ANTHROPOLOGIE • LVII/3 • pp. 247–261 • 2019

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WOMEN AT A DISADVANTAGE? NOT NECESSARILY: SEX-SPECIFIC DIFFERENCES IN LIFE EXPECTANCY OF 20-YEAR-OLD INDIVIDUALS IN THE LATE BRONZE AGE / EARLY IRON AGE

ABSTRACT: Women in pre- and protohistoric times were subject to a higher mortality rate than men, according to a widespread, yet insufficiently tested hypotheses. This statement is examined for 20-year-old individuals in a sample of 66 European communities that used cremation as a burial rite in the late Bronze Age / early Iron Age (1300–500 BC). Results indicate an average difference of 3.6 years in the mortality to the disadvantage of women, which increases with weak significance over time. It is noteworthy that in one-fifth of the samples the 20-year-old males have a lower life expectancy than their female peers. The regional distribution of the Central European communities across three subgroups show less favourable relations for women in the southern populations.

ZUSAMENFASSUNG: Frauen unterliegen gemäß weit verbreiteter, aber für vor- und frühgeschichtliche Zeiten kaum hinlänglich nachgewiesener Meinung einer höheren Sterblichkeit. Am Beispiel von 66 europäischen Bevölkerungen mit Brandbestattungssitte der jüngeren Bronze-/frühen Eisenzeit (ca. 1300–500 v.Chr.) wird diese Ansicht anhand der Lebenserwartung 20Jähriger überprüft. Es ergibt sich eine durchschnittliche Differenz von 3,6 Jahren zu Ungunsten der Frauen, die sich über den Beobachtungszeitraum schwach signifikant vergrößert. Bemerkenswert ist, dass bei einem Fünftel der Stichproben die 20jährigen Männer eine geringere Lebenserwartung aufweisen als ihre weiblichen Altersgenossinnen. Bei regionaler Aufteilung der zentraleuropäischen Bevölkerungen in drei Teilgruppen ergeben sich vor allem für die Frauen der südlichen Populationen ungünstigere Relationen.

KEY WORDS: Life expectancy – Mortality differences – Cremations – Late Bronze Age – Early Iron Age

Received 7 March 2018; accepted 19 July 2018.

DOI: https://doi.org/10.26720/anthro.19.08.28.1

INTRODUCTION

Life expectancy at birth is a demographic variable that is easy to understand for everyone. The expectancy of life at the moment of birth and the life span are identical for a new-born child. In late Bronze / early Iron Age populations of Central Europe, the average life span is around 29.5 years, although there is a surprisingly wide variation (R = 10.9 to 54.2 years). The comparative values are taken from the author's continuously updated database. Two hundred seventeen burial communities predominantly using cremation as a burial custom (minimum number of individuals: 10 individuals; on average: 89 individuals) are available for the period from 1300 to 500 BC. Even if life expectancy at birth of not even 30 years seems remarkably low when compared to contemporary populations – where some already exceed the 80-year mark – it is nevertheless unsurprising for pre- and early historical times, when infant- and childhood mortality was high. Furthermore, this value does not even take into account that small children are underrepresented in most cemeteries. This lack of data can be compensated with a range of methodological correction factors, which ultimately lead to a significant decrease in the life expectancy at birth. For the European populations of the late Bronze Age / early Iron Age, the average corrected value is 25.3 years (R = 10.9 to 45.6 years). The extremes appear abnormal, however: in the population of Sobocisko (Miskiewicz 1975) with a life expectancy at birth of 10.9 years, we may harbour considerable doubts about the demographic representativeness of the sample. The maximum value of 45.6 resp. 54.2 years in the population of Pithekoussai (Becker, Donadio 1992) can also be called into question, as the diagnostic methods for ageing seem incorrect in the context of contemporaneous findings. In both cases, one can propose special burial customs that include a specific selection of buried people to explain the observed results, albeit ones with differing motivations.

Correcting for the suspected lack of remains of small children at prehistoric burial sites and the subsequent attempts to calculate life expectancy at birth have spawned a seemingly endless discussion. This can be bypassed if the life expectancy is considered from the beginning of the 20th birthday, which is neither dependent on the reconstructed number of infants nor on the amount of excavated skeletal material of subadults. A cut-off of 15 years would be more suitable, as women's fertile span is usually calculated from 15 to 50 years. The 20-year limit has been chosen because sex diagnosis of adolescents is not consistently possible in cremation material as well as some studies do not provide more detailed age information for using the lower limit.

FIGURE 1: Geographical position of the late Bronze Age / early Iron Age populations taken into account. For numbering see tab. 1.

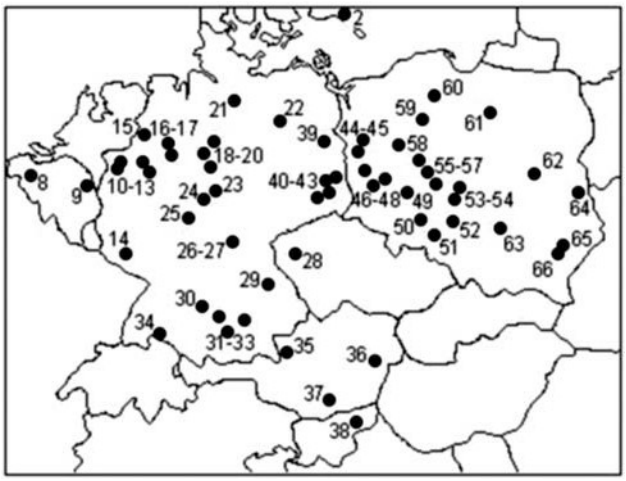

FIGURE 2: Distribution of Central European series. Detail from fig. 1. For numbering see tab. 1.

European populations using cremation as a burial custom from the 13th to the sixth century BC have an average life expectancy of 20 years at the beginning of the third decade of life. The median value describes the facts more accurately, but the difference between average and median value is very low. A life expectancy of 20 years at the moment of the 20th birthday is analogous to a life-span of 40 years. This also means that the young adult will die in their 41st year. In statistical terms, this is an average value. Some individuals will reach an older age, while others will die before that year. The values mentioned in this study refer to the beginning of the third decade of life (20 years of age). They should not be generalized, because mortality can develop differently in the following decades of life. For example, a higher remaining life span often arises for older women (from about 60 years) compared to men.

This raises the question of whether the life expectancy of the 20-year-old male is equal of the 20-year old female or whether there are differences. According to the current doctrine, the latter should be the case, but the hypothesis has hardly been tested with archaeological material. Based on 16 Neolithic to medieval populations Wells (1975) calculated a constant difference of about five years in the life expectancy to the disadvantage of women, which is proposed to exist in all age classes. Bach and Simon (1978, 11 and fig. 2–3) come to similar conclusions (5 to 6 years) based on fewer populations for the same period. According to a compilation of Acsádi and Nemeskéri (1970, Tab. 55) males are ahead by 6.4 years during the middle Palaeolithic and Mesolithic (n = 8 series). In the Neolithic (n = 8 series), the difference amounts to 3.5 years and for the Middle Ages (only five series) to 1.6 years – each to the disadvantage of women (Acsádi, Nemeskéri 1970, Tab. 70 et 91). These statements are based on a small number of series and are also distributed over a long period of time and deliver only a rather superficial assessment in the context of a diachronic consideration. The rather superficial impression of a long-term improvement for women cannot be statistically verified. The values for the late Roman and migration periods are statistically more accurate: The 20-year-old women had a 2.1 years lower life expectancy compared to their male peers (n = 45 series; Caselitz 2005, 89). However, there are also four samples with approximately balanced life-expectancy values (difference range ± 0.5 years) and eight other populations in which the 20-year old males have a lower life expectancy. Regional differences are mentioned in Caselitz (2005, tab. 90): the diachronic development of life expectancy at 20 years from the third to the seventh century AD is discussed in Caselitz (2005, fig. 47).

MATERIAL AND METHODS

Generally speaking, we may be surprised at statements such as "women live longer", or "women die earlier due to the stress caused by pregnancy and

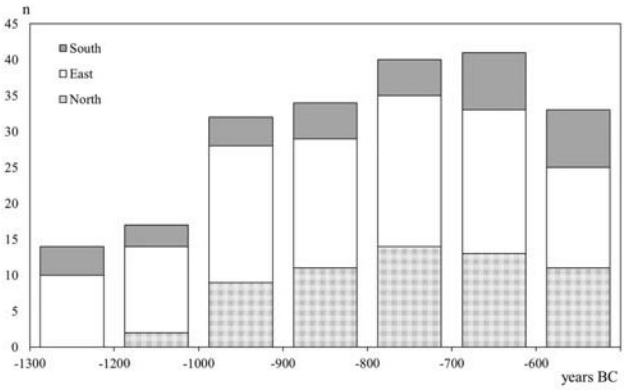

FIGURE 3: Distribution of series per century; n = number of observations.

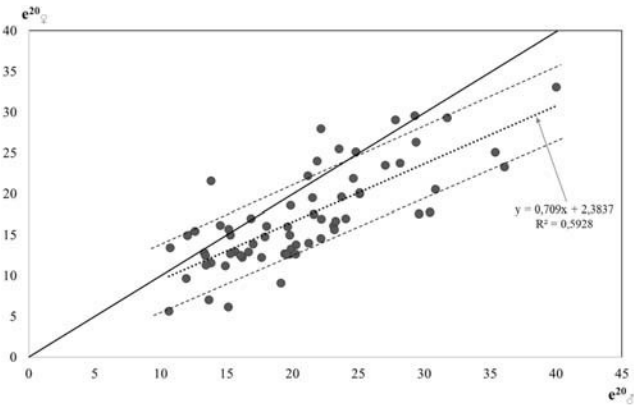

FIGURE 4: Distribution of life expectancy of 20-year-old men and women of the late Bronze Age / early Iron Age including the northern and southern European findings (*Figure 1*: # 1–7). The solid line marks the sequence of life expectancy along identical values, while the dotted line (± standard deviation) reflects the levels of regression of the findings. Life expectancy (e^{20}) in years.

TABLE 1: Populations of late Bronze Age / early Iron Age mainly using a cremation rite and with at least 10 scientifically determined adults per sex. e^{20} = life expectancy at the begin of third decade of life (20 years). For geographic positions see fig. 1 and 2.

Series	Nr. in fig. 1–2	Dating BC	e^{20}-male	e^{20}-female	n male	n female	Source
Satakunta	1	1050–500	15.29	14.98	13	14	Seger 1981
Simris 2	2	800–500	24.79	25.16	21	21	Gejvall 1961
Cîrna	3	1500–1200	16.19	12.27	34	11	Nicolaescu-Plopsor 1961
Pontecagnano (incl. unburnt skeletons)	4	900–700	27.80	29.07	26	11	Vitiello *et al.* 1988
Pithekoussai	5	750–675	39.99	33.08	39	61	Becker, Donadio 1992
Loma del Boliche	6	800–500	29.27	29.56	39	42	de Miguel Ibañez 2009
Medellín	7	625–425	23.11	16.12	75	67	Almagro-Gorbea 2011
Destelbergen	8	900–400	19.63	16.03	18	39	Janssens 1986
Rekem	9	800–500	12.61	15.47	10	19	Janssens 1980
Düne Wissing	10	1000–475	12.03	14.94	12	12	Kühl 1977
Rheinberg	11	900–500	29.59	17.56	16	49	Thieme 1939
Sölten	12	800–350	36.09	23.29	17	28	Krumbein 1935
Oespel	13	1200–800	24.60	21.92	80	65	Kunter 2006a
Bescheid-Strackheck	14	700–250	20.28	13.79	35	30	Kunter 1993a
Nordhorn-Brandlecht	15	800–600	27.04	23.50	16	24	Caselitz (unpubl.)
Lengerich-Wechte	16	600–100	19.10	9.12	17	12	Herrmann 1976
Telgte-Raestrup	17	1100–700	19.39	12.74	29	33	Herrmann 1981
Godshorn	18	750–500	30.83	20.55	18	15	Caselitz 1998
Hameln-Wangelist	19	1100–600	35.37	25.10	11	11	Caselitz 1986
Holzminden	20	800–500	29.38	26.32	14	10	Caselitz 2004
Rullstorf	21	1150–650	22.16	27.97	14	24	Caselitz 2017
Blievenstorf	22	1100–500	21.50	19.54	45	35	Müller 1965, 1970
Vollmarshausen	23	1100–475	11.93	9.68	44	31	Czarnetzki 1982
Fritzlar	24	1000–700	23.28	16.69	14	20	Kunter 1989
Marburg – Sammelserie	25	1100–800	19.84	18.61	23	10	Kunter 1994
Oberstreu-Struth	26	700–500	13.65	7.05	19	40	Röhrer-Ertl 2004
Urspringen	27	700–550	10.63	5.64	16	22	Röhrer-Ertl 2006
Manětín-Hrádek	28	700–350	23.52	25.53	21	23	Chochol 1984
Schirndorf (only cremation burials)	29	900–500	15.63	12.96	39	42	Claasen 2001
Bopfingen	30	700–500	30.42	17.79	23	11	Kunter 2005

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Series	Nr. in fig. 1–2	Dating BC	e^{20}-male	e^{20}-female	n male	n female	Source
Heidenheim-Süd	31	700–550	24.02	17.02	16	28	Kunter 1998b
Friedberg	32	1100–500	28.16	23.77	23	17	Kunter 1998a
Zuchering-Ingolstadt	33	1300–700	23.16	15.64	105	56	Kunter 2006b
Singen-Nordstadtterrasse	34	1300–800	19.78	12.67	10	12	Wahl 1998
Obereching	35	1000–700	21.61	17.50	64	34	Kunter 1993b
Pitten	36	1600–1200	23.71	19.64	34	45	Teschler-Nicola 1985
Führholz	37	800–400	15.28	12.74	29	24	Renhart 1990-2003, Renhart, Kanelutti 1991
Pod Kotom	38	1500–1000	13.30	12.84	37	44	Šlaus 2010
Berlin-Rahnsdorf	39	1200–600	22.17	16.93	29	49	Horst *et al.* 1987
Cottbus	40	1100–700	21.87	24.02	19	28	Grosskopf 2004
Tornow-Hügelgräberfeld	41	1200–500	14.50	16.16	59	67	Greil 1970
Schöpsdorf	42	1100–400	25.08	20.00	33	28	Heussner 1987
Saalhausen 2	43	1300–700	31.73	29.33	13	34	Dalitz 1990
Łupowo	44	1100–500	19.79	15.00	18	12	Malinowski 1976
Suleçin	45	1300–800	17.91	14.78	59	59	Piontek 1975
Trzebule	46	650–500	16.05	12.54	15	14	Piontek 1972a
Kotla	47	1300–500	13.80	11.61	25	19	Piontek 1972b
Przyborów	48	1300–650	15.16	15.71	36	28	Piontek 1974
Cieszkow	49	800–400	19.87	13.29	19	25	Domańska, Gołubkow 1975–1979
Dobrzen Mały	50	650–500	13.41	12.44	29	12	Rajchel, Skarzynska 1978
Chorula	51	800–500	17.00	13.89	21	20	Gralla 1965
Dankow	52	1300–800	15.12	6.18	15	16	Malinowski 1965
Zbrojewsko	53	1400–600	17.66	12.28	19	39	Malinowski 1967, Kaczanowski, Gleń 1991
Zarzecin	54	1300–1100	13.42	11.31	19	20	Szlachetko, Wiercinska 1984
Zakrzew	55	800–400	21.15	22.23	22	27	Strzałko 2005
Spławie	56	800–500	21.22	14.02	25	35	Swornowski 2005
Biernatki	57	800–650	16.84	16.98	19	16	Malinowski, Józwiak-Malinowska 1963
Kowalewko	58	1400–700	16.67	12.92	12	12	Malinowski 2002
Kozia Gora	59	650–450	20.24	12.66	23	21	Florkowski 1972

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Series	Nr. in fig. 1–2	Dating BC	e^{20}-male	e^{20}-female	n male	n female	Source
Grabowo 2	60	1100–600	10.71	13.45	14	14	Roznowski 1979
Woryty	61	1000–400	18.04	16.06	15	23	Strzałko *et al.* 1981
Ostroleka	62	1100–650	22.14	14.56	14	23	Wiercinska 1969
Myśliborz	63	1000–500	19.56	12.62	22	37	Wiercinska 1964
Wojciechów	64	1350–900	13.80	21.60	12	16	Kozak-Zychman 1994
Knapy	65	1100–500	25.09	20.14	25	21	Sikora (Bugajska 1974)
Bachórz-Chodorówka	66	1300–700	14.91	11.25	58	89	Szybowicz 1995

childbirth", especially because only a few prehistoric populations have been taken into account. These unsupported opinions do not only appear in popular literature, but become – especially in the case of the last statement – engrained even in scientific literature almost totally without any reflection (i.e. Radoschewski 1977, 225 and Opitz 1997, 288). Two questions arise: Are these statements contradictory, and what is the basis of the supposed higher mortality of (young) women? The first question seems easy to answer. If indeed the childbearing years are associated with a higher mortality rate, the time thereafter may coincide with better living conditions (see Kemkes-Grottenthaler 1999), assuming a consistent workload. In other words if women survive their reproductive phase of life, there is a good chance for them to reach old age. Even if it were necessary to verify these statements, the focus of the following remarks is on reviewing evidence for a higher female mortality. While this requires an examination of a broad range of material evidence, this study is restricted to late Bronze / early Iron Age populations (1300–500 BC) using primarily cremation as a burial custom. The underlying anthropological assessments of age at death are thereby taken as reliable, although some criticism would be appropriate. The calculation of the required mortality tables refers to Acsádi and Nemeskéri 1970 (60ff.). For an overview of diagnostic methods of cremated remains see Rösing (1977, see also Caselitz 2005, 3–6). Three aspects will be explored: Are there sex-specific differences in the life expectancy of 20-year-old individuals, are there regional differences and are the ratios constant during the period under investigation?

From a dataset of 217 burial communities from the late Bronze Age and early Iron Age using at least predominantly cremation, a sample of 66 series (summarizing 1805 males and 1896 females) can be used (*Table 1*). The number of individuals of each sex is not below ten per series. The series are primarily distributed in Central Europe, throughout Germany and Poland; only a small number of the sampled populations are from northern (*Figure 1*: #1–2) or southern Europe (*Figure 1*: #3–7). Three regional groups can be distinguished: a northwestern (*Figure 2*: #8–25), southern (*Figure 2*: #26–38) and eastern Central European group (*Figure 2*: #39–66). The chronological framework of some series partially exceeds the late Bronze and early Iron Ages (c. 1300 – 500 BC). The conditions in older and younger centuries as well as among populations with body burial custom remain hidden in the mists of research.

The overall sample includes at least 14 case studies per century. A weakly significant increase in observation scope can be observed with younger samples (r_{xy} = +0.862; *Figure 3*). The geographically defined subgroups differ in the number of series that constitute them, but they are similar in the average length of the dating span and in the average value of dating (*Table 2*). Significant differences do not occur. Except for the eastern group, there is a weakly significant correlation between observation scope and later dating (r_{xy_north}: +0.892 bzw. r_{xy_south}: +0.882). To avoid misunderstandings, it should be noted that in

diachronic considerations for all cemeteries in a particular century, the arithmetic mean of the respective measurement variable is used. For example, the values of a series dated 850–760 BC are considered both in the group of the ninth century and the eighth century without further division and weighting.

RESULTS

During the late Bronze Age / early Iron Age, the 20-year-old men have an average life expectancy of 20.7 years whilst the women of the same age have a life expectancy of 17.1 years (*Table 2*). This difference is marked in the three regional groups. The northern and southern populations of Central Europe have a larger difference between the sexes of around 4.7 years, while it is noticeably lower in eastern populations, at 2.9 years. The ratio of the difference in life expectancy in relation to the number of men as well as women is random in both the total sample as well as in the regional groups. If the sex ratio is expressed as a so-called masculinity index value (number of males * 1000 / number of females; Caselitz 1984, 141–143 and Caselitz 1981), there is at best a very weak correlation with the difference in life expectancy among the populations of eastern Central Europe (r_{xy} = +0.800). Outliers, however, may significantly distort the picture. The size of the median value describes the situation more accurately. The difference between these two statistical parameters (mean versus median) is strikingly low overall, while differences are observable, particularly in the northern group (*Table 2*). Examining the median values, a sex-specific difference of 3.6 years in the life expectancy of 20 year-old-women can be expected in late Bronze Age / early Iron Age populations of Central Europe. This value corresponds approximately to the findings for the northern and eastern groups, while conditions for women appear significantly worse in the southern populations.

Assuming an influence of pregnancy and birth on the life expectancy raises the question of whether the reproductive period started earlier in northern and eastern Central Europe than in southern Europe, and whether this is reflected in the life expectancy of 20-year-old individuals. Osteoarchaeology supplies only singular and therefore statistically not evaluable data sets taken primarily from inhumation burials as well as a few cases of cremations (for an exception, see Finkenstaedt 1984). The focus here is on the biologically and socially determined time at which the reproductive phase of teenagers or young adults begins. A wide range of opinions on these topics can be found in the literature (especially Grimm 1979). The same applies to the question of whether there is an increased risk in pregnancy and childbirth for younger women (see Fracassi 2009, pp. 11 for an overview). This seamlessly leads to a discussion of whether women are more at risk during the first or subsequent pregnancies and births. Many studies have shown that the alleged risks of giving birth decline with an increasing age of women (see Fracassi 2009, 15). A juvenile or early adult age for a woman represents – at least today – no medical risk for the mother and her child (see Fracassi 2009 and similar Barchmann 2009). From both biological and medical perspectives, hardly anything speaks against an early pregnancy; rather, socioeconomic factors would seem more relevant. The beginning of socially sanctioned reproduction equates the earliest timeset for marriage. Are the known legal data for ancient Rome (girls: 12 years; boys: 14 years) or the European medieval period (girls 12 to 16 years) transferable to the populations of the late Bronze Age / early Iron Age? The answer may be left open at this point as well as the question of when the sexes first got together. The Roman historian Publius Cornelius Tacitus (approx. AD 58 to 120; Germania Ch. 20) wrote that in antiquity the Germans found each other late in life, while in ancient Rome unmarried and childless women and men from an age of 20 years onwards had to expect some significant disadvantages through the Lex Papia Poppaea from AD 9.

The natural sciences offer hardly any data relevant to this discussion. However, answering the question of what the relationship between the life expectancy of 20-year-old men to that of women of the same age was, may offer some insights. In 14 out of the 66 series that make up the complete European sample – after all, nearly a fifth – the young women have a higher life expectancy than their male peers (see *Table 1*). In the best case, the difference is 7.8 years (series Wojciechów; *Figure 2*: #64). Five populations have approximately the same values (± 0.5 years). In the vast majority of cases, the 20-year-old women have a lower life expectancy. Three extreme cases (Sölten: 12.80 years; *Figure 2*: #12), Bopfingen: 12.63 years (*Figure 2*: #30) and Rheinberg: 12.03 years (*Figure 2*: #12)) with differences of over 12 years in the life expectancy of men and women are to be rejected. Assessing the age at death in cremated remains of adults through anthropological as well as forensic investigations often results in quite a wide time span.

The answer to the question of whether life expectancies of 20-year-old men and women are independent variables is clear: for the complete sample of all 66 European series as well as for that of the 59 Central European series, the required significance level is not reached (r_{xy} = +0.770 resp. r_{xy} = +0.720). A very weakly significant correlation between the life expectancies of 20-year-old men and women (r_{xy} = +0.813) exists only in the southern populations. This result is strongly influenced by some series that lie outside the area of distribution defined by the standard deviation (*Figure 4*). At least seven series with clear disadvantages for women (in *Figure 4* from left to right: Urspringen (*Figure 2*: #27), Oberstreu-Struth (#26), Dankow (#52), Lengerich-Wechte (#16), Rheinberg (#11), Bopfingen (#30) and Sölten (#12)) as well as eight series with less favourable values for men (in fig. 4 from left to right: Wojciechow (*Figure 2*: #64), Zakrzew (#55), Cottbus (#40), Rullstorf (#21), Manětín-Hrádek (#28), Simris 2 (*Figure 1*: #2), Pontecagnano (#4) and Loma del Boliche (#6)).

Although the probability of an identical ratio falls with increasing life expectancy of men, the two Mediterranean series Pontecagnano (*Figure 1*: #4) and Loma del Boliche (*Figure 1*: #6) can be found in the upper part of the distribution. This is surprising, since the life expectancies of both sexes are nearly equal in both series. Assessing the r-squared value as a quality criterion for the regression found in the material, a nearly 60 percent correlation can be derived for the life expectancies of 20-year-old individuals. The assumption of exponentially marked dependence must be rejected because of the r-squared value. At best, a second-order polynomial provides values similar to the linear regression. This finding should be put into the perspective of the regional contexts of all 66 series. The populations in southern Central Europe are very significant for the overall findings with an r-squared value of 66 percent. For the other two regional groups, the values are below the threshold of 50 percent (northern group: 47 percent and eastern group: 44 percent). A more diffuse picture emerges when translating the findings into a graphical form for the Central European regional groups (*Figure 5*). At most, we may expect a concentration of values in the eastern group for the area of lower life expectancy values for both sexes (exception: Saalhausen 2; *Figure 2*: #43). Also, we may recognize a tendency towards higher values in the northern group, especially for 20-year-old males. In the face of an average life expectancy difference of 3.6 years to the disadvantage of women, it is not surprising that in the majority of regional groups we observe a situation that is under balanced conditions.

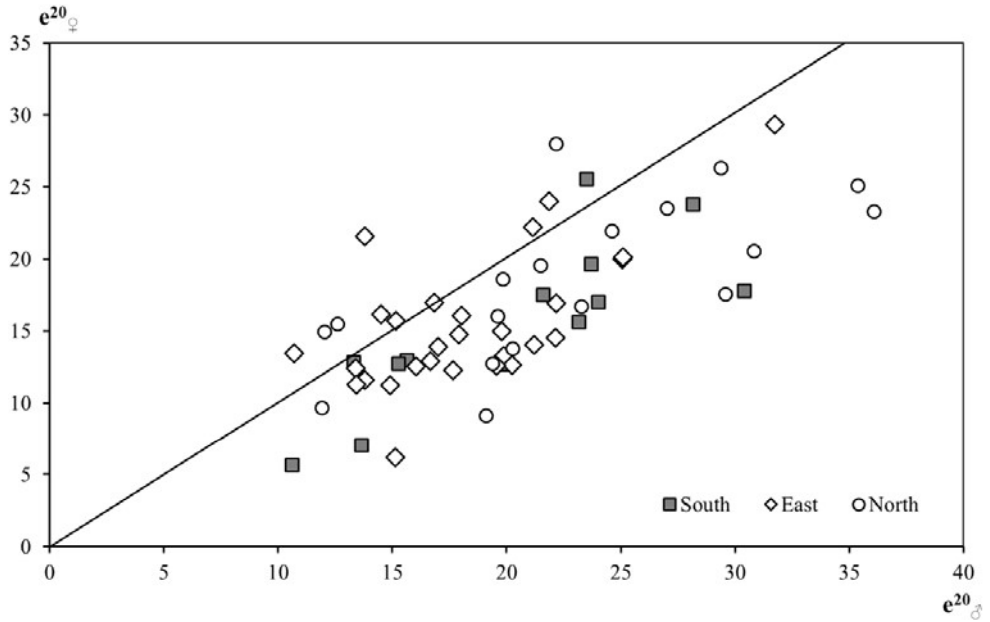

FIGURE 5: Distribution of life expectancy 20-year-old men and women of the Late Bronze Age / Early Iron Age in the three Central European sub-groups (*Figure 1*: # 8–66). The line shows the sequence of values of identical life expectancy. Life expectancy (e^{20}) in years.

Equal conditions did not persist throughout the considered period of eight centuries: the difference of life expectancy of 20-year-old women to men decreases from the 13th to the 12th century BC to an average of 0.8 years in the total sample (*Figure 6*). There are at least 15 samples per century. This result is influenced by the inclusion of two series from northern Central Europe dated to the 12th century BC. The difference in life expectancy of the young adults increases almost continuously from the 12th century BC onwards until the sixth century BC. At the end of the period under consideration, the difference is at least 4.2 years. The entire development is weakly significant (r_{xy} = +0.853). The reason appears to be the rate of increase in general life expectancy of 20-year-old individuals: the rate increases among males from 17.8 to 20.6 years (therefore 2.8 years; r_{xy} = +0.876) and among women from 14.7 to 16.4 years (therefore only 1.7 years; r_{xy} = +0.638). The weak significance for males could point to an overall improvement of their living conditions. This, however, should be substantiated by research into populations that inhumed their dead, but here exist a gap in comprehensive studies. Surprisingly, the highest life expectancy for both sexes is found in the eighth century BC (men: 21.7 years, women 18.4 years).

Initially, a slightly different impression arises in the diachronic consideration of the development of sex-specific differences in life expectancy in the three Central European regional groups (*Figure 6*). This is caused by the small sample size from the 12th century BC in the northern group (only two series). For the first centuries considered in this study, only four or five samples can be considered for the southern Central European group; more data is available for the last two centuries (n = 8 series). The number of the series included per century in the Eastern Group is sufficiently large (n_min: 10 series). The difference in life expectancies increases over the observation period from 2.3 to 3.7 years to the disadvantage of women. The complete development of the differences is significant in the eastern Central European group, i.e. it is not random (r_{xy} = +0.948). The increase in the difference from 2.7 to 5.2 years appears most clearly in the series of northern Central Europe, excluding the 12th century. This development is also significant (r_{xy} = +0.947). The life expectancy of 20-year-old men and women improves from the 13th to the 6th century BC, but the quantitative difference between the two sexes also increases in the same period. The living conditions of women do not seem to have improved in the same way as those of their male peers.

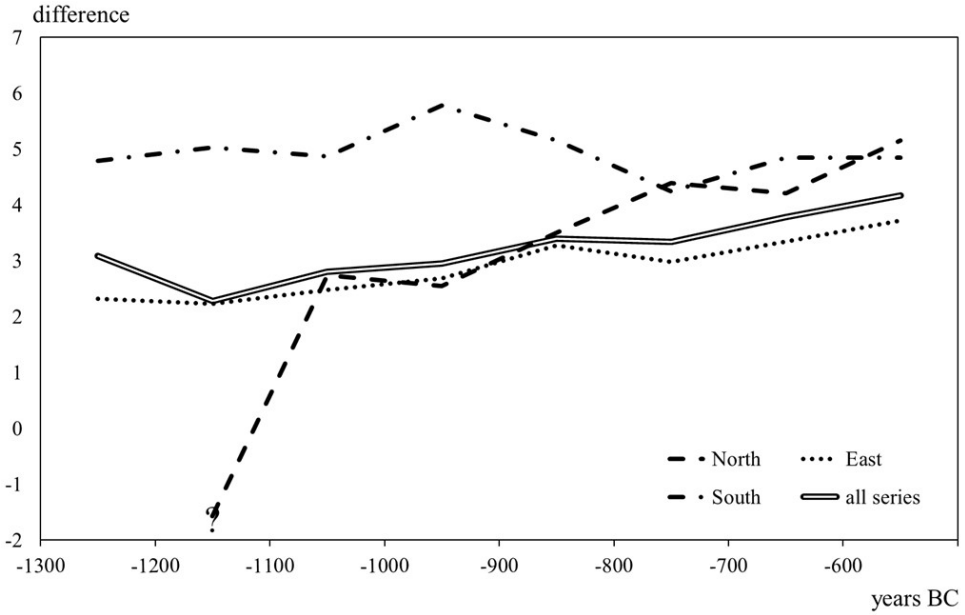

FIGURE 6: Diachronic development of the differences in life expectancy for 20-year-old men and women of the late Bronze Age / early Iron Age in the overall sample and in the three Central European subgroups. Difference in years, positive values correspond to a longer life expectancy for males.

TABLE 2: Statistical parameters in the overall sample (all) as well as in the three regional groups of Central Europe. Dating range in years before Christ; e^{20} = life expectancy in years.

	all	North	South	East
Number of observations	66	18	13	28
Dating range	1600–100	1200–100	1600–350	1400–400
Average of dating span	419	417	365	482
Average of dating	798	731	817	838
e^{20}-male – average	20.74	23.04	20.22	18.39
e^{20}-male – median	19.86	21.83	21.61	17.79
e^{20}-female – average	17.09	18.49	15.45	15.50
e^{20}-female – median	15.87	18.09	15.64	14.29
Number of males – average	27.3	24.1	33.5	24.6
Number of females – average	28.7	25.9	30.6	28.7
Difference $e^{20}_{\male} - e^{20}_{\female}$ average	3.65	4.55	4.78	2.89
Difference $e^{20}_{\male} - e^{20}_{\female}$ median	3.63	3.57	4.39	3.32

DISCUSSION

Over the whole of the late Bronze Age / early Iron Age, 20-year-old women were consistently disadvantaged with respect to the number of years remaining for them to live. This statement may indeed support the commonly held doctrine mentioned above, which has so far not been sufficiently supported by data from prehistory. Factors that may interfere significantly influence this finding have to be taken into consideration. Of primary importance is the improvement age and sex assessment of cremated human remains. In the presently considered reference material, there are no significant dependencies of the sex determination to any of the considered parameters. The calculation of life expectancy at the beginning of the third decade of life circumvents the problem of the 'child deficit', supposedly missing children in the place of burial, and is based on the number of individuals at the beginning of this age class. The problem of wide age spans assigned particularly to older adults only has a minor impact with this method and can be mitigated by a detailed age assessment of younger adults, which has previously been lacking.

Life expectancy may be debated in individual cases, for the whole burial community or population. We should nevertheless be careful of simplifying matters: 20-year-old women were not at a disadvantage in terms of their life expectancy compared to their male peers in every population of the late Bronze Age / early Iron Age in Europe. After all, in 14 of 66 series women attain higher, and thus better, life expectancy values. In addition to improving analysis of cremated remains, e. g. by comparing findings of contemporary populations that inhumed their dead, it becomes important to look at comparable data. Rather than focussing on the evaluation of late medieval / early modern church records and census lists, data from the Roman Empire and migration period (e.g. Caselitz 2005, Tab. 30) should be considered. For example, the Roman funerary inscriptions from 81 cities and regions, as presented by Szilágyi (1962–1967, similarly Russell 1958, tab. 17ff and for social differences see Acsádi and Nemeskéri 1970, tab. 78) provide valuable insights. In this type of source, social selection is to be expected, yet it is unlikely to affect the age composition of the deceased. Examining funerary inscriptions, however, does not provide a clear picture: The life expectancy of 20-year-old women is less than that of similarly aged males in almost three-quarters of the 81 series. In three cases, identical values of the life expectancy in both sexes are found within the tolerance range of ± 0.5 years, while in nearly a quarter of the sample the males are at a disadvantage. Remarkable regional differences appear, all to the disadvantage of women: North Africa: 2.0 years (n = 36 series), Central

/ Southern Italy and Hispania: 4.5 years (n = 20 series) and Northern Italy 5.3 years (n = 25 Series). These findings are similar to those for the European late Bronze Age / early Iron Age, but should at least lead to a qualification of the dogmatic statement that 20-year-old women are generally at a disadvantage in the number of years of life still ahead of them.

The closing question as to the reasons for the differences between the sexes should re-examine the often cited but little reflected burden of pregnancy, childbirth and workload. A 20-year-old woman of the late Bronze / early Iron Age would in most cases have already borne her first child and may well already have subsequent pregnancies at the time of entry into the third decade of life. The young women have survived the alleged stresses of the first childbirth (see above) and the late and/or multiple parturients (see e.g. Imhof 1979, tab. 3B and 4B) still have at least a decade of life before them. The role of fathers has been neglected in population studies (Kemkes-Grottenthaler 1999, 179), even though young men in agrarian-dominated societies were exposed to the burdens of labour and combat. Causes for differences in life or age expectancy are to be found in the socio-cultural, and therefore in the behavioural or environmental rather than the biological environment. Women have a biological survival advantage but not exceeding an amount of one to two years (Luy 2002a; see also Bach, Simon 1978; note 1; Christensen, Vaupel 2011 as well as Waldron 1983; for socio-economic aspects see e.g. Luy 2002b, 19 and Klotz 1998). Here a factor-analytical approach would present opportunities. However, there is a lack of usable parameters for pre- and early historical times. Archaeology has to supply the data, but even today this field of research often still focusses purely on descriptive efforts and is often methodologically unsound and statistically unreliable. The natural sciences must catch up in terms of standards and continued development of methods for ascertaining the age and sex of skeletal remains. Those working on the scientific side should increase the number of investigations, while the osteoarchaeological field should provide further compilations of data for diachronic development of the differences between the life expectancy of 20-year-old individuals. At some point in the modern era, the situation reversed and young women were no longer disadvantaged in terms of life expectancy. The question arises whether the life expectancy at birth and those of 20-year-old individuals changed together or independently of one another, and when this happened. According to Gehrmann (1984), the conditions are reversed only in the second half of the 17th century; a later date is suspected by some (e.g. Stolnitz 1956). A comparison of skeletal findings, church registers and census data of the early modern period is in preparation (Caselitz forthcoming).

ACKNOWLEDGEMENTS

The author would like to thank A. Baigent B.A. (Hamburg) and Dr. K. Rebay-Salisbury (Wien) for brushing up the language.

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