.651	469	974.416	0,99958	70.468.541	72,30
5	0,00035	0,500	0,00035	974.182	342	974.011	0,99967	69.494.125	71,34
6	0,00032	0,500	0,00032	973.840	307	973.686	0,99970	68.520.114	70,36
7	0,00028	0,500	0,00028	973.533	276	973.395	0,99973	67.546.428	69,38
8	0,00026	0,500	0,00026	973.257	251	973.132	0,99975	66.573.033	68,40
9	0,00024	0,500	0,00024	973.007	233	972.890	0,99976	65.599.901	67,42
10	0,00023	0,500	0,00023	972.773	227	972.660	0,99976	64.627.011	66,44
11	0,00024	0,500	0,00024	972.546	233	972.430	0,99975	63.654.351	65,45
12	0,00026	0,500	0,00026	972.313	255	972.186	0,99972	62.681.921	64,47
13	0,00030	0,500	0,00030	972.059	293	971.912	0,99967	61.709.735	63,48
14	0,00036	0,500	0,00036	971.766	346	971.592	0,99961	60.737.823	62,50
15	0,00042	0,500	0,00042	971.419	411	971.214	0,99954	59.766.231	61,52
16	0,00049	0,500	0,00049	971.009	478	970.770	0,99948	58.795.017	60,55
17	0,00056	0,500	0,00056	970.531	539	970.261	0,99942	57.824.247	59,58
18	0,00061	0,500	0,00060	969.992	587	969.698	0,99938	56.853.986	58,61
19	0,00064	0,500	0,00064	969.405	624	969.093	0,99934	55.884.288	57,65
20	0,00068	0,500	0,00068	968.781	659	968.452	0,99930	54.915.195	56,68
21	0,00072	0,500	0,00072	968.123	697	967.774	0,99926	53.946.742	55,72
22	0,00076	0,500	0,00076	967.426	737	967.057	0,99922	52.978.968	54,76
23	0,00080	0,500	0,00080	966.689	777	966.300	0,99917	52.011.911	53,80
24	0,00085	0,500	0,00085	965.911	820	965.501	0,99913	51.045.611	52,85
25	0,00090	0,500	0,00090	965.091	865	964.659	0,99908	50.080.109	51,89
26	0,00095	0,500	0,00095	964.226	914	963.769	0,99902	49.115.450	50,94
27	0,00100	0,500	0,00100	963.312	966	962.830	0,99897	48.151.681	49,99
28	0,00106	0,500	0,00106	962.347	1.022	961.836	0,99891	47.188.852	49,04
29	0,00113	0,500	0,00113	961.325	1.083	960.783	0,99884	46.227.016	48,09
30	0,00120	0,500	0,00120	960.241	1.152	959.665	0,99876	45.266.233	47,14

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
31	0,00128	0,500	0,00128	959.089	1.228	958.476	0,99867	44.306.568	46,20
32	0,00137	0,500	0,00137	957.862	1.314	957.205	0,99859	43.348.092	45,26
33	0,00145	0,500	0,00145	956.548	1.391	955.852	0,99849	42.390.887	44,32
34	0,00156	0,500	0,00156	955.157	1.489	954.412	0,99839	41.435.035	43,38
35	0,00166	0,500	0,00165	953.668	1.578	952.879	0,99828	40.480.623	42,45
36	0,00179	0,500	0,00179	952.090	1.700	951.240	0,99814	39.527.744	41,52
37	0,00194	0,500	0,00194	950.390	1.840	949.470	0,99799	38.576.505	40,59
38	0,00209	0,500	0,00209	948.550	1.981	947.560	0,99781	37.627.034	39,67
39	0,00229	0,500	0,00228	946.569	2.161	945.489	0,99761	36.679.475	38,75
40	0,00250	0,500	0,00250	944.408	2.359	943.229	0,99739	35.733.986	37,84
41	0,00273	0,500	0,00273	942.049	2.568	940.765	0,99715	34.790.757	36,93
42	0,00297	0,500	0,00297	939.481	2.789	938.086	0,99690	33.849.992	36,03
43	0,00323	0,500	0,00322	936.692	3.020	935.182	0,99664	32.911.906	35,14
44	0,00350	0,500	0,00349	933.672	3.262	932.041	0,99636	31.976.724	34,25
45	0,00379	0,500	0,00379	930.410	3.522	928.649	0,99606	31.044.683	33,37
46	0,00411	0,500	0,00410	926.888	3.802	924.987	0,99573	30.116.034	32,49
47	0,00445	0,500	0,00444	923.086	4.097	921.038	0,99538	29.191.047	31,62
48	0,00480	0,500	0,00479	918.989	4.405	916.787	0,99502	28.270.009	30,76
49	0,00519	0,500	0,00517	914.584	4.731	912.219	0,99461	27.353.223	29,91
50	0,00562	0,500	0,00560	909.854	5.096	907.306	0,99418	26.441.004	29,06
51	0,00605	0,500	0,00603	904.758	5.456	902.030	0,99373	25.533.698	28,22
52	0,00653	0,500	0,00651	899.302	5.856	896.374	0,99323	24.631.668	27,39
53	0,00705	0,500	0,00703	893.446	6.281	890.305	0,99269	23.735.295	26,57
54	0,00762	0,500	0,00759	887.165	6.734	883.797	0,99211	22.844.990	25,75
55	0,00823	0,500	0,00820	880.430	7.215	876.823	0,99148	21.961.193	24,94
56	0,00889	0,500	0,00885	873.215	7.731	869.349	0,99078	21.084.370	24,15
57	0,00963	0,500	0,00958	865.484	8.293	861.337	0,99002	20.215.021	23,36
58	0,01045	0,500	0,01039	857.190	8.907	852.737	0,98917	19.353.684	22,58
59	0,01134	0,500	0,01128	848.283	9.568	843.499	0,98824	18.500.947	21,81
60	0,01233	0,500	0,01225	838.715	10.276	833.577	0,98723	17.657.448	21,05
61	0,01339	0,500	0,01330	828.439	11.017	822.930	0,98615	16.823.871	20,31
62	0,01451	0,500	0,01441	817.422	11.776	811.534	0,98501	16.000.941	19,57
63	0,01570	0,500	0,01557	805.645	12.547	799.372	0,98381	15.189.407	18,85
64	0,01696	0,500	0,01682	793.099	13.339	786.429	0,98252	14.390.035	18,14
65	0,01832	0,500	0,01815	779.759	14.155	772.682	0,98112	13.603.606	17,45

Age (x)	${}_nM_x$	${}_na_x$	${}_nq_x$	l_x	${}_nd_x$	${}_nL_x$	${}_nP_x$	T_x	e_x
66	0,01982	0,500	0,01962	765.604	15.023	758.093	0,97955	12.830.924	16,76
67	0,02152	0,500	0,02129	750.581	15.980	742.591	0,97777	12.072.832	16,08
68	0,02347	0,500	0,02320	734.601	17.042	726.080	0,97574	11.330.241	15,42
69	0,02567	0,500	0,02534	717.559	18.185	708.467	0,97352	10.604.160	14,78
70	0,02804	0,500	0,02765	699.375	19.339	689.705	0,97112	9.895.694	14,15
71	0,03059	0,500	0,03013	680.036	20.492	669.790	0,96851	9.205.988	13,54
72	0,03343	0,500	0,03288	659.544	21.687	648.700	0,96561	8.536.199	12,94
73	0,03660	0,500	0,03594	637.857	22.924	626.395	0,96241	7.887.498	12,37
74	0,04009	0,500	0,03931	614.933	24.171	602.847	0,95892	7.261.104	11,81
75	0,04387	0,500	0,04293	590.762	25.360	578.082	0,95517	6.658.257	11,27
76	0,04794	0,500	0,04682	565.402	26.470	552.166	0,95111	6.080.175	10,75
77	0,05241	0,500	0,05107	538.931	27.524	525.169	0,94665	5.528.008	10,26
78	0,05734	0,500	0,05575	511.407	28.509	497.153	0,94177	5.002.839	9,78
79	0,06277	0,500	0,06086	482.898	29.388	468.204	0,93697	4.505.686	9,33
80	0,06754	0,500	0,06533	453.510	29.630	438.695	0,93235	4.037.482	8,90
81	0,07267	0,500	0,07013	423.880	29.725	409.018	0,92741	3.598.787	8,49
82	0,07819	0,500	0,07525	394.156	29.658	379.326	0,92213	3.189.769	8,09
83	0,08410	0,500	0,08071	364.497	29.417	349.788	0,91651	2.810.443	7,71
84	0,09043	0,500	0,08652	335.080	28.992	320.584	0,91053	2.460.654	7,34
85	0,09721	0,500	0,09270	306.088	28.375	291.901	0,90418	2.140.070	6,99
86	0,10444	0,500	0,09925	277.713	27.564	263.931	0,89746	1.848.170	6,65
87	0,11214	0,500	0,10618	250.150	26.562	236.869	0,89036	1.584.238	6,33
88	0,12033	0,500	0,11350	223.588	25.377	210.899	0,88288	1.347.370	6,03
89	0,12902	0,500	0,12120	198.210	24.024	186.198	0,83616	1.136.471	5,73
90+			1,00000	174.186	174.186	950.273		950.273	5,46

Annex 3 – Complete Mortality Table – Male Population with Income <=2 MW

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
0	0,02921	0,150	0,02850	1.000.000	28.501	975.772	0,97577	67.636.320	67,64
1	0,00251	0,500	0,00251	971.499	2.437	970.280	0,99802	66.660.548	68,62
2	0,00146	0,500	0,00146	969.062	1.410	968.357	0,99872	65.690.267	67,79
3	0,00110	0,500	0,00110	967.651	1.060	967.121	0,99901	64.721.911	66,89
4	0,00089	0,500	0,00089	966.591	864	966.159	0,99924	63.754.789	65,96
5	0,00063	0,500	0,00063	965.727	606	965.424	0,99945	62.788.630	65,02
6	0,00046	0,500	0,00046	965.121	447	964.897	0,99960	61.823.206	64,06
7	0,00035	0,500	0,00035	964.674	334	964.507	0,99967	60.858.309	63,09
8	0,00031	0,500	0,00031	964.340	295	964.192	0,99969	59.893.802	62,11
9	0,00031	0,500	0,00031	964.045	295	963.897	0,99969	58.929.610	61,13
10	0,00032	0,500	0,00032	963.750	305	963.598	0,99968	57.965.713	60,15
11	0,00033	0,500	0,00033	963.445	315	963.288	0,99965	57.002.115	59,16
12	0,00037	0,500	0,00037	963.131	355	962.953	0,99953	56.038.827	58,18
13	0,00057	0,500	0,00057	962.775	546	962.502	0,99932	55.075.874	57,21
14	0,00079	0,500	0,00079	962.229	756	961.851	0,99900	54.113.372	56,24
15	0,00121	0,500	0,00121	961.473	1.161	960.893	0,99863	53.151.521	55,28
16	0,00154	0,500	0,00154	960.312	1.477	959.574	0,99830	52.190.628	54,35
17	0,00186	0,500	0,00185	958.835	1.778	957.946	0,99801	51.231.054	53,43
18	0,00214	0,500	0,00213	957.057	2.041	956.036	0,99775	50.273.108	52,53
19	0,00238	0,500	0,00237	955.016	2.268	953.882	0,99750	49.317.072	51,64
20	0,00262	0,500	0,00262	952.748	2.493	951.502	0,99727	48.363.190	50,76
21	0,00285	0,500	0,00285	950.255	2.709	948.901	0,99706	47.411.688	49,89
22	0,00303	0,500	0,00302	947.546	2.864	946.114	0,99693	46.462.787	49,03
23	0,00312	0,500	0,00311	944.682	2.941	943.212	0,99687	45.516.673	48,18
24	0,00315	0,500	0,00314	941.741	2.960	940.261	0,99685	44.573.461	47,33
25	0,00315	0,500	0,00315	938.781	2.957	937.302	0,99684	43.633.200	46,48
26	0,00317	0,500	0,00316	935.824	2.961	934.343	0,99682	42.695.898	45,62
27	0,00320	0,500	0,00319	932.863	2.978	931.374	0,99678	41.761.554	44,77
28	0,00326	0,500	0,00325	929.884	3.023	928.373	0,99671	40.830.181	43,91
29	0,00334	0,500	0,00333	926.862	3.089	925.317	0,99662	39.901.808	43,05
30	0,00343	0,500	0,00342	923.773	3.160	922.193	0,99653	38.976.491	42,19

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
31	0,00352	0,500	0,00351	920.613	3.231	918.997	0,99644	38.054.298	41,34
32	0,00361	0,500	0,00361	917.382	3.308	915.728	0,99633	37.135.301	40,48
33	0,00375	0,500	0,00374	914.074	3.417	912.365	0,99619	36.219.573	39,62
34	0,00389	0,500	0,00388	910.657	3.535	908.889	0,99604	35.307.208	38,77
35	0,00405	0,500	0,00404	907.122	3.667	905.288	0,99587	34.398.319	37,92
36	0,00423	0,500	0,00422	903.455	3.815	901.547	0,99568	33.493.031	37,07
37	0,00443	0,500	0,00442	899.640	3.978	897.651	0,99547	32.591.483	36,23
38	0,00465	0,500	0,00464	895.662	4.159	893.582	0,99523	31.693.832	35,39
39	0,00490	0,500	0,00489	891.502	4.359	889.323	0,99498	30.800.250	34,55
40	0,00517	0,500	0,00515	887.144	4.573	884.857	0,99470	29.910.927	33,72
41	0,00546	0,500	0,00545	882.571	4.806	880.168	0,99439	29.026.069	32,89
42	0,00579	0,500	0,00578	877.765	5.070	875.230	0,99404	28.145.902	32,07
43	0,00617	0,500	0,00615	872.695	5.368	870.011	0,99364	27.270.672	31,25
44	0,00659	0,500	0,00656	867.327	5.694	864.480	0,99321	26.400.661	30,44
45	0,00705	0,500	0,00702	861.634	6.051	858.608	0,99274	25.536.180	29,64
46	0,00754	0,500	0,00751	855.582	6.424	852.370	0,99225	24.677.572	28,84
47	0,00803	0,500	0,00799	849.158	6.788	845.765	0,99177	23.825.202	28,06
48	0,00850	0,500	0,00847	842.371	7.132	838.805	0,99129	22.979.438	27,28
49	0,00899	0,500	0,00895	835.239	7.473	831.502	0,99081	22.140.633	26,51
50	0,00949	0,500	0,00944	827.766	7.818	823.857	0,99028	21.309.131	25,74
51	0,01005	0,500	0,01000	819.948	8.203	815.847	0,98966	20.485.274	24,98
52	0,01073	0,500	0,01067	811.745	8.664	807.413	0,98892	19.669.427	24,23
53	0,01155	0,500	0,01148	803.081	9.222	798.470	0,98806	18.862.014	23,49
54	0,01249	0,500	0,01241	793.859	9.853	788.933	0,98708	18.063.544	22,75
55	0,01352	0,500	0,01343	784.006	10.527	778.742	0,98605	17.274.611	22,03
56	0,01459	0,500	0,01448	773.479	11.202	767.878	0,98499	16.495.869	21,33
57	0,01568	0,500	0,01555	762.276	11.856	756.348	0,98392	15.727.992	20,63
58	0,01675	0,500	0,01662	750.420	12.469	744.186	0,98285	14.971.643	19,95
59	0,01785	0,500	0,01769	737.951	13.057	731.423	0,98174	14.227.457	19,28
60	0,01902	0,500	0,01884	724.894	13.655	718.067	0,98054	13.496.035	18,62
61	0,02029	0,500	0,02009	711.239	14.289	704.095	0,97923	12.777.968	17,97
62	0,02169	0,500	0,02146	696.951	14.956	689.472	0,97779	12.073.873	17,32
63	0,02324	0,500	0,02297	681.994	15.666	674.161	0,97621	11.384.400	16,69
64	0,02494	0,500	0,02463	666.328	16.413	658.122	0,97450	10.710.239	16,07
65	0,02674	0,500	0,02638	649.915	17.148	641.342	0,97268	10.052.117	15,47

Age (x)	${}_nM_x$	${}_na_x$	${}_nq_x$	l_x	${}_nd_x$	${}_nL_x$	${}_nP_x$	T_x	e_x
66	0,02868	0,500	0,02827	632.768	17.891	623.822	0,97067	9.410.776	14,87
67	0,03090	0,500	0,03043	614.877	18.708	605.523	0,96835	8.786.953	14,29
68	0,03346	0,500	0,03291	596.169	19.620	586.359	0,96572	8.181.430	13,72
69	0,03635	0,500	0,03570	576.550	20.583	566.258	0,96281	7.595.071	13,17
70	0,03950	0,500	0,03873	555.967	21.534	545.200	0,95970	7.028.813	12,64
71	0,04284	0,500	0,04194	534.433	22.414	523.226	0,95641	6.483.613	12,13
72	0,04637	0,500	0,04532	512.019	23.203	500.417	0,95296	5.960.387	11,64
73	0,05006	0,500	0,04884	488.816	23.872	476.880	0,94936	5.459.970	11,17
74	0,05394	0,500	0,05253	464.943	24.423	452.732	0,94555	4.983.091	10,72
75	0,05811	0,500	0,05647	440.521	24.877	428.083	0,94147	4.530.358	10,28
76	0,06262	0,500	0,06072	415.644	25.239	403.025	0,93708	4.102.276	9,87
77	0,06747	0,500	0,06527	390.406	25.482	377.665	0,93237	3.699.251	9,48
78	0,07270	0,500	0,07015	364.924	25.598	352.125	0,92733	3.321.587	9,10
79	0,07834	0,500	0,07538	339.326	25.579	326.536	0,92268	2.969.462	8,75
80	0,08271	0,500	0,07942	313.746	24.918	301.287	0,91855	2.642.926	8,42
81	0,08731	0,500	0,08366	288.828	24.163	276.747	0,91422	2.341.639	8,11
82	0,09216	0,500	0,08810	264.665	23.316	253.007	0,90969	2.064.892	7,80
83	0,09725	0,500	0,09274	241.349	22.382	230.158	0,90496	1.811.885	7,51
84	0,10259	0,500	0,09758	218.967	21.368	208.283	0,90002	1.581.727	7,22
85	0,10818	0,500	0,10263	197.599	20.280	187.459	0,89489	1.373.444	6,95
86	0,11403	0,500	0,10788	177.319	19.129	167.754	0,88955	1.185.985	6,69
87	0,12013	0,500	0,11333	158.190	17.927	149.226	0,88402	1.018.231	6,44
88	0,12649	0,500	0,11897	140.262	16.687	131.919	0,87830	869.005	6,20
89	0,13310	0,500	0,12479	123.576	15.421	115.865	0,84281	737.086	5,96
90+			1,00000	108.155	108.155	621.220		621.220	5,74

Annex 4 – Complete Mortality Table – Female Population with Income <=2 MW

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
0	0,02127	0,137	0,02088	1.000.000	20.884	981.979	0,98198	75.391.755	75,39
1	0,00200	0,500	0,00199	979.116	1.952	978.141	0,99850	74.409.776	76,00
2	0,00102	0,500	0,00102	977.165	992	976.669	0,99913	73.431.635	75,15
3	0,00072	0,500	0,00072	976.173	703	975.821	0,99941	72.454.967	74,22
4	0,00047	0,500	0,00047	975.470	454	975.243	0,99960	71.479.145	73,28
5	0,00034	0,500	0,00034	975.016	331	974.851	0,99968	70.503.902	72,31
6	0,00030	0,500	0,00030	974.685	297	974.537	0,99971	69.529.051	71,33
7	0,00027	0,500	0,00027	974.388	267	974.255	0,99974	68.554.514	70,36
8	0,00025	0,500	0,00025	974.122	242	974.000	0,99976	67.580.259	69,38
9	0,00023	0,500	0,00023	973.879	226	973.766	0,99977	66.606.259	68,39
10	0,00023	0,500	0,00023	973.653	219	973.543	0,99977	65.632.493	67,41
11	0,00023	0,500	0,00023	973.434	225	973.321	0,99976	64.658.949	66,42
12	0,00025	0,500	0,00025	973.208	245	973.086	0,99973	63.685.628	65,44
13	0,00029	0,500	0,00029	972.963	281	972.823	0,99969	62.712.542	64,46
14	0,00034	0,500	0,00034	972.682	330	972.517	0,99963	61.739.720	63,47
15	0,00040	0,500	0,00040	972.352	388	972.158	0,99957	60.767.203	62,50
16	0,00046	0,500	0,00046	971.964	449	971.740	0,99951	59.795.045	61,52
17	0,00052	0,500	0,00052	971.515	503	971.264	0,99946	58.823.305	60,55
18	0,00056	0,500	0,00056	971.012	544	970.740	0,99942	57.852.042	59,58
19	0,00059	0,500	0,00059	970.468	577	970.180	0,99939	56.881.301	58,61
20	0,00063	0,500	0,00063	969.891	609	969.587	0,99935	55.911.122	57,65
21	0,00066	0,500	0,00066	969.283	644	968.960	0,99932	54.941.535	56,68
22	0,00070	0,500	0,00070	968.638	681	968.298	0,99928	53.972.575	55,72
23	0,00074	0,500	0,00074	967.957	718	967.598	0,99924	53.004.277	54,76
24	0,00078	0,500	0,00078	967.239	758	966.860	0,99919	52.036.679	53,80
25	0,00083	0,500	0,00083	966.481	800	966.081	0,99915	51.069.819	52,84
26	0,00088	0,500	0,00087	965.681	845	965.259	0,99910	50.103.738	51,88
27	0,00093	0,500	0,00093	964.837	893	964.390	0,99905	49.138.479	50,93
28	0,00098	0,500	0,00098	963.944	945	963.471	0,99899	48.174.088	49,98
29	0,00104	0,500	0,00104	962.999	1.002	962.498	0,99893	47.210.617	49,02
30	0,00111	0,500	0,00111	961.997	1.065	961.465	0,99886	46.248.119	48,08

Age (x)	${}_nM_x$	${}_na_x$	${}_nq_x$	l_x	${}_nd_x$	${}_nL_x$	${}_nP_x$	T_x	e_x
31	0,00118	0,500	0,00118	960.932	1.135	960.364	0,99878	45.286.654	47,13
32	0,00127	0,500	0,00127	959.797	1.215	959.189	0,99870	44.326.290	46,18
33	0,00134	0,500	0,00134	958.581	1.286	957.938	0,99861	43.367.101	45,24
34	0,00144	0,500	0,00144	957.295	1.378	956.606	0,99852	42.409.162	44,30
35	0,00153	0,500	0,00153	955.917	1.460	955.187	0,99841	41.452.556	43,36
36	0,00165	0,500	0,00165	954.457	1.573	953.671	0,99828	40.497.369	42,43
37	0,00179	0,500	0,00179	952.885	1.703	952.033	0,99814	39.543.698	41,50
38	0,00193	0,500	0,00193	951.182	1.834	950.265	0,99798	38.591.665	40,57
39	0,00211	0,500	0,00211	949.348	2.001	948.348	0,99779	37.641.399	39,65
40	0,00231	0,500	0,00231	947.348	2.184	946.255	0,99759	36.693.051	38,73
41	0,00252	0,500	0,00252	945.163	2.379	943.974	0,99737	35.746.796	37,82
42	0,00274	0,500	0,00274	942.785	2.584	941.493	0,99714	34.802.822	36,91
43	0,00298	0,500	0,00298	940.201	2.798	938.802	0,99690	33.861.329	36,02
44	0,00323	0,500	0,00322	937.403	3.023	935.891	0,99664	32.922.528	35,12
45	0,00350	0,500	0,00349	934.380	3.266	932.747	0,99636	31.986.637	34,23
46	0,00379	0,500	0,00379	931.114	3.526	929.351	0,99606	31.053.890	33,35
47	0,00411	0,500	0,00410	927.588	3.801	925.688	0,99574	30.124.539	32,48
48	0,00444	0,500	0,00443	923.787	4.088	921.743	0,99540	29.198.851	31,61
49	0,00479	0,500	0,00478	919.699	4.392	917.503	0,99503	28.277.108	30,75
50	0,00518	0,500	0,00517	915.307	4.733	912.940	0,99463	27.359.605	29,89
51	0,00558	0,500	0,00557	910.574	5.070	908.038	0,99421	26.446.665	29,04
52	0,00603	0,500	0,00601	905.503	5.445	902.781	0,99375	25.538.627	28,20
53	0,00651	0,500	0,00649	900.059	5.843	897.137	0,99325	24.635.846	27,37
54	0,00703	0,500	0,00701	894.216	6.268	891.082	0,99271	23.738.708	26,55
55	0,00760	0,500	0,00757	887.947	6.720	884.587	0,99213	22.847.627	25,73
56	0,00821	0,500	0,00818	881.227	7.206	877.625	0,99149	21.963.039	24,92
57	0,00889	0,500	0,00885	874.022	7.735	870.154	0,99078	21.085.415	24,12
58	0,00964	0,500	0,00960	866.286	8.314	862.129	0,98999	20.215.261	23,34
59	0,01047	0,500	0,01042	857.972	8.939	853.502	0,98913	19.353.132	22,56
60	0,01138	0,500	0,01132	849.033	9.610	844.228	0,98820	18.499.629	21,79
61	0,01236	0,500	0,01229	839.423	10.313	834.266	0,98720	17.655.402	21,03
62	0,01340	0,500	0,01331	829.110	11.036	823.592	0,98615	16.821.135	20,29
63	0,01449	0,500	0,01439	818.074	11.772	812.187	0,98504	15.997.544	19,56
64	0,01566	0,500	0,01554	806.301	12.532	800.035	0,98384	15.185.356	18,83
65	0,01692	0,500	0,01678	793.769	13.317	787.110	0,98255	14.385.321	18,12

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
66	0,01830	0,500	0,01814	780.452	14.156	773.374	0,98110	13.598.211	17,42
67	0,01988	0,500	0,01968	766.296	15.082	758.755	0,97944	12.824.837	16,74
68	0,02168	0,500	0,02145	751.214	16.113	743.158	0,97757	12.066.082	16,06
69	0,02371	0,500	0,02343	735.102	17.227	726.488	0,97551	11.322.924	15,40
70	0,02591	0,500	0,02557	717.875	18.360	708.695	0,97329	10.596.435	14,76
71	0,02827	0,500	0,02788	699.515	19.499	689.766	0,97087	9.887.740	14,14
72	0,03089	0,500	0,03042	680.016	20.689	669.672	0,96818	9.197.974	13,53
73	0,03382	0,500	0,03326	659.327	21.930	648.362	0,96520	8.528.303	12,93
74	0,03706	0,500	0,03639	637.397	23.193	625.801	0,96196	7.879.940	12,36
75	0,04056	0,500	0,03975	614.204	24.415	601.997	0,95848	7.254.139	11,81
76	0,04433	0,500	0,04336	589.790	25.576	577.002	0,95470	6.652.142	11,28
77	0,04847	0,500	0,04732	564.214	26.699	550.864	0,95056	6.075.141	10,77
78	0,05304	0,500	0,05167	537.515	27.774	523.628	0,94601	5.524.277	10,28
79	0,05807	0,500	0,05643	509.741	28.765	495.358	0,94154	5.000.649	9,81
80	0,06250	0,500	0,06060	480.975	29.149	466.401	0,93723	4.505.291	9,37
81	0,06726	0,500	0,06507	451.827	29.401	437.126	0,93262	4.038.890	8,94
82	0,07238	0,500	0,06985	422.425	29.507	407.672	0,92769	3.601.764	8,53
83	0,07787	0,500	0,07495	392.919	29.450	378.194	0,92244	3.194.092	8,13
84	0,08375	0,500	0,08039	363.469	29.219	348.860	0,91684	2.815.898	7,75
85	0,09005	0,500	0,08617	334.250	28.803	319.849	0,91090	2.467.039	7,38
86	0,09677	0,500	0,09231	305.448	28.195	291.350	0,90460	2.147.190	7,03
87	0,10394	0,500	0,09881	277.252	27.395	263.555	0,89794	1.855.840	6,69
88	0,11157	0,500	0,10568	249.858	26.404	236.656	0,89091	1.592.285	6,37
89	0,11967	0,500	0,11292	223.454	25.231	210.838	0,84447	1.355.629	6,07
90+			1,00000	198.222	198.222	1.144.791		1.144.791	5,78

Annex 5 – Complete Mortality Table – Male Population with Income <=3 MW

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
0	0,02883	0,139	0,02813	1.000.000	28.131	975.772	0,97577	68.068.709	68,07
1	0,00248	0,500	0,00248	971.869	2.406	970.666	0,99804	67.092.937	69,03
2	0,00144	0,500	0,00144	969.463	1.392	968.767	0,99874	66.122.271	68,21
3	0,00108	0,500	0,00108	968.071	1.046	967.548	0,99902	65.153.504	67,30
4	0,00088	0,500	0,00088	967.025	853	966.598	0,99925	64.185.956	66,37
5	0,00062	0,500	0,00062	966.172	599	965.873	0,99946	63.219.357	65,43
6	0,00046	0,500	0,00046	965.573	441	965.353	0,99960	62.253.485	64,47
7	0,00034	0,500	0,00034	965.132	330	964.967	0,99968	61.288.132	63,50
8	0,00030	0,500	0,00030	964.802	291	964.657	0,99970	60.323.165	62,52
9	0,00030	0,500	0,00030	964.511	291	964.366	0,99969	59.358.508	61,54
10	0,00031	0,500	0,00031	964.220	301	964.070	0,99968	58.394.143	60,56
11	0,00032	0,500	0,00032	963.919	311	963.764	0,99966	57.430.073	59,58
12	0,00036	0,500	0,00036	963.608	351	963.433	0,99954	56.466.309	58,60
13	0,00056	0,500	0,00056	963.257	538	962.988	0,99933	55.502.877	57,62
14	0,00077	0,500	0,00077	962.719	743	962.348	0,99902	54.539.888	56,65
15	0,00118	0,500	0,00118	961.976	1.138	961.407	0,99866	53.577.540	55,70
16	0,00150	0,500	0,00150	960.839	1.444	960.116	0,99834	52.616.133	54,76
17	0,00181	0,500	0,00181	959.394	1.735	958.527	0,99806	51.656.017	53,84
18	0,00208	0,500	0,00208	957.659	1.988	956.665	0,99781	50.697.490	52,94
19	0,00231	0,500	0,00231	955.671	2.206	954.568	0,99757	49.740.825	52,05
20	0,00255	0,500	0,00254	953.465	2.425	952.252	0,99734	48.786.257	51,17
21	0,00277	0,500	0,00277	951.040	2.635	949.722	0,99715	47.834.005	50,30
22	0,00294	0,500	0,00294	948.405	2.786	947.012	0,99702	46.884.283	49,43
23	0,00303	0,500	0,00303	945.619	2.861	944.188	0,99696	45.937.271	48,58
24	0,00306	0,500	0,00306	942.758	2.880	941.318	0,99694	44.993.082	47,72
25	0,00307	0,500	0,00306	939.877	2.877	938.439	0,99693	44.051.765	46,87
26	0,00308	0,500	0,00308	937.000	2.882	935.559	0,99691	43.113.326	46,01
27	0,00311	0,500	0,00310	934.119	2.899	932.669	0,99687	42.177.767	45,15
28	0,00316	0,500	0,00316	931.220	2.942	929.749	0,99680	41.245.098	44,29
29	0,00324	0,500	0,00324	928.278	3.007	926.775	0,99672	40.315.349	43,43
30	0,00333	0,500	0,00332	925.271	3.076	923.733	0,99663	39.388.574	42,57

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
31	0,00342	0,500	0,00341	922.195	3.146	920.622	0,99654	38.464.841	41,71
32	0,00351	0,500	0,00350	919.049	3.221	917.439	0,99643	37.544.219	40,85
33	0,00364	0,500	0,00363	915.828	3.327	914.164	0,99630	36.626.781	39,99
34	0,00378	0,500	0,00377	912.501	3.442	910.780	0,99615	35.712.616	39,14
35	0,00394	0,500	0,00393	909.058	3.572	907.272	0,99598	34.801.837	38,28
36	0,00411	0,500	0,00410	905.487	3.716	903.629	0,99580	33.894.564	37,43
37	0,00431	0,500	0,00430	901.771	3.876	899.833	0,99559	32.990.936	36,58
38	0,00452	0,500	0,00451	897.895	4.053	895.868	0,99537	32.091.103	35,74
39	0,00476	0,500	0,00475	893.842	4.248	891.718	0,99512	31.195.234	34,90
40	0,00502	0,500	0,00501	889.595	4.457	887.366	0,99485	30.303.516	34,06
41	0,00531	0,500	0,00529	885.138	4.685	882.795	0,99455	29.416.150	33,23
42	0,00563	0,500	0,00561	880.453	4.943	877.981	0,99420	28.533.355	32,41
43	0,00600	0,500	0,00598	875.510	5.234	872.893	0,99382	27.655.373	31,59
44	0,00640	0,500	0,00638	870.276	5.553	867.499	0,99340	26.782.481	30,77
45	0,00685	0,500	0,00683	864.723	5.903	861.771	0,99294	25.914.982	29,97
46	0,00732	0,500	0,00730	858.819	6.268	855.686	0,99247	25.053.211	29,17
47	0,00780	0,500	0,00777	852.552	6.624	849.240	0,99200	24.197.525	28,38
48	0,00826	0,500	0,00823	845.928	6.962	842.447	0,99154	23.348.285	27,60
49	0,00873	0,500	0,00870	838.966	7.296	835.317	0,99106	22.505.839	26,83
50	0,00922	0,500	0,00918	831.669	7.635	827.852	0,99055	21.670.522	26,06
51	0,00977	0,500	0,00973	824.034	8.014	820.027	0,98995	20.842.670	25,29
52	0,01043	0,500	0,01038	816.020	8.467	811.787	0,98923	20.022.643	24,54
53	0,01123	0,500	0,01116	807.553	9.015	803.046	0,98839	19.210.857	23,79
54	0,01214	0,500	0,01207	798.538	9.635	793.721	0,98744	18.407.811	23,05
55	0,01314	0,500	0,01305	788.903	10.298	783.754	0,98644	17.614.090	22,33
56	0,01418	0,500	0,01408	778.605	10.963	773.123	0,98540	16.830.336	21,62
57	0,01524	0,500	0,01512	767.642	11.608	761.837	0,98437	16.057.213	20,92
58	0,01629	0,500	0,01615	756.033	12.214	749.926	0,98332	15.295.376	20,23
59	0,01735	0,500	0,01720	743.820	12.796	737.421	0,98224	14.545.449	19,56
60	0,01849	0,500	0,01832	731.023	13.390	724.328	0,98108	13.808.028	18,89
61	0,01973	0,500	0,01953	717.634	14.019	710.624	0,97981	13.083.700	18,23
62	0,02109	0,500	0,02087	703.615	14.683	696.274	0,97841	12.373.075	17,59
63	0,02259	0,500	0,02234	688.932	15.389	681.238	0,97686	11.676.802	16,95
64	0,02424	0,500	0,02395	673.543	16.134	665.476	0,97520	10.995.564	16,32
65	0,02599	0,500	0,02566	657.409	16.869	648.974	0,97343	10.330.089	15,71

Age (x)	${}_nM_x$	${}_na_x$	${}_nq_x$	l_x	${}_nd_x$	${}_nL_x$	${}_nP_x$	T_x	e_x
66	0,02788	0,500	0,02750	640.539	17.614	631.732	0,97147	9.681.115	15,11
67	0,03004	0,500	0,02959	622.925	18.435	613.708	0,96922	9.049.382	14,53
68	0,03253	0,500	0,03201	604.491	19.351	594.816	0,96665	8.435.674	13,96
69	0,03534	0,500	0,03473	585.140	20.321	574.980	0,96382	7.840.859	13,40
70	0,03841	0,500	0,03768	564.819	21.284	554.177	0,96079	7.265.879	12,86
71	0,04166	0,500	0,04081	543.535	22.179	532.446	0,95758	6.711.702	12,35
72	0,04509	0,500	0,04410	521.356	22.990	509.861	0,95423	6.179.256	11,85
73	0,04868	0,500	0,04753	498.366	23.685	486.523	0,95072	5.669.395	11,38
74	0,05246	0,500	0,05112	474.681	24.267	462.547	0,94701	5.182.872	10,92
75	0,05652	0,500	0,05497	450.414	24.758	438.035	0,94302	4.720.324	10,48
76	0,06091	0,500	0,05911	425.656	25.161	413.075	0,93874	4.282.290	10,06
77	0,06563	0,500	0,06355	400.494	25.451	387.769	0,93415	3.869.215	9,66
78	0,07072	0,500	0,06830	375.044	25.617	362.235	0,92923	3.481.446	9,28
79	0,07621	0,500	0,07341	349.427	25.653	336.600	0,92469	3.119.211	8,93
80	0,08047	0,500	0,07736	323.774	25.046	311.251	0,92066	2.782.610	8,59
81	0,08495	0,500	0,08149	298.728	24.344	286.556	0,91643	2.471.359	8,27
82	0,08968	0,500	0,08583	274.384	23.550	262.609	0,91201	2.184.803	7,96
83	0,09464	0,500	0,09036	250.834	22.666	239.501	0,90738	1.922.194	7,66
84	0,09984	0,500	0,09510	228.168	21.698	217.319	0,90256	1.682.693	7,37
85	0,10530	0,500	0,10003	206.471	20.653	196.144	0,89754	1.465.374	7,10
86	0,11100	0,500	0,10516	185.818	19.541	176.047	0,89232	1.269.230	6,83
87	0,11695	0,500	0,11049	166.277	18.371	157.091	0,88692	1.093.182	6,57
88	0,12315	0,500	0,11600	147.906	17.157	139.327	0,88132	936.091	6,33
89	0,12959	0,500	0,12170	130.748	15.913	122.792	0,84589	796.764	6,09
90+			1,00000	114.836	114.836	673.972		673.972	5,87

Annex 6 – Complete Mortality Table – Female Population with Income <=3 MW

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
0	0,02100	0,126	0,02063	1.000.000	20.626	981.979	0,98198	75.759.930	75,76
1	0,00197	0,500	0,00197	979.374	1.928	978.410	0,99851	74.777.951	76,35
2	0,00100	0,500	0,00100	977.446	980	976.956	0,99914	73.799.541	75,50
3	0,00071	0,500	0,00071	976.466	694	976.119	0,99942	72.822.585	74,58
4	0,00046	0,500	0,00046	975.772	448	975.548	0,99960	71.846.466	73,63
5	0,00034	0,500	0,00034	975.324	327	975.161	0,99968	70.870.918	72,66
6	0,00030	0,500	0,00030	974.997	293	974.850	0,99971	69.895.757	71,69
7	0,00027	0,500	0,00027	974.704	264	974.572	0,99974	68.920.907	70,71
8	0,00025	0,500	0,00025	974.440	240	974.320	0,99976	67.946.335	69,73
9	0,00023	0,500	0,00023	974.201	223	974.089	0,99977	66.972.015	68,75
10	0,00022	0,500	0,00022	973.977	217	973.869	0,99977	65.997.926	67,76
11	0,00023	0,500	0,00023	973.761	222	973.649	0,99976	65.024.057	66,78
12	0,00025	0,500	0,00025	973.538	242	973.417	0,99973	64.050.407	65,79
13	0,00028	0,500	0,00028	973.296	277	973.158	0,99969	63.076.990	64,81
14	0,00033	0,500	0,00033	973.020	324	972.858	0,99964	62.103.832	63,83
15	0,00039	0,500	0,00039	972.696	380	972.505	0,99958	61.130.975	62,85
16	0,00045	0,500	0,00045	972.315	439	972.096	0,99952	60.158.469	61,87
17	0,00050	0,500	0,00050	971.877	490	971.632	0,99948	59.186.373	60,90
18	0,00055	0,500	0,00055	971.386	530	971.121	0,99944	58.214.742	59,93
19	0,00058	0,500	0,00058	970.856	561	970.576	0,99941	57.243.620	58,96
20	0,00061	0,500	0,00061	970.296	591	970.000	0,99937	56.273.044	58,00
21	0,00065	0,500	0,00065	969.704	626	969.391	0,99934	55.303.044	57,03
22	0,00068	0,500	0,00068	969.078	662	968.747	0,99930	54.333.653	56,07
23	0,00072	0,500	0,00072	968.417	698	968.067	0,99926	53.364.906	55,11
24	0,00076	0,500	0,00076	967.718	737	967.350	0,99922	52.396.838	54,14
25	0,00080	0,500	0,00080	966.982	777	966.593	0,99917	51.429.488	53,19
26	0,00085	0,500	0,00085	966.204	821	965.794	0,99913	50.462.895	52,23
27	0,00090	0,500	0,00090	965.383	868	964.949	0,99907	49.497.102	51,27
28	0,00095	0,500	0,00095	964.516	918	964.056	0,99902	48.532.152	50,32
29	0,00101	0,500	0,00101	963.597	973	963.110	0,99896	47.568.096	49,37
30	0,00108	0,500	0,00108	962.624	1.035	962.106	0,99889	46.604.985	48,41

Age (x)	${}_nM_x$	${}_na_x$	${}_nq_x$	l_x	${}_nd_x$	${}_nL_x$	${}_nP_x$	T_x	e_x
31	0,00115	0,500	0,00115	961.588	1.104	961.036	0,99881	45.642.879	47,47
32	0,00123	0,500	0,00123	960.484	1.181	959.894	0,99873	44.681.843	46,52
33	0,00130	0,500	0,00130	959.303	1.251	958.678	0,99865	43.721.949	45,58
34	0,00140	0,500	0,00140	958.052	1.339	957.383	0,99856	42.763.272	44,64
35	0,00148	0,500	0,00148	956.713	1.419	956.003	0,99846	41.805.889	43,70
36	0,00160	0,500	0,00160	955.293	1.529	954.529	0,99833	40.849.886	42,76
37	0,00174	0,500	0,00174	953.764	1.655	952.937	0,99820	39.895.357	41,83
38	0,00187	0,500	0,00187	952.109	1.783	951.217	0,99804	38.942.420	40,90
39	0,00205	0,500	0,00205	950.326	1.946	949.353	0,99786	37.991.203	39,98
40	0,00224	0,500	0,00224	948.380	2.124	947.318	0,99766	37.041.850	39,06
41	0,00245	0,500	0,00244	946.256	2.314	945.099	0,99745	36.094.531	38,14
42	0,00267	0,500	0,00266	943.942	2.513	942.686	0,99722	35.149.432	37,24
43	0,00290	0,500	0,00289	941.429	2.722	940.068	0,99699	34.206.746	36,33
44	0,00314	0,500	0,00313	938.707	2.941	937.237	0,99674	33.266.678	35,44
45	0,00340	0,500	0,00340	935.766	3.177	934.178	0,99646	32.329.441	34,55
46	0,00369	0,500	0,00368	932.589	3.431	930.874	0,99617	31.395.263	33,66
47	0,00399	0,500	0,00398	929.158	3.698	927.309	0,99586	30.464.389	32,79
48	0,00431	0,500	0,00430	925.460	3.979	923.470	0,99553	29.537.080	31,92
49	0,00465	0,500	0,00464	921.481	4.275	919.343	0,99517	28.613.610	31,05
50	0,00504	0,500	0,00502	917.205	4.608	914.901	0,99478	27.694.267	30,19
51	0,00542	0,500	0,00541	912.597	4.937	910.129	0,99437	26.779.366	29,34
52	0,00586	0,500	0,00584	907.660	5.302	905.009	0,99393	25.869.237	28,50
53	0,00633	0,500	0,00631	902.358	5.691	899.512	0,99344	24.964.228	27,67
54	0,00683	0,500	0,00681	896.667	6.107	893.613	0,99292	24.064.716	26,84
55	0,00738	0,500	0,00735	890.560	6.549	887.285	0,99235	23.171.102	26,02
56	0,00798	0,500	0,00794	884.011	7.023	880.500	0,99173	22.283.817	25,21
57	0,00864	0,500	0,00860	876.988	7.541	873.217	0,99104	21.403.317	24,41
58	0,00937	0,500	0,00933	869.447	8.108	865.392	0,99028	20.530.100	23,61
59	0,01018	0,500	0,01012	861.338	8.720	856.978	0,98944	19.664.708	22,83
60	0,01106	0,500	0,01100	852.618	9.377	847.929	0,98853	18.807.729	22,06
61	0,01201	0,500	0,01194	843.241	10.067	838.207	0,98757	17.959.800	21,30
62	0,01302	0,500	0,01294	833.174	10.777	827.785	0,98654	17.121.593	20,55
63	0,01408	0,500	0,01398	822.396	11.501	816.646	0,98546	16.293.808	19,81
64	0,01522	0,500	0,01511	810.896	12.249	804.771	0,98430	15.477.162	19,09
65	0,01644	0,500	0,01630	798.647	13.022	792.136	0,98304	14.672.391	18,37

Age (x)	$_nM_x$	$_na_x$	$_nq_x$	l_x	$_nd_x$	$_nL_x$	$_nP_x$	T_x	e_x
66	0,01778	0,500	0,01763	785.625	13.849	778.701	0,98163	13.880.254	17,67
67	0,01931	0,500	0,01913	771.776	14.763	764.395	0,98002	13.101.554	16,98
68	0,02107	0,500	0,02085	757.013	15.782	749.122	0,97820	12.337.159	16,30
69	0,02304	0,500	0,02278	741.231	16.885	732.788	0,97619	11.588.037	15,63
70	0,02517	0,500	0,02486	724.346	18.008	715.342	0,97403	10.855.249	14,99
71	0,02747	0,500	0,02710	706.338	19.141	696.767	0,97168	10.139.907	14,36
72	0,03002	0,500	0,02958	687.196	20.327	677.033	0,96906	9.443.141	13,74
73	0,03287	0,500	0,03234	666.869	21.567	656.086	0,96616	8.766.108	13,15
74	0,03602	0,500	0,03538	645.302	22.832	633.886	0,96301	8.110.022	12,57
75	0,03942	0,500	0,03866	622.470	24.063	610.438	0,95962	7.476.136	12,01
76	0,04309	0,500	0,04218	598.407	25.239	585.788	0,95594	6.865.697	11,47
77	0,04711	0,500	0,04603	573.168	26.383	559.977	0,95190	6.279.910	10,96
78	0,05156	0,500	0,05027	546.786	27.485	533.043	0,94747	5.719.933	10,46
79	0,05646	0,500	0,05491	519.301	28.513	505.044	0,94312	5.186.890	9,99
80	0,06076	0,500	0,05897	490.788	28.943	476.317	0,93892	4.681.845	9,54
81	0,06540	0,500	0,06333	461.845	29.248	447.221	0,93442	4.205.529	9,11
82	0,07038	0,500	0,06799	432.598	29.411	417.892	0,92961	3.758.307	8,69
83	0,07573	0,500	0,07296	403.186	29.418	388.477	0,92448	3.340.415	8,29
84	0,08146	0,500	0,07827	373.768	29.254	359.141	0,91902	2.951.938	7,90
85	0,08759	0,500	0,08391	344.514	28.909	330.059	0,91322	2.592.798	7,53
86	0,09414	0,500	0,08990	315.605	28.374	301.418	0,90707	2.262.738	7,17
87	0,10112	0,500	0,09625	287.230	27.647	273.407	0,90056	1.961.321	6,83
88	0,10855	0,500	0,10296	259.583	26.728	246.220	0,89369	1.687.914	6,50
89	0,11645	0,500	0,11004	232.856	25.624	220.044	0,84737	1.441.694	6,19
90+			1,00000	207.232	207.232	1.221.650		1.221.650	5,90