FIND THE EXISTENCE OF BURSTS OF HEALTHY LIFE YEARS LOST (HLYL) AT 40 AND 60 YEARS OF AGE

Christos H Skiadas

Abstract

We are happy that today we can present a verification of our study presented few years earlier. This was done in the paper by Shen, X., Wang, C., Zhou, X. *et al.* Nonlinear dynamics of multi-omics profiles during human aging. *Nat Aging* (2024). https://doi.org/10.1038/s43587-024-00692-2. They had proven that the human age changes follow bursts starting from 40 years of age and another burst at 60 years of age at least in USA.

In this study we reproduce the results for USA while we test our methodology for other countries. We have provided a methodology to estimate the HLYL via the formula: $HLYL=b_x=max\{xm_x/Sum(m_xdx)\}$ or the similar for q_x.

We test the stability of the findings for bursts at 40 and 60 years of age via the Healthy Life Years Lost to Disability.

See https://link.springer.com/book/10.1007/978-3-031-28697-1 for details and ask about the related programs in Excel from the authors.

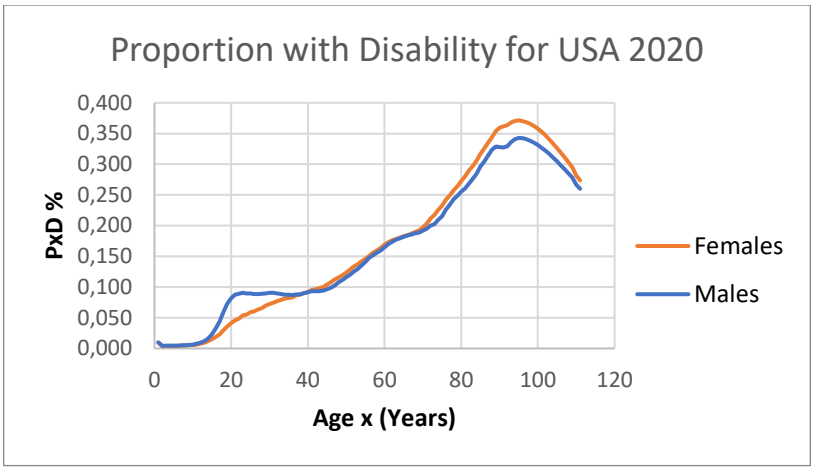
Key words: Life Expectancy, Healthy Life Expectancy, Life Tables, Health Parameters, Healthy Life Years Lost.

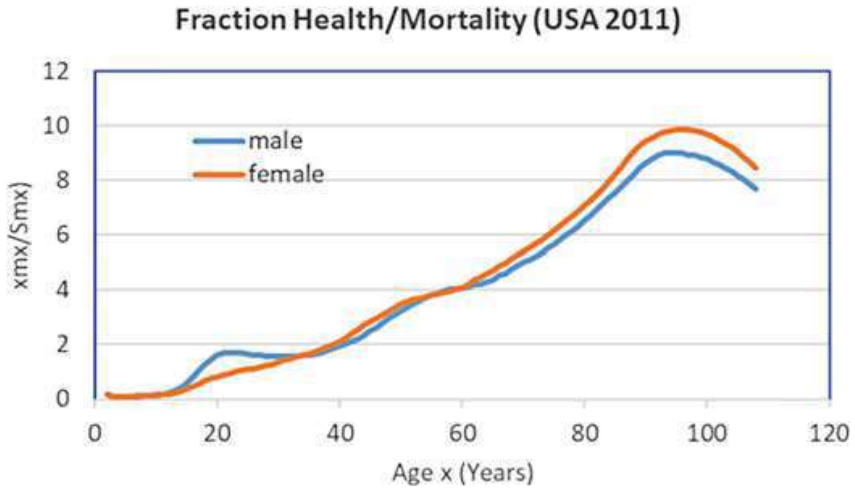
JEL Code: C10, J11

Introduction

In a recent study, Shen, X., Wang, C., Zhou, X. *et al.* Nonlinear dynamics of multi-omics profiles during human aging. *Nat Aging* (2024). https://doi.org/10.1038/s43587-024-00692-2, had proven that aging do not follow linear development over time. Instead, dramatic changes appear during 44 years of age followed by new changes at 60 years of age. Though a good number of 108 persons had taken part and extensive tests have been done for sufficient time, the extention of results to the United States is very important. Few years ago, we already have done and publish an application in a Springer Series in Demography. In our provided figures males and females follow parallel paths ove time from 40 to 60 years of age in USA. The results provided in graphes for USA and reproduced with new results here.

Fig. 1.





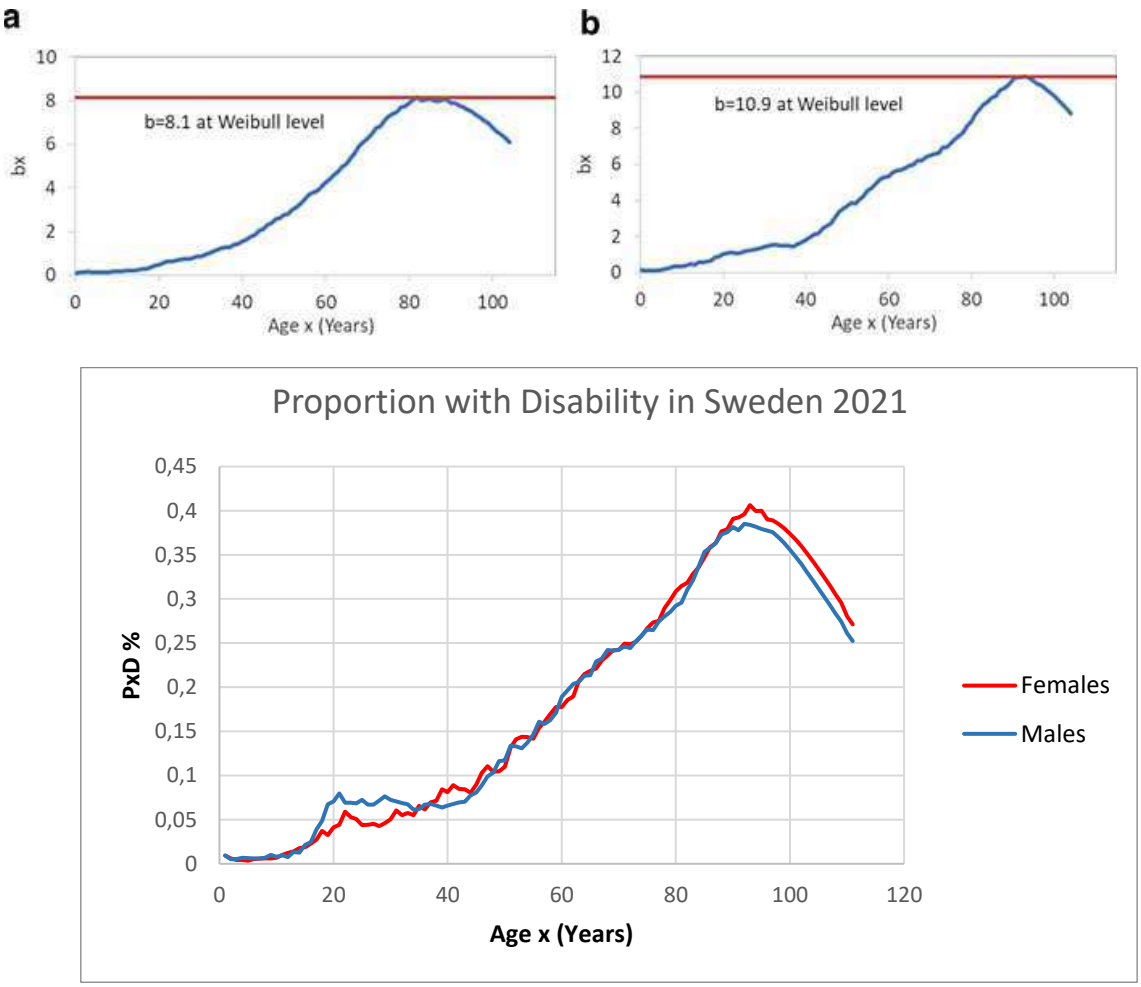
Source: own calculations

As it was found, the males and females follow similar paths from 34 years until 70 years old. A Burst is expected until 45 years followed by a second strong burst in the 60 years old period. An important estimate is related to check the periods with equal spead of growth for females and males that is expected for both sexes in the periods from 40 to 60 years of age as it was already presented for USA 2011 in our paper of 2019 in published in Springer Demography Book ,see Skiadas & Skiadas 2018a,b and 2020 a, b, c. In another chapter of this book similar application for Czechia appear illustrated in the related figures. See also the application for Sweden for this book graphs for females and our recent application for both males and females. See also our Chapter 3 with

1. The Case of the United States

The above methodology may apply in many countries when good full life tables exist as in the United States. Furthermore, the U.S. censuses of the population included important information to estimate the percentage of disabilities per year of age. Stock and Beegle (2004) had summarized the material from the 1970–90 censuses. Our Direct estimates with the previous method are presented in Fig. 3.6 for three ten-year periods 1970–79, 1990–99 and 2010–17. The first two curves from 1970–79 and 1990–99 respond to Stock and Beegle calculations. Their main points refer to a disability level lower than 10% for those under age 40 and rising "dramatically" starting around age 45. In our estimates, the three curves coincide close to 45 years at 10% of disability level. The next critical points refer to a disability affecting the higher part of the population with a maximum of one-third of the population for the periods 1970–79, 1990–99 and at 35% for the period 2010–17.

Fig. 2 and 3 (a) HLYL indicator in Sweden, females 1950. (b) HLYL indicator in Sweden, females, 2015



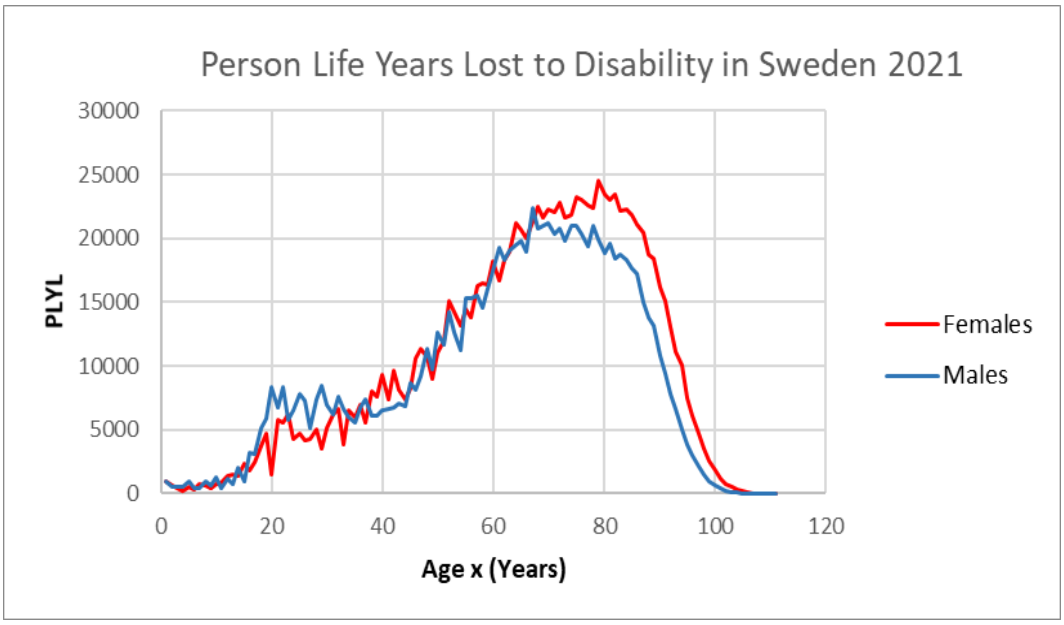


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Fig. 4.

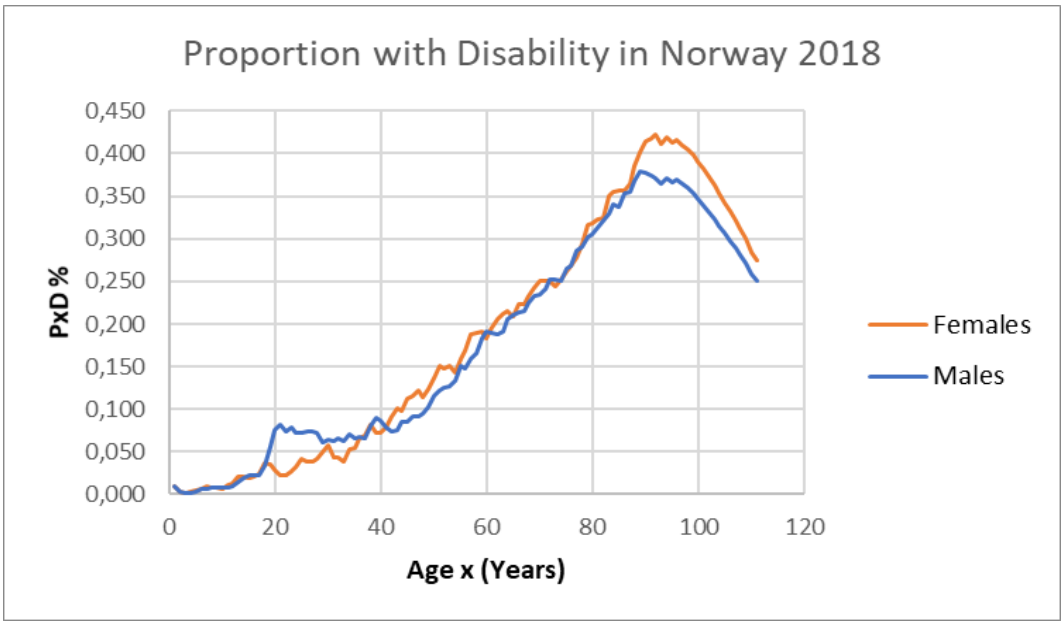

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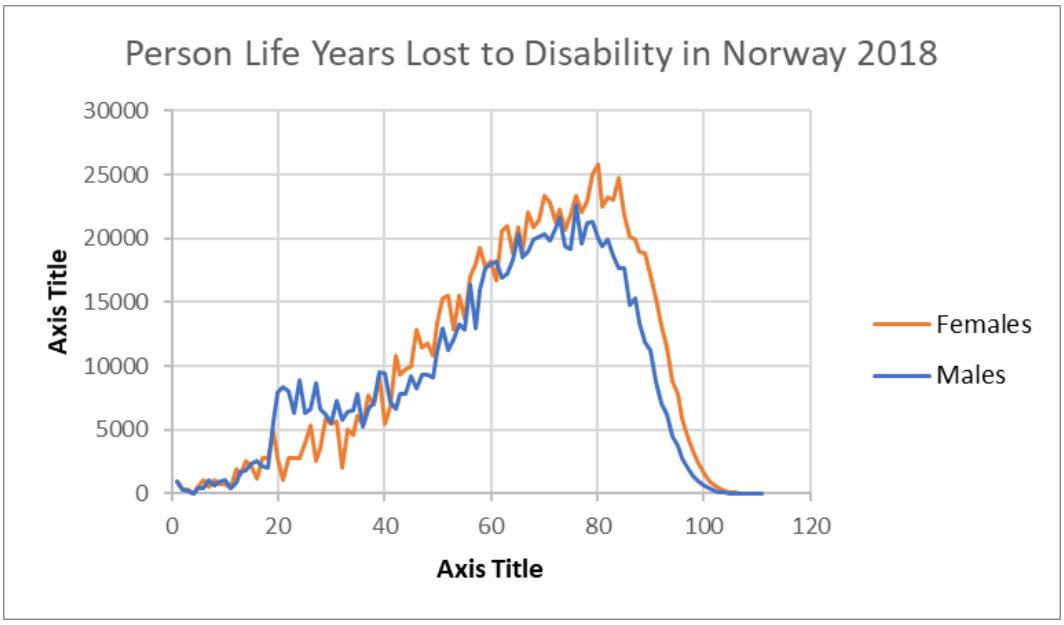
Fig. 5.



Source: own calculations

16 Countries have tested with our methodology presented few years earlier with applications to USA, Sweden and Czechia and reproduced here along with the other countries. The changes cover a time period starting before 40 years of age and expanded to more than 60 years of age. Females start to differ from males soon after 60s as presented in the following figures. Of course, males differ from 18 to 30 years old from females, providing bigger PLYL.

Fig. 6.

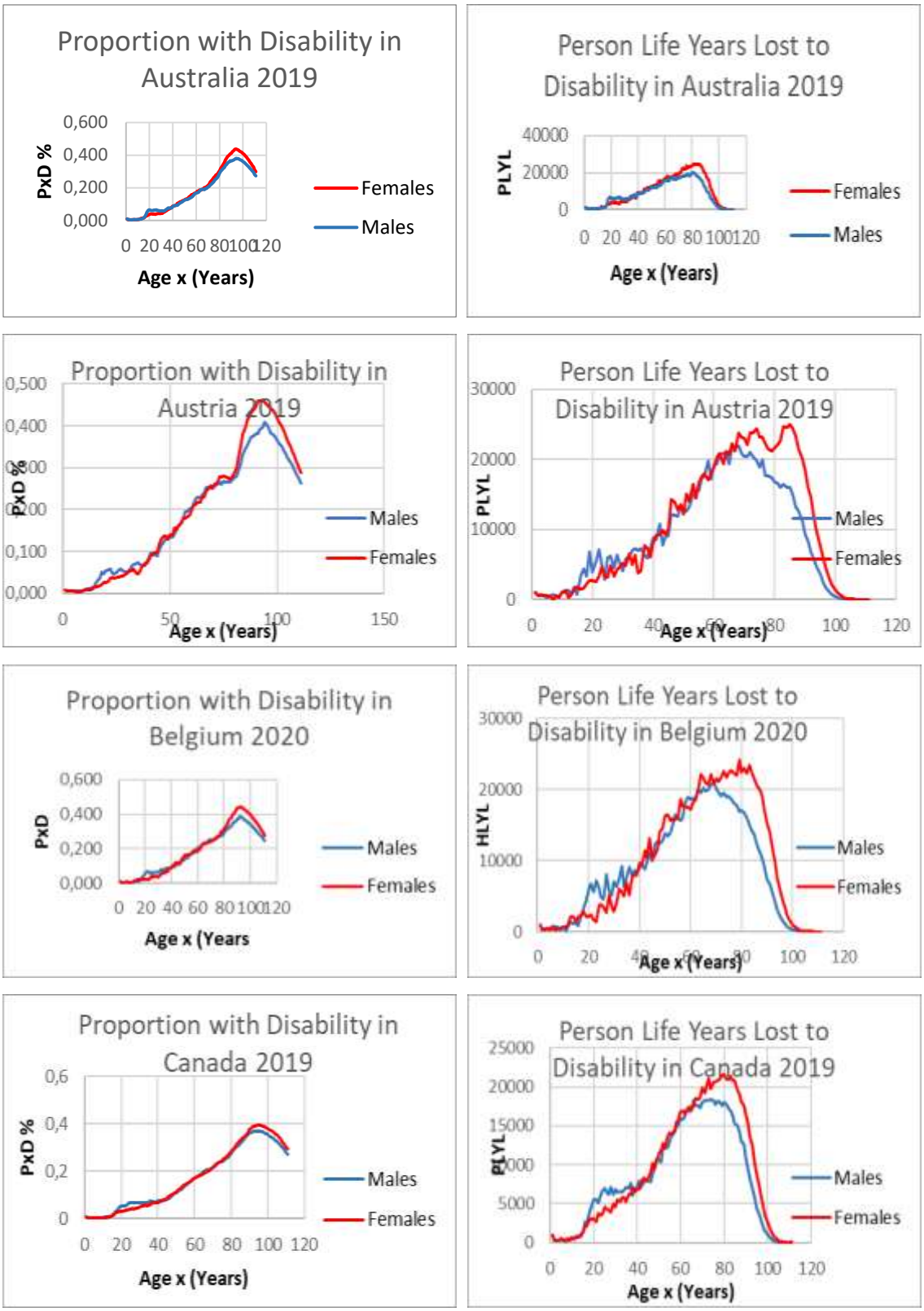


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Fig. 7.

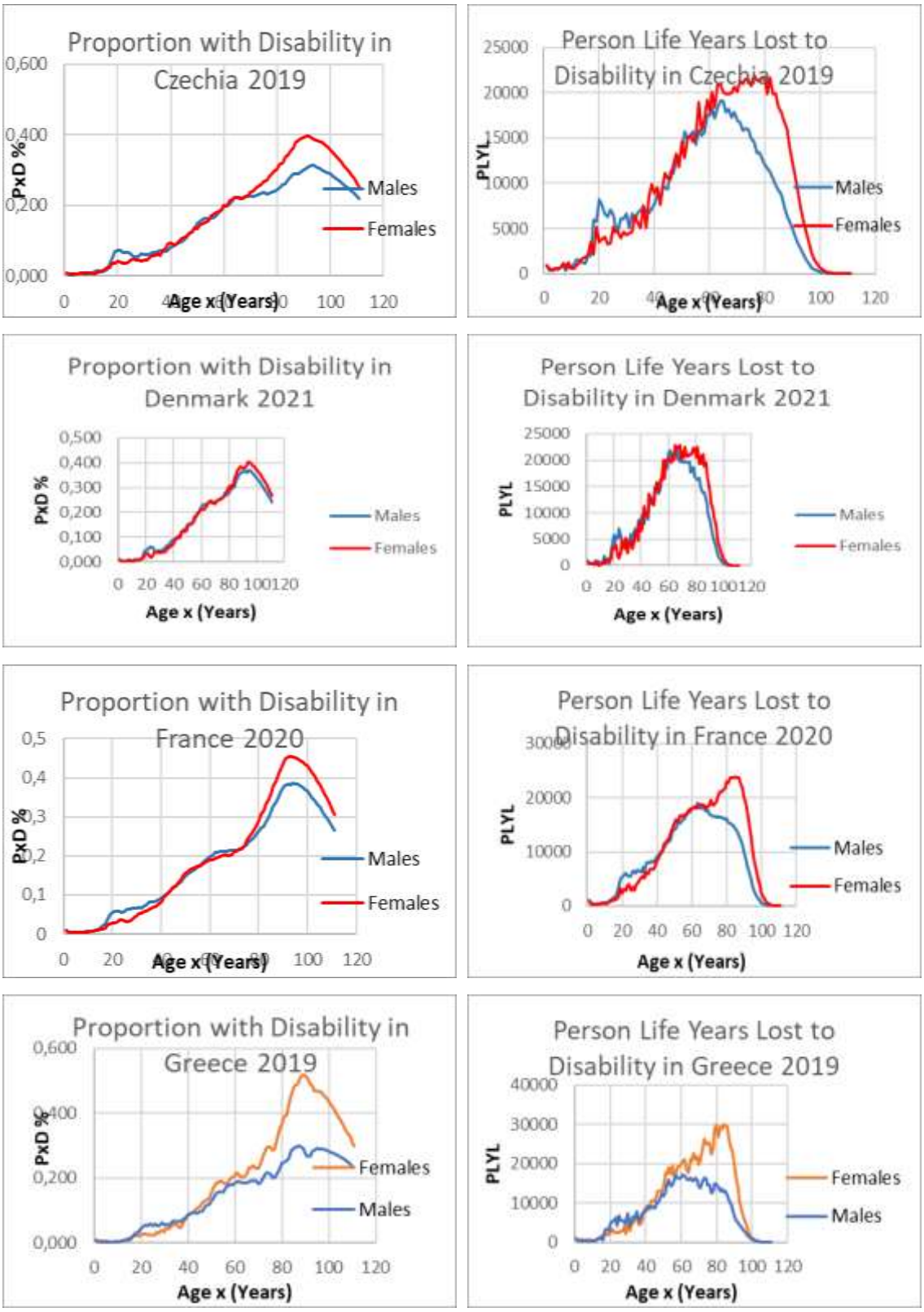

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Fig. 8.

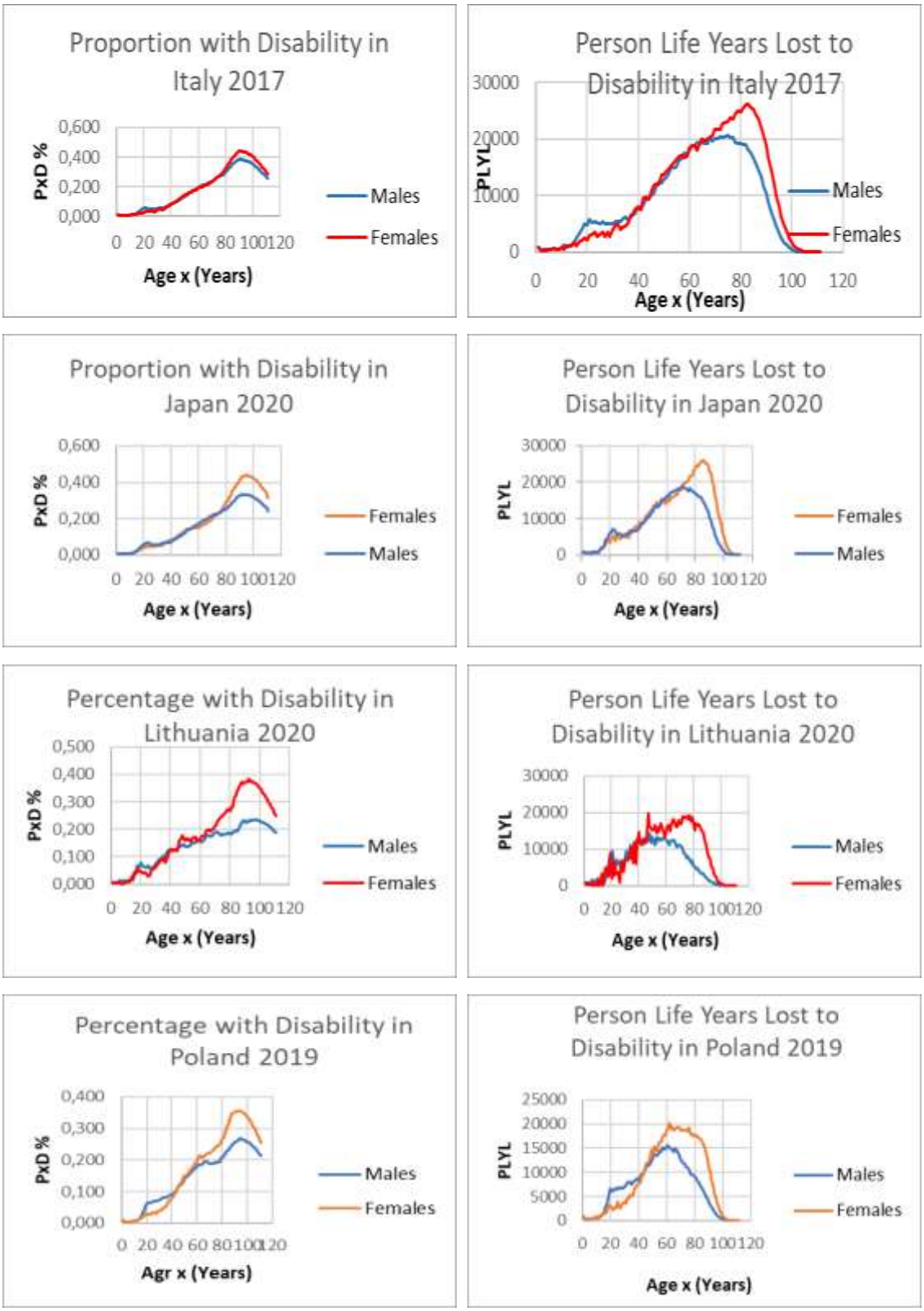

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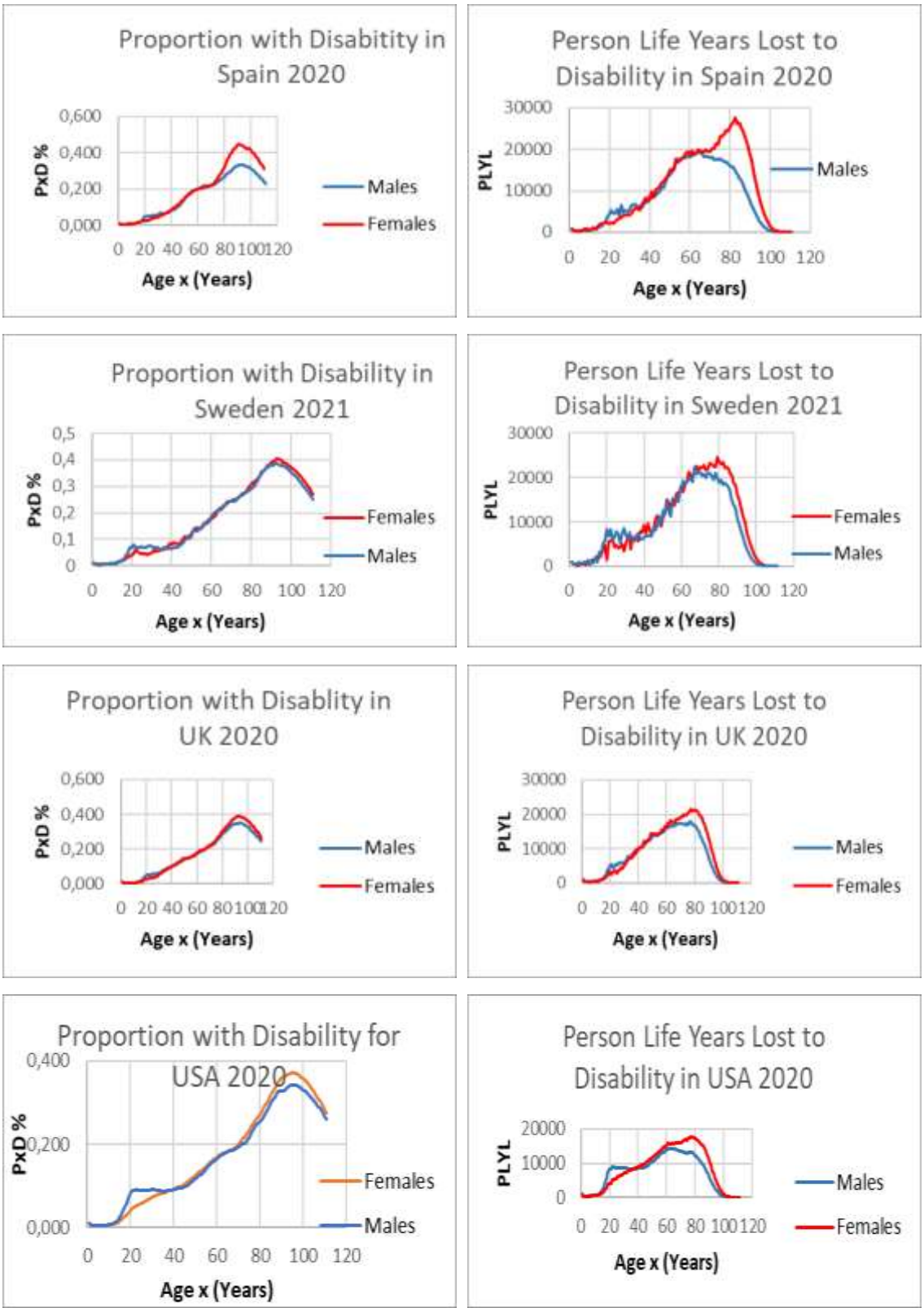
Fig. 9.



Source: own calculations

Findings

The main points refer to renew and verify the existence of sudden changes at 40-45 and 60 years of age in both females and males in the 16 countries studied. Instead, females and males differentiate their behaviour in the last period of the human ages, the females living longer but having higher disability rates as a sum. See the PxD and PLYL to Disability graphs. From the PLYL Disability graphs we find the space after 60 years old that is 64 years after for Australia, 67 years for Austria, 69 years for Belgium, 67 years for Canada, 67 years for Czechia, 74 years for Denmark, 71 years for France, 62 years for Greece, 70 years for Italy, 70 years for Japan, 58 years for Lithuania, 53 years for Poland, 65 years for Spain, 69 years for Sweden, 66 years for UK and 64 years for USA. The results provide a mean of 66 years of age for the after 60 years old period to calculate radical changes.

We can assume changes from deseases with a five year mean duration repeated in a geometric progress r=5/10=1/2. The result will be a/(1-r)-40*2=80 years of age for the 40 year bursts and 45/(1-r)=45*2=90 years of age for the 45 year bursts. Accordingly, the 60 years of age bursts will be followed by 60/(1-r)=60*2=120 years of age radical changes for people living duration that are the centenaries and supercentenarians.

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Contact

Christos H. Skiadas

ISAST International, Athens, Greece

Mail: skiadas@asmda.com