IMPROVEMENTS IN MORTALITY RATES AMONG PEOPLE AGED 60 YEARS AND OVER, IN THE SOUTHEAST OF BRAZIL, OVER THE 1980-2000

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INTRODUCTION

The aim of this paper is to investigate the trends of the rates of mortality of the elderly living in the Southeast of Brazil, during the period 1980/2000, especially the rhythm of decline of the mortality rates and the sex differentials.

Until recent decades, the decline of the mortality rates in the advanced ages had received little attention due to the faith that the mortality in the most advanced ages could not be substantially reduced. This, however, has proved to be a debatable assumption. KANNISTO et al. (1994), studied the annual average reduction in the mortality rates in advanced ages for 27 developed countries and they observed at least three inconsistent points with the idea that the expectation of life at birth would tend to limit around 80 years.

1 - The reductions in the mortality rates in advanced ages accelerated during the whole course of the XX century, and particularly since the years 1950, consequently, if the life expectancy was approaching a limit, the declines in the mortality in advanced ages should be smaller and smaller and not bigger and bigger;

2 - The rhythm of decline of the mortality rates in the countries with low mortality has been approximately as high, in the average, as the reduction in countries with high mortality levels;

3 - The mortality rates in different countries and between men and women have not been converging the whole time. In other words, there are no indications that the levels of mortality of the different countries, and of men and women, have been converging for a final limit.

The studies involving the theme (which demands more and more importance) are scarce for developing countries, in part due to the lack of suitable or reliable information, such in the case of Brazil.

The aging process of the Brazilian population has occurred in a very accelerated path, particularly in the southeast area, the most developed region of the country, as measured by socioeconomic indicators. In 1980, the census registered 7.2 millions people aged 60 years and over, while in 2000, this number was of 14.5 millions,

duplicating its representation in the total population. In addition, in the nineties, the aged population had an annual growth rate of 3.4%, in contrast with only 1.6%, estimated for the total population.

Initially, this aging process is influenced, above all, by the reduction in the fertility levels, but as this tendency consolidates the longevity of the population also begins to play an important role. Parallel to the aging process, two phenomena are observed in relation to the Brazilian elderly population.

1 - The deaths are concentrating more and more in this segment of the population. In 1980, in the whole country, only 35% of the masculine deaths and 42% of the feminine deaths occurred among people aged 60 years and over. In 2000, that age group accounted for 49% and 64% of the deaths respectively (in the Southeast, in 2000, those proportions are of 49% and 68%, respectively).

2 - From 1980 to 2000, the life expectancy of the Brazilian population at 60 years increased and such gains were larger than those obtained by the total population.

VAUPEL (1986) shows that in an aging scenery, of concentration of the deaths in the elderly segment of the population and of increase of the expectancy of the elderly' life (as it is the Brazilian case), the reductions in the mortality rates in advanced ages become crucial in the determination of the expectancy of life of the population as well as in the determination of the volume and of the proportion of the elderly. Those same elements are decisive in the elderly quality of life and they interfere, for instance, in the planning of the system of health, and in the social security (retirement system).

The focus in the Southeast region of Brazil for which there are more reliable information, may help the throw light on the elderly process in Brazil and to subsidize the design and implementation of public polices to improve the living condition of elderly in the whole country.

METHODOLOGY

Based in KANNISTO et al. (1994) the values of the annual average reduction in mortality rate were calculated as follows.

1 – The annual age-specific central rate is given by

$$m(x,y) = \frac{D(x,y)}{N(x,y)} \qquad \textbf{(1)}$$

where D (x,y) represents the number of deaths at age *x* over the course of year *y* among men or women (the data about mortality used in this article are from the "Sistema de Informações sobre Mortalidade" – SIM, organized in Brazil by Ministério da Saúde), and N(x,y) represents the number of men or women who were *x* years old on July 1st of year *y* (the data about population in Brazil used in this article are from the census of 1980, 1991 and 2000, and the population on July 1st in each year was obtained by log-linear interpolation).

2 – The average death rate in the interval from age *x* through *x** and year y through *y** can be calculated by:

$$\overline{m}(x,x^*,y,y^*) = \frac{\sum_{j=y}^{y^*}\sum_{i=x}^{x^*} w(i)m(i,j)}{\sum_{j=y}^{y^*}\sum_{i=x}^{x^*} w(i)} \qquad \textbf{(2)}$$

The weights *w* are used to standardize the sex and age composition of the population so that comparisons can be made over time, across populations, and between sexes (in this paper we based the weights on the age composition of the elderly between 60 through 89 years in the state of São Paulo population, men and women combined, from 1980 through 2000).

$$w(i) = \frac{\sum_{y=1980}^{2000}\left(N_m(i,y) + N_f(i,y)\right)}{\sum_{x=60}^{89}\sum_{y=1980}^{2000}\left(N_m(x,y) + N_f(x,y)\right)} \quad \textbf{(3)}$$

where N_m and N_f denote men and women populations counts.

3 – The average annual rate of improvement in death rates from the first period to the second period is given by:

$$\rho = -\left(\left(\frac{\overline{m}_2}{\overline{m}_1}\right)^{1/\delta} - 1\right) \quad \textbf{(4)}$$

where δ is the interval between the means of the two periods:

$$\delta = \frac{(y_2 + y_2 * + 1)}{2} - \frac{(y_1 + y_1 * + 1)}{2} \quad \textbf{(5)}$$

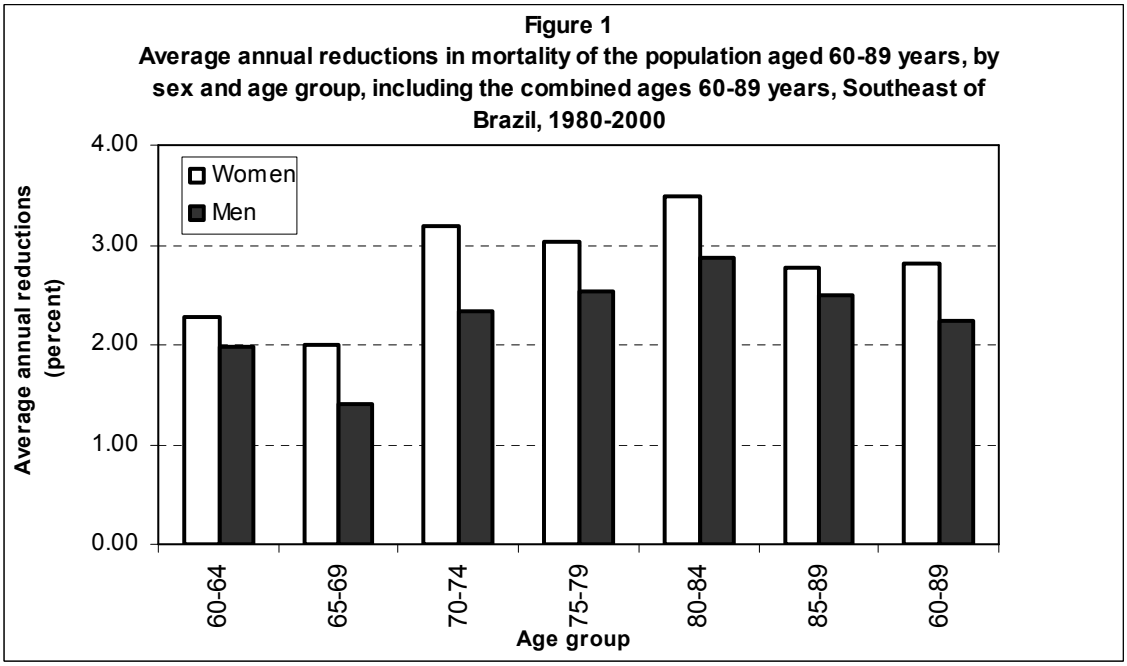
the first period running from y_1, through y_1* and the second period from y_2 through y_2*.

RESULTS

Figure 1 shows, for the Southeast of Brazil the annual average of reduction in the mortality rates of the elderly from 1980 to 2000, for sex and age groups, including the combined ages from 60 to 89 years.

From 1980 to 2000, the annual reduction in the mortality rates among the population aged 60 to 89 years, in the Southeast of Brazil, was about 2.2% for men and about 2.8% for women. The less expressive reductions were the ones of the group 65-69 years while the age group with the most expressive reductions was the 80-84 years (for both sexes).

Figure 1
Average annual reductions in mortality of the population aged 60-89 years, by sex and age group, including the combined ages 60-89 years, Southeast of Brazil, 1980-2000

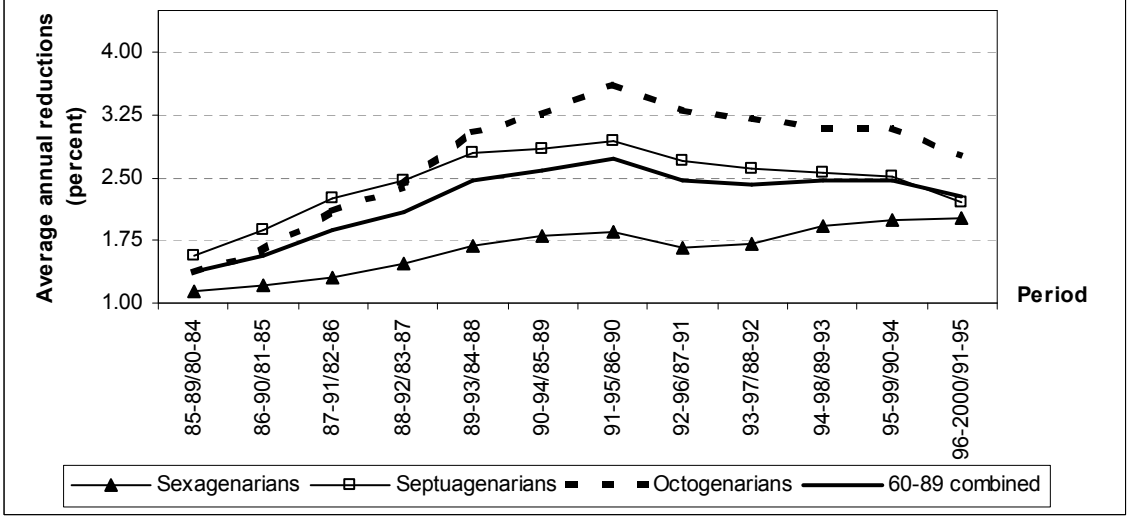


Source: CAMPOS e RODRIGUES (2004)

Figures 2 and 3 present, for the period 1980-2000, the average annual reductions in the mortality rates between successive five-years periods, for men and women sexagenarians, septuagenarians, octogenarians and for the combined ages 60-89 years.

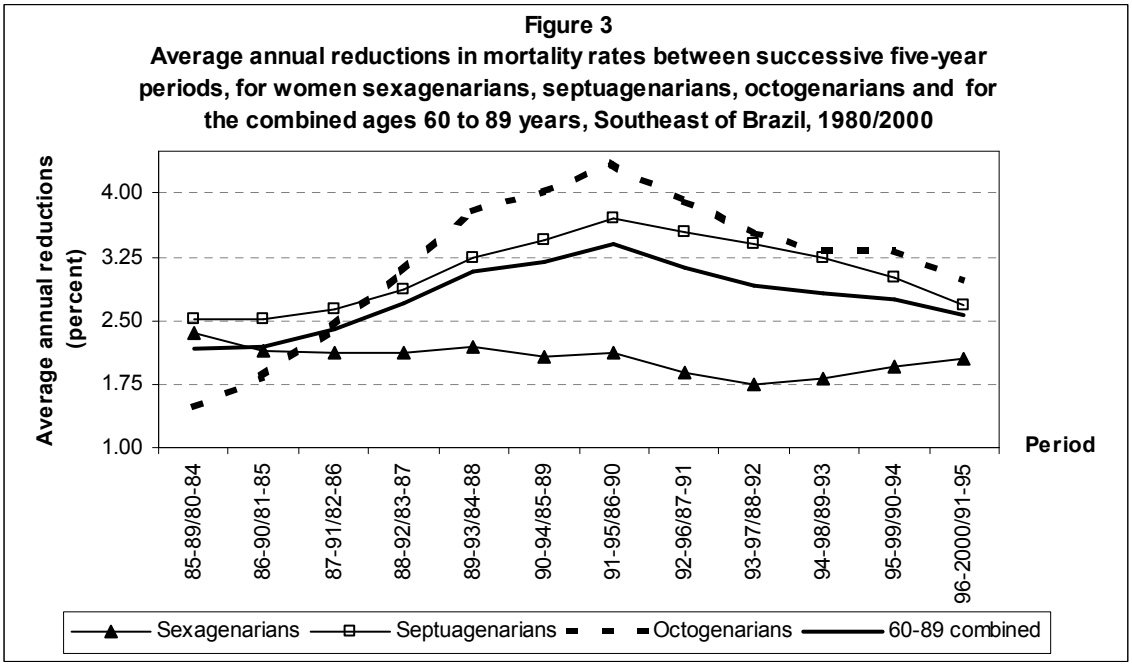
It is observed, that the octogenarians presented average reductions in the mortality rates, which were more expressive than the septuagenarians, that, for their time, presented reductions more expressive than the sexagenarians. At the end of the period, the levels of reduction of the mortality among the age groups present a certain convergence, for both sexes.

Figure 2
Average annual reductions in mortality rates between successive five-year periods, for men sexagenarians, septuagenarians, octogenarians and for the combined ages 60 to 89 years, Southeast of Brazil, 1980/2000



Source: CAMPOS e RODRIGUES (2004)

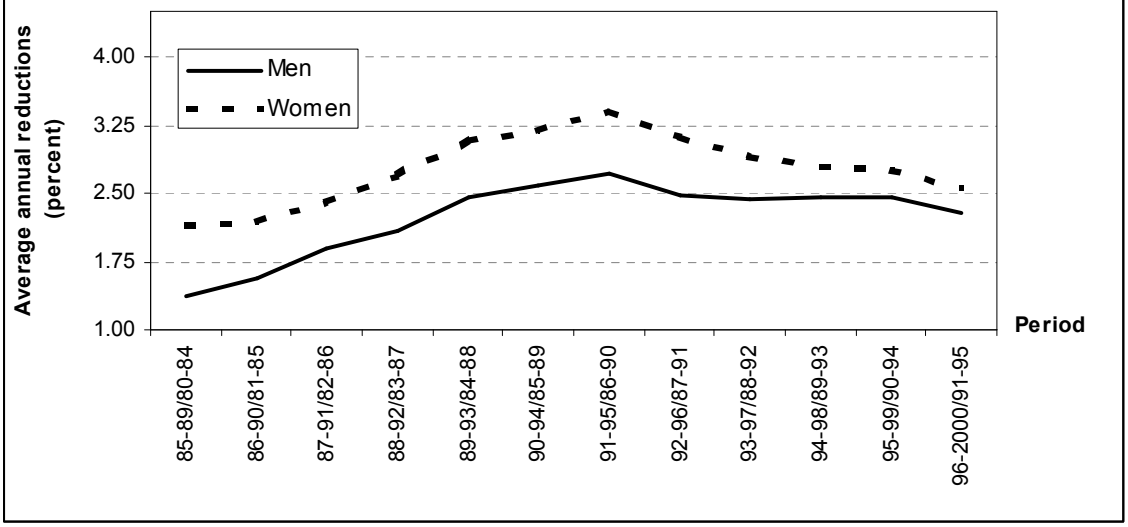
Figure 3
Average annual reductions in mortality rates between successive five-year periods, for women sexagenarians, septuagenarians, octogenarians and for the combined ages 60 to 89 years, Southeast of Brazil, 1980/2000



Source: CAMPOS e RODRIGUES (2004)

Figure 4 allows the comparison among the sexes of the average reductions in mortality rates between successive five-years periods, by sex, for the combined ages 60-89 years, in Southeast of Brazil, from 1980 to 2000. It shows that the pace of decline in higher among women than men. It can also be observed that, overall, the pace of reductions increase during the first half of the period and tends to decrease in the second half, for the both sexes.

Figure 4
Average annual reductions in mortality rates between successive five-year periods, by sex, for the combined ages 60 to 89 years, Southeast of Brazil, 1980/2000



Source: CAMPOS e RODRIGUES (2004)

CONCLUSIONS

Although the study for the Southeast of Brazil offers indicators of the decline of the mortality among the elderly, evaluating this phenomenon for the whole of Brazil can be a complex task, because the under-registration of deaths and the misreporting of age may interfere in the estimates.

The scenery of expressive reductions in the elderly mortality, more expressive reduction for octogenarians than for the "youngest-older" and the most expressive improvement for women than for men show that during the period 1980-2000 the elderly mortality in the Southeast was far from converging for a limit where future reductions would be difficult.

Even without evaluating the trends in the factors that affect the elderly mortality, there are no reasons to believe that future reductions in the elderly mortality in the Southeast of Brazil are a hypothesis to be discarded. Thus, the process of aging of the population in the region will be influenced, in the next years, not only by the reduction in the fertility levels, but also, and even more, by reductions in the elderly mortality itself.

This result raises important implications, at least in two levels:

- It is necessary that the population projections adopt strategies that take into account the reduction in the mortality among the elderly under the risk of underestimating the volume of the elderly population.

- Given that there would be space for larger reductions of the mortality among the elderly population it is necessary the adoption of health politics and social security system that guarantee appropriate life conditions for the elderly.

Studies evaluating the rhythm of decline of the mortality among the elderly should also focus the other areas of the country, in order to subsidize the population projection and the formulation of appropriate public politics.

REFERENCES

ALTMANN, A.M.G. e FERREIRA, C.E.C. A situação dos registros dos fatos vitais no Brasil. **Informe Demográfico**, n. 7, 1982, p. 1-15.

BARKER, D.J.P. et al. Growth in utero, blood pressure in childhood and adult life, and mortality from cardiovascular disease. **British Medical Journal**, v. 298, n. 6.673, March, 1989, p. 564-567.

BENGTSSON, T. e LINDSTRÔM, M. Childhood misery and disease in later life: the effects on mortality in old age of hazards experienced in early life, southern Sweden, 1760-1894. **Population Studies**, v. 54, n. 3, 2000, p. 263-277.

BERKMAN, L.F. e SYME, S. L. Social networks, host-resistance, and mortality: a nine-year follow–up study of Alameda Country residents. **American Journal of Epidemiology**, v. 109, n. 2, 1979, p. 186-204.

CAMARANO, A.A. **Envelhecimento da população brasileira**: uma contribuição demográfica. Rio de Janeiro: IPEA, 2002. 26p. (Texto para Discussão, n. 858).

CAMBOIS, E., ROBINE, J. e HAYWARD, M.D. Social inequalities in disability-free life expectancy in French male population, 1980-1991. **Demography**, v. 38, n. 4, Nov. 2001, p. 513-524.

CAMPOS, N.O.B.; RODRIGUES, R.N. Ritmo de declínio nas taxas de mortalidade dos idosos nos estados do Sudeste, 1980-2000. Revista Brasileira de Estudos de População, Campinas, v.21, n.2, p.323-342, jul./dez. 2004.

CHRISTENSON, B.A. e JOHNSON, N.E. Educational inequality in adult mortality: an assessment with death certificate data from Michigan. **Demography**, v. 32, n. 2, May 1995, p. 215-229.

COALE, A.J. e KISKER, E.E. Mortality crossovers: reality or bad data? **Population Studies**, v. 40, n. 3, Nov. 1986, p. 389-401.

COSTA, D.L. Understanding the twentieth-century decline in chronic conditions among older men. **Demography**, v. 37, n. 1, Feb. 2000, p. 53-72.

CRIMMINS, E.M., HAYWARD, M.D. e SAITO, Y. Changing mortality and morbidity rates and the health status and life expectancy of the older population. **Demography,** v. 31, n. 1, Feb. 1994, p. 159-175.

DATASUS. **Dados de declaração de óbito do Sistema de Informação sobre Mortalidade (SIM)**. Brasília: Ministério da Saúde (Disponível em CDs-ROM).

DECHTER, A.R. e PRESTON, S.H. Age misreporting and its effects on adult mortality estimates in Latin America. **Population Bulletin of the United Nations**, ns. 31/32, 1991, p. 1-17.

DOBLHAMMER, G. Reproductive history and mortality later in life: a comparative study of England and Wales and Austria. **Population Studies**, v. 54, n. 2, Jul. 2000, p. 169-176.

ENSP/FIOCRUZ/FENSPTEC. **Projeto carga de doença**. 2002 (Relatório final do projeto Estimativa da carga de doença do Brasil. FENSPTEC – Tecnologia em saúde para Qualidade de Vida, outubro de 2002)

FOGEL, R.W. The relevance of Malthus for the study of mortality today: long-run influences on health, mortality, labour-force participation and population growth. In: LINVIDAL, K. e LANDBERG, H. (eds.), **Population, economic development and the environment**. The making of our common future. Oxford: Oxford University Press, 1994, p. 231-284.

FREEDMAN, V.A. e MARTIN, L. The role of education in explaining and forecasting trends functional limitations among older Americans. **Demography**, v. 36, n. 4, Nov. 1999, p. 461-473.

FRIDLIZIUS, G. The mortality decline in the first phase of the demographic transition: Swedish experiences. In: BENGTSSON, T., FRIDILIZIUS, G. e OHLSSON, R. (eds.), **Preindustrial population change**. Lund: Studentlitteratur, 1984, p. 71-114.

FUNDAÇÃO NACIONAL DE SAÚDE/CENEPI – Centro Nacional de Epidemiologia. **Banco de dados dos sistemas de informação sobre mortalidade (SIM) e nascidos vivos (SINASC) – 1996-2000**. Brasília: Ministério da Saúde (disponível em CDs-ROM).

HAKKERT, R. **Fontes de dados demográficos**. Belo Horizonte: ABEP, 1996. 71p. (Textos Didáticos, n. 3).

HUMMER, R.A., ROGERS, R.G. e EBERSTEIN, I.W. Sociodemographic differentials in adult mortality: a review of analytic approaches. **Population and Development Review**, v. 24, n. 3, Sept. 1998, p. 553-578.

HUMMER, R.A., ROGERS, R.G., CHARLES, B.N. e CHRISTOPER, E. Religious involvement and U.S. adult mortality. **Demography**, v. 36, n. 2, May 1999, p. 273-285.

IBGE. **Censo demográfico do Brasil**. Rio de Janeiro: IBGE, 1980, 1991 e 2000.

IBGE. **Tendências demográficas**: uma análise dos resultados do universo do Censo Demográfico 2000. Rio de Janeiro: IBGE, 2002. 63p. (Estudos e Pesquisas Informação Demográfica).

IBGE/DPE/DEPI. Departamento de População e Indicadores Sociais. Divisão de Estudos e Análises da Dinâmica Demográfica. **Projeto UNFAPA/BRASIL (BRA/98/PO8) – Sistema integrado de projeções e estimativas populacionais e indicadores sociodemográficos**. Rio de Janeiro: IBGE.

IBGE/DPE/DEPI. Departamento de População e Indicadores Sociais. Divisão de Estudos e Análises da Dinâmica Demográfica. **Tábua completa de mortalidade para o ano 2000 e evolução da esperança de vida ao nascer nos anos 90**. Rio de Janeiro: IBGE, 2003. Disponível em: <http://www.ibge.gov.br>. Acesso em: jan. 2004.

JARVIS, G.K. e HERBERT, C.N. Religion and differences in morbidity and mortality. **Social Science and Medicine**, v. 25, n. 7, 1987, p. 813-824.

KANNISTO, V., LAURITSEN, J., THATCHER, A.R. e VAUPEL, J.W. Reductions in mortality at advanced: several decades of evidence from 27 countries. **Population and Development Review**, v. 20, n. 4, Dec. 1994, p. 793-810.

KRAVDAL, O. Social inequalities in cancer survival. **Population Studies**, v. 54, n. 1, Mar. 2000, p. 1-18.

LAUDERDALE, D.S. Education and survival: birth cohort, period, and age effects. **Demography**, v. 38, n. 4, Nov. 2001, p. 551-561.

LEE, R. e MILLER, T. Evaluating the performance of the Lee-Carter method for forecasting mortality. **Demography**, v. 38, n. 4, Nov. 2001, p. 537-549.

MILLER, G.H. e GERSTEIN, D.R. The life expectancy of nonsmoking men and women. **Public Health Reports**, v. 98, n. 4, 1983, p. 343-349.

MOREIRA, M.M. Sub-registro de óbitos no Brasil. In: ENCONTRO NACIONAL DE ESTUDOS POPULACIONAIS, 3, 1982, Vitória. **Anais...** ABEP, 1982. Disponível em: <http://www.abep.nepo.unicamp.br/docs/anais/pdf/1982/T82V1A110.pdf>.

OLIVEIRA, J.C. e ALBUQUERQUE, F.R.P. **Evolução da esperança de vida no Brasil na última década do século XX**: os ganhos e os diferenciais por sexo. Rio de Janeiro: IBGE, 2003. Disponível em: <http://www.ibge.gov.br>. Acesso em: jan. 2004.

PAES, N.A. A mortalidade por causas no Brasil: qualidade e comportamento dos dados. In: ENCONTRO NACIONAL DE ESTUDOS POPULACIONAIS, 10, 1996, Caxambu, MG. **Anais...** Belo Horizonte: ABEP, 1996, v. 4. p. 1.945-1.969.

PAES, N.A. A geografia da mortalidade por causas dos idosos no Brasil. In: ENCONTRO NACIONAL DE ESTUDOS POPULACIONAIS, 12, 2000, Caxambu, MG. **Anais...** Belo Horizonte: ABEP, 2000. Disponível em: <http://www.abep. nepo.unicamp.br/docs/anais/pdf/2000/Todos/saut18_3.pdf>.

PAES, N.A. A. Base de dados e atlas sobre a mortalidade dos idosos no Brasil. In: ENCONTRO NACIONAL DE ESTUDOS POPULACIONAIS, 13, 2002, Ouro Preto, MG. **Anais...** Belo Horizonte: ABEP, 2002. 21p. Disponível em: <http://www.abep.nepo.unicamp.br/docs/anais/pdf/2002/Com_ENV_PO6_Paes_texto.pdf>

PAMPEL, F.C. Cigarette use and the narrowing sex differential in mortality. **Population and Development Review**, v. 28, n. 1, Mar. 2002, p. 77-104.

PRESTON, S.H. **Older male mortality and cigarette smoking**: a demographic analysis. Berkeley: University of California/Institute of International Studies, 1970. 150p.

PRESTON, S.H., ELO, I.T. e STEWART, Q. Effects of age misreporting on mortality estimates at older ages. **Population Studies**, v. 53, n. 2, Jul. 1999, p. 165-177.

ROGERS, R.G. Sociodemographic characteristics of long-lived and healthy individuals. **Population and Development Review**, v. 21, n. 1, Mar. 1995, p. 33-58.

SEEMAN, T.E., KAPLAN, G.A., KNUDSEN, L. et al. Social network ties and mortality among the elderly in the Alameda Country study. **American Journal of Epidemiology**, v. 126, n. 4, Oct. 1987, p. 714-723.

VASCONCELOS, A.M. A qualidade das estatísticas de óbitos no Brasil. **Revista Brasileira de Estudos de População**, v. 15, n. 1, jan./jul. 1998, p. 115-124.

VASCONCELOS, A.M. A qualidade das estatísticas de óbitos no Brasil: uma classificação das unidades da federação. In: ENCONTRO NACIONAL DE ESTUDOS POPULACIONAIS, 12, 2000, Caxambu, MG. **Anais...** Belo Horizonte: ABEP, 2000. Disponível em: <http://www.abep.nepo.unicamp.br/ docs/anais /pdf/2000/Todos /saut7_1.pdf>.

VAUPEL, J.W. How change in age-specific mortality affects life expectancy. **Population Studies**, v. 40, n. 1, Mar. 1986, p. 147-157.

WALDRON, I. The contribution of smoking to sex differences in mortality. **Public Health Reports**, v. 101, n. 2, Marc./Apr. 1986, p. 163-173.

ZUCKERMAN, D.M., KASL, S.V. e OSTFELD, A.M. Psychosocial predictors of mortality among the elderly poor: the role of religion, well-being, and social contacts. **American Journal of Epidemiology**, v. 119, n. 3, Mar. 1984, p. 410-423.