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THE MORTALITY GENDER GAP IS NARROWING WITH THE ADVANCED CHRONOLOGICAL AGE

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Introduction:
Today, the number of older people is growing and centenarians are not an exceptionally rare breed anymore. Human life span is the complex, multifactorial issue involving genetics, life style, and the environment. Traditionally, the mortality rates are calculated by Gompertz attrition method of actuarial statistics which is suited to protect the wining odds of the insurance companies. The aim of this report is to assess the probability of the life span by studying the cumulative frequency distribution of mortality with a median derivative power function method. For one summer month we have followed the obituaries published in the daily newspaper “Večernji list” (edition for Primorsko-goranska županija, Croatia). There were 813 obituaries reported (447 men and 366 women), showing their birth and death dates or total life span in years; fifty four more subjects of both sexes had incomplete data on the life span and therefore were not included in the study. Since the data were publically displayed and no names or other whereabouts were considered, there were no ethical restraints that would require informed consent or implementation of the Declaration of Helsinki.

Subjects and methods:
To scrutinize mortality frequency distribution of men and women, we used the median derivative method to fit the sigmoid (bioassay ogive) logistic regression analytical function: $A_2 + (A_1 - A_2) / [1 + (x/x_0)^p]$ where $A_1$ is initial value (lower horizontal asymptote), $A_2$ is final value (upper horizontal asymptote), $x_0$ is center (point of inflection, in our case it is the median $M_0$), $p$ is power (the parameter that affects the slope of the area about the inflection point). The Qtiplot Data Analysis and Scientific Visualization program was used for this analysis (www.soft.proindependent.com/qtiplot.html). First we assess the median ($M_0$) of age at the time of death in of our population cumulative mortality curve. By definition, one half of the studied population was above the median (upward median branch, $U_0$), and the other half was below the median (downward median branch, $D_0$). Hence, the population size (PS) for $M_0$ is the sum of the respective upward and downward median branches around the central inflection “hinge” $M_0$, i.e., $PS = U_0 + D_0 = 0.5 + 0.5 = 1.0$. Both the respective upward and downward median branches can be further divided in the same way into a series of sequential median derivatives ($U_0,1,2,3,\ldots,n-1, n$ and $D_0,1,2,3,\ldots,n-1, n$). Thus, instead of mechanically implementing the preconceived percentile grid upon the observed data, we inferred the median derivative grid out from the given data set.

Results and discussion:
The median life span was longer in women (81 yr) than in men (75 yr); however this gender difference in life span became negligible at the age of about 90 yr. Death before the age of 40 yr was not associated with the chronological age, but after the chronological age of 50 yr the impact of the chronological age became observable. Indeed, the cumulative mortality was increasing exponentially after the age 60 yr and 65 yr in men and women, respectively ($D_2-U_2 r^2 = 0.99, r^2 d_2u_2 = 0.94$). Simply, if somebody is a 75 years old man, his chance to wake up alive the next morning is fifty-fifty; the same goes for a woman of 81 yr. Our results indicate that the observed average human life span expansion phenomenon is an actuarial statistics delusion. On
the average, we are not living longer because the life span has increased, but because we are making more out of our innate life span capacity under the given genetic background, life style, and the environment. The current average life span is a useful actuarial probability concept when we bet our odds against the insurance companies, but it is a misnomer when it is used to claim the existence of the human life span extension. Essentially, the human life span is a stochastic (random) event within the deterministic frame of cumulative mortality. It is determined that we would all die some time, but life span is also an individual stochastic (random) affair, since we do not know who and when would be that particular person called out from the stream of life. Moreover, the life span of the human population is very inhomogeneous. Indeed, we humans are not all endowed with the equal life span capacity and, apparently, there is a segment of human population having an innate short life span. It would be advisable if the probability of the life span length is taken into consideration in all the epidemiology studies when dealing with subjects older than the chronological age of 60 years.

**Conclusion:**

Human life span is a highly variable individual trait. After the age of 60 yr in men and 65 yr in women, the chronological age is the principal probability determinant of the life span length. The gender gap at the low median derivatives D1d1 was seven years (65 - 72) and at the upper end median derivative U4u4 there is an intersection between men and women at the age of 93.