Am J Transl Res 2023;15(12):6832-6840
www.ajtr.org /ISSN:1943-8141/AJTR0153931

Original Article

Premature death patterns and trends in diseases of the musculoskeletal system and connective tissue in Shanghai China from 1973 to 2019

Hongyue Zhang[1*], Jiaxin Xie[2*], Bo Lu[3*], Yichen Chen[4,5*], Yibo Ding[6], Yue Zhang[7], Shuogui Xu[1], Xiaopan Li[8]

[1]Department of Orthopedics, First Affiliated Hospital of Naval Medical University, Shanghai 200433, China; [2]Department of High-Altitude Operational Medicine, Army Medical University, Chongqing 400038, China; [3]Department of Orthopedics, Hebei Petrochina Central Hospital, Langfang 065000, Hebei, China; [4]Center for Disease Control and Prevention, Pudong New Area, Shanghai 200136, China; [5]Fudan University Pudong Institute of Preventive Medicine, Pudong New Area, Shanghai 200136, China; [6]Department of Epidemiology, Naval Medical University, Shanghai 200433, China; [7]School of Public Health, Department of Epidemiology, Shanxi Medical University, Taiyuan 030001, Shanxi, China; [8]Department of Health Management Center, Zhongshan Hospital, Shanghai Medical College of Fudan University, Shanghai 200032, China. [*]Equal contributors.

Received October 15, 2023; Accepted November 24, 2023; Epub December 15, 2023; Published December 30, 2023

Abstract: Objectives: The long-term trends in crude mortality rates (CMRs) and age-standardized mortality rates characterized by Segi's world standard population (ASMRWs) of DMSCT in Pudong New Area (PNA), Shanghai, were evaluated from 1973 to 2019, and the role of demographic and non-demographic factors in the mortality of diseases of the musculoskeletal system and connective tissue (DMSCT) was explored. Methods: The PNA district has the largest population and area in Shanghai. Therefore, the mortality registration system of the PNA district was used to calculate and verify the number of deaths. Then, the Joinpoint Regression Program was used to analyze the time trend of mortality. The difference decomposition method was used to visualize the mortality of population and non-population factors, and GraphPad Prism was used for image visualization. Results: A total of 2260 deaths from DMSCT occurred from 1973 to 2019. The CMR and ASMRW of DMSCT were 2.56/105 person-years and 1.57/105 person-years, respectively. The number of people aged ≥80 (696 deaths) who died of DMSCT was the highest among total deaths, the highest number of years of life lost (YLL) was observed in the 45-59 age group, and the YLL rate in the ≥80 age group was the highest. The CMR and YLL rates of DMSCT showed upward trends in the total population from 1973 to 2019. Conclusion: The CMR and YLL rates of DMSCT showed upward trends in the total population from 1973 to 2019 in PNA, Shanghai, and age was closely related to the occurrence of DMSCT. Similarly, demographic factors played a role in this process.

Keywords: Diseases of the musculoskeletal system and connective tissue, mortality, years of life lost, trend analysis, decomposition method

Introduction

Diseases of the musculoskeletal system and connective tissue refer to diseases caused by various reasons with bone, ligament, tendon, muscle and connective tissue as the lesion site or caused by musculoskeletal diseases. Because of the wide range of diseases involved, such as arthritis, osteoporosis, cervical spondylosis, and systemic lupus erythematosus, these diseases have a very high incidence worldwide [1]. In recent years, there has been a growing worldwide awareness of these diseases, and studies have shown that in the Russian Federation and elsewhere, there is a marked tendency of these diseases, including those with a vertebrogenic pathology [2]. Analysis of statistical indices of annual state accounts by the Kirgizia Ministry of Public Health for 1995-2000 showed an increase in musculoskeletal disease morbidity of nearly one-third. In the field of paediatrics and obstetrics, degenerative diseases of the joints and spine account for a relatively high proportion [3]. In 2021, following standardized procedures, the European League against Rheumatism

(EULAR) made recommendations for the management of gout, vasculitis, systemic sclerosis (SSC), myositis, mixed connective tissue disease (MCTD), systemic lupus erythematosus (SLE), and antiphospholipid syndrome (APS) [4]. The aim was to guide clinical practice and future research for improving management in rheumatic and musculoskeletal diseases. Both demographic and non-demographic factors play a role in these diseases. Demographic factors refer to indicators that describe the population, including age, the number of people, etc., while non-demographic factors include environmental factors, living habits, air pollution, dietary preferences, and other factors. All these factors indicate that research in this field is continuously increasing and that these diseases continue to cause problems. Therefore, there is still need for further research.

In recent years, China's economy has grown exponentially, and Shanghai, as one of the most densely populated cities in China, is at the forefront in the field of health care as well as the economy [5]. As China becomes an ageing society, the medical system of Shanghai is increasingly being improved. As the first city in China to establish a death information registration system covering the whole population, Shanghai can provide reliable guidance for the analysis of death data [6]. Especially in regard to the summary and collation of death data such as those for diseases of the musculoskeletal system and connective tissue (DMSCT), the large population base of Shanghai increases the credibility of the results. The Shanghai Pudong New Area (PNA) is the largest and most populous area among the 16 districts in Shanghai, with its population accounting for one-fifth of the total population of Shanghai [6]. PNA has witnessed a fast changes in humanities, sciences, and the environment in China in recent years, which can provide full support for our research, enhancing the credibility and persuasiveness of our results. Generally, the Shanghai PNA is an ideal representative of the epidemiological characteristics and time changes of DMSCT.

Materials and methods

Data source

In the PNA of Shanghai, the mortality data on DMSCT from 1973 to 2019 were derived from the Mortality Registration System. On the basis of the previous death registration system, the total number of deaths was collected from all medical institutions, and professionals from community sanitary service centres collected the relevant data. The final figures were checked against local population registries (Household Registration Authority) to ensure their accuracy. Our study covered nearly 50 years of data, and death data were divided into three components based on the different coding methods. According to the International Classification of Diseases, 8th revision, 9th revision and 10th revision (ICD-8) (ICD-9) (ICD-10) [7], especially the ICD-10, all causes of DMSCT were coded by highly trained clinicians, and each record was further validated by professionals at the Centers for Disease Control and Prevention (CDC). Finally, the research data were obtained. People who had a household registration in the local area and had not lived in other places for more than one year were included in our research.

Statistical analysis

The crude mortality rates (CMRs) and age-standardized mortality rates characterized by Segi's world standard population (ASMRWs) were the commonly used indicators and are expressed as per 100,000 person-years (/10^5) [5]. To compare the CMRs and ASMRWs between sexes, we used the Poisson approximation method [8]. We also divided the death cases into 8 groups based on age: 0-4 years, 5-14 years, 15-29 years, 30-44 years, 45-59 years, 60-69 years, 70-79 years, and >80 years. Age-specific mortality rates were calculated. Years of life lost (YLL) was used to investigate the burden of DMSCT according to previous studies [9]. Using the Joinpoint Regression Program (version 4.3.1.0, National Cancer Institute, MD, USA), the average annual percent change (AAPC), temporal trends in mortality, YLL, and YLL rate from 1973 to 2019 were examined with corresponding 95% confidence intervals (CIs) and used as indicators [10]. The Z test was employed to analyze whether the annual percent change (APC) was significantly different from zero [11]. The changes in mortality over each five-year period from 1980 to 2019 were compared with the changes in mortality over the period from 1973 to 1979. The quantitative contribution of demographic and non-demo-

Table 1. Baseline characteristics of deaths and the burden of DMSCT by sex and period from 1973 to 2019

Characteristic	Deaths (n, %)	Age in years (Mean ± SD)	Age in years (Median)	CMR (/10^5)	ASMRW (/10^5)	YLL (years)	YLL rate (/10^5)
Sex							
Male	807 (36.25)	69.34 ± 17.53	73.08	2.03	1.25	9190.05	23.11
Female	1419 (63.75)	67.36 ± 19.55	72.08	3.48	1.87	18925.64	46.42
Type							
Arthropathies (M00-M25)	1040 (46.72)	75.27 ± 12.86	77.52	1.29	0.62	10217.05	12.69
Systemic connective tissue disorders (M30-M36)	671 (30.14)	54.52 ± 18.50	55.99	0.83	0.58	12146.63	15.08
Dorsopathies (M40-M54)	170 (7.64)	71.56 ± 15.19	73.12	0.21	0.11	1890.34	2.35
Soft tissue disorders (M60-M79)	125 (5.62)	60.05 ± 20.13	62.76	0.16	0.10	1932.31	2.40
Osteopathies and chondropathies (M80-M94)	220 (9.88)	77.26 ± 20.87	83.54	0.27	0.15	1929.35	2.40
Total	2226 (100.00)	68.08 ± 18.86	72.58	2.76	1.57	28115.69	34.91

ASMRW, age-standardized mortality rate by Segi's world standard population; CMR, crude mortality rate; SD, standard deviation; YLL, years of life lost.

graphic factors to the changes in the mortality rate during 1973-2019 was evaluated by the difference decomposition method [11]. SPSS 21.0 (SPSS, Inc., Chicago, IL) was used to conduct other data analyses. A *P* value of <0.05 was considered to indicate statistically significant differences.

Results

Basic information and burden of death from DMSCT

From 1973 to 2019, 807 males and 1,419 females died from the diseases. The average age at death from DMSCT was 68.08 ± 18.86 years, and the median age at death was 72.58 years. The CMR and ASMRW of DMSCT were 26.73/10^5 person-years and 15.72/10^5 person-years, respectively. The CMR and ASMRW were 2.03/10^5 person-years and 1.25/10^5 person-years, respectively, in males, while the corresponding rates were 3.48/10^5 person-years and 1.87/10^5 person-years for females. The highest CMR and ASMRW were associated with arthropathies, and the lowest CMR and ASMRW were associated with soft tissue disorders (**Table 1**). From 1973 to 2019, the YLL due to premature death from DMSCT was 28115.69 years, and the YLL rate was 34.91/10^5. The YLL and YLL rate for females (18925.64 years and 177/10^5) were significantly higher than those for males (9190.05 years and 23.10/10^5). In terms of different diseases, the highest YLL and YLL rate were for systemic connective tissue disorders (12146.63 years and 15.08/10^5) (**Table 1**).

Age-specific mortality and burden of premature death

The number of people aged ≥80 (696 deaths) who died of DMSCT was the highest among the age groups, followed by those aged 60-69 years (528 deaths) and 70-79 years (376 deaths). The CMR was low among those younger than 60 years, and it increased rapidly from 60 years and peaked after 70 years. The highest YLL were observed in the 45-59, 60-69, and 70-79 age groups, which were 6430.08 years, 5410.30 years, and 5024.22 years, respectively. The YLL rate in the ≥80 age group was the highest (154.03/10^5), followed by the 70-79 (103.89/10^5) and 60-69 (62.31/10^5) age groups (**Table 2**).

Trends of the mortality and burden of DMSCT

The CMR and DMSCT rate showed significant upward trends among males, females, and the total population from 1973 to 2019 (all P<0.05); however, the ASMRWs of DMSCT showed downward trends (all P<0.05). The trend of the CMR by age group was relatively stable, but the trend of decline by age group was more obvious between 70 and 79, while the trend of decline in the YLL rate by age group was more obvious. There was a small increase in the YLL of other age groups (**Figure 1**). When we combined ten years of data, it was found that the CMR increased by 1.30% (95% CI = 0.70%~1.90%, P<0.001), the ASMRW decreased by 1.19% (95% CI = -0.56~-1.90%, P<0.001), and the YLL also increased by 5.56% (95% CI = 4.72%~6.40%, P<0.001) (**Table 3**).

Table 2. Age-specific mortality and burden of premature death from DMSCT during 1973-2019

Age group (years)	Deaths (N)	Proportion (%)	CMR (/10^5)	YLL (years)	YLL rate (/10^5)
0-4	7	0.31	0.20	211.59	6.08
5-9	19	0.85	0.24	558.46	6.97
15-29	86	3.86	0.54	2368.35	14.76
30-44	183	8.22	0.94	4481.37	23.13
45-59	331	14.87	1.86	6430.08	36.22
60-69	376	16.89	4.33	5410.30	62.31
70-79	528	23.72	10.92	5024.22	103.89
≥80	696	31.27	29.52	3631.33	154.03
Total	2226	100.00	2.76	28115.69	34.91

ASMRW, age-standardized mortality rate by Segi's world standard population; CMR, crude mortality rate; YLL, years of life lost.

Quantitative contribution of demographic and non-demographic factors to changes in the CMR

The change trend of the CMR value caused by demographic and non-demographic factors in the last 40 years is shown in **Figure 2**. Overall, the mortality rate due to population factors showed an upward trend [APPC (95% CI) = 47.96% (38.16~58.46), P<0.001], and non-demographic factor-related changes showed a significant downward trend [APPC (95% CI) = -33.83% (-17.49~-46.94), P = 0.004]. Similarly, in the classification criteria for males and females, more women were affected [APPC (95% CI) = 30.71% (15.16~43.41), P = 0.004]. Notably, the impact of non-demographic factors and the CMR tended to decrease during 2014-2019 but did not affect the overall trend.

Discussion

As a city with large population in China, Shanghai is at the forefront of medical care and health management in China [12]. Also, Shanghai provides accurate research results on the evolution of the trend of DMSCT mortality and the assessment of the medical burden [12], which can be used to evaluate the impact of this field on human health.

In our study, we found that there were significantly more women died of DMSCT than men, and this was closely related to the pathogenesis of DMSCT. Studies have confirmed that oestrogen is closely related to the occurrence of these diseases among many pathogenic factors [13]. Sex is a key factor affecting the prognosis of patients. Similarly, our studies on YLL and YLL rates have also confirmed that women's health is more susceptible to being affected.

At the same time, we found that the highest CMR and ASMRW were associated with joint diseases, of which the representative disease was hip osteoarthritis. In recent years, a study confirmed that hip osteoarthritis is an independent risk factor for cardiovascular mortality, resulting in a very high mortality rate [14], and that patients with this disease are prone to a variety of accidents while in bed due to their highly restricted physical activity. This necessitates research on complications caused by DMSCT in the future [15]. In terms of age-specific mortality, the ≥80 age group had the largest number of deaths (696 deaths), followed by the 60-69 age group (528 deaths) and the 70-79 age group (376 deaths). This also suggests that the risk of death due to DMSCT increases with age, and elderly patients are at risk of mortality. Therefore, as with most diseases, it is important to strengthen health education, medical care, and health screening for elderly people [16]. Similarly, the group with the highest YLL rate (154.03/105) was also the ≥80 age group, indicating that DMSCT played a crucial role in the longevity of elderly patients compared to younger patients, and this result is consistent with the higher mortality rate of elderly people with these diseases.

We found that, from 1973 to 2019, the CMR of DMSCT for males, females and the total population showed a significant upward trend (P<0.05); however, the ASMRW of DMSCT showed a downward trend (P<0.05). Although there was a difference in mortality between the CMR and ASMRW, the overall YLL rate increased significantly enough to warrant our atten-

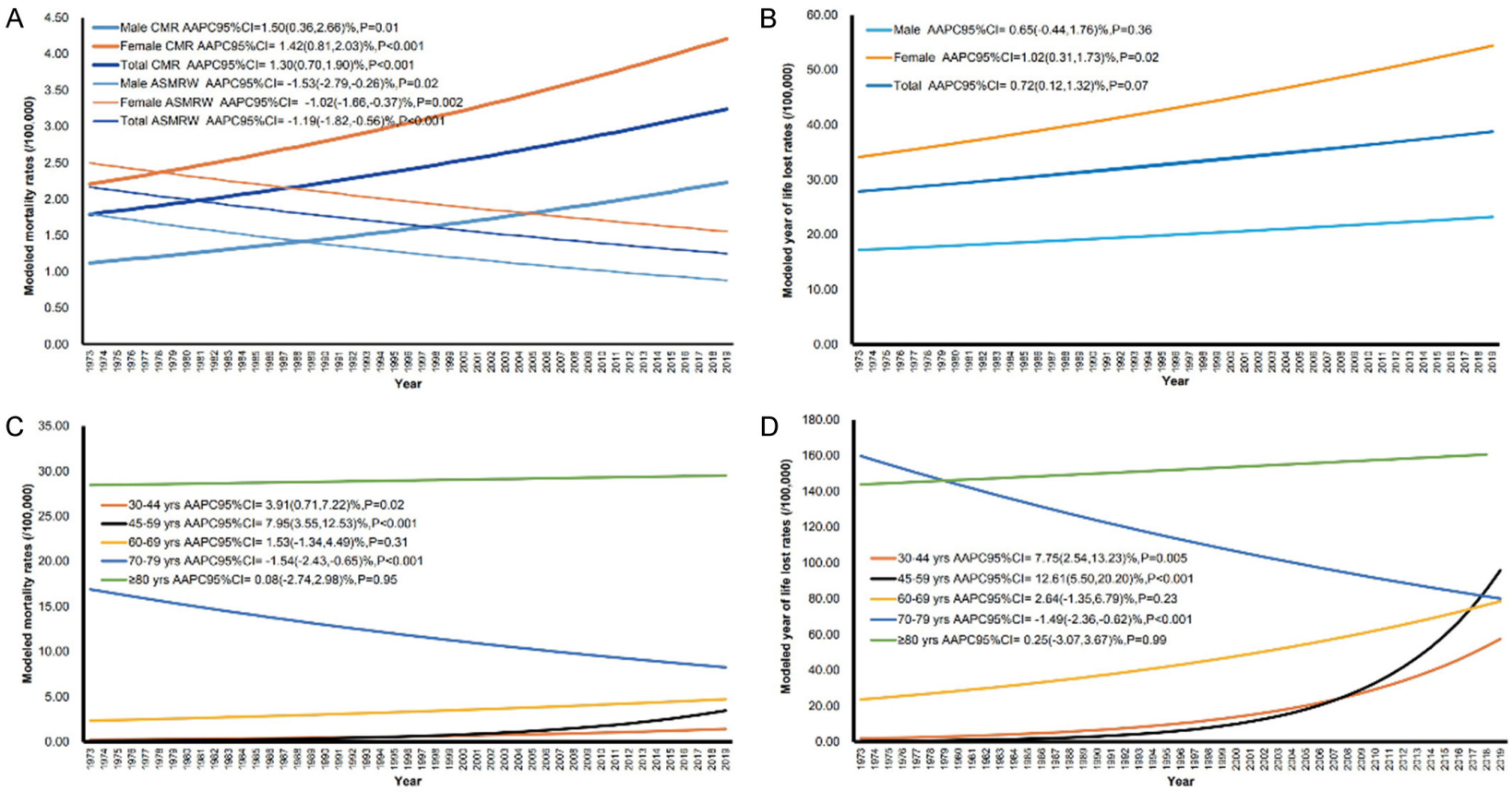

Figure 1. The trends of CMR, ASMRW, and YLL rate of people with DMSCT by sex and age groups in Pudong New Area, Shanghai, from 1973 to 2019. A. CMR and ASMRW by sex. B. YLL rate by sex. C. CMR by age group. D. YLL rate by age group. ASMRW, age-standardized mortality rate by Segi's world standard population (per 100,000); CMR, crude mortality rate (per 100,000); YLL, years of life lost (per 100,000).

Table 3. Trends in the CMR, ASMRW, YLL, and YLL rate of liver cancer by age and sex groups during 2010-2019

	Period	AAPC (95% CI)	P
CMR			
Male	2010-2019	1.50 (0.36, 2.66)	0.01
Female	2010-2019	1.42 (0.81, 2.03)	<0.001
30-44 years	2010-2019	-3.16 (-6.89, 0.72)	0.11
45-59 years	2010-2019	7.95 (3.55, 12.53)	<0.001
60-69 years	2010-2019	1.53 (-1.34, 4.49)	0.31
70-79 years	2010-2019	-0.06 (-0.97, 0.87)	0.71
≥80 years	2010-2019	0.08 (-2.74, 2.98)	0.95
Total	2010-2019	1.30 (0.70, 1.90)	<0.001
ASMRW			
Male	2010-2019	-1.53 (-2.79, -0.26)	0.02
Female	2010-2019	-1.02 (-1.66, -0.37)	0.002
Total	2010-2019	-1.19 (-1.82, -0.56)	<0.001
YLLs			
Male	2010-2019	5.75 (4.44, 7.07)	<0.001
Female	2010-2019	5.63 (4.73, 6.54)	<0.001
30-44 years	2010-2019	1.27 (-4.76, 7.67)	0.74
45-59 years	2010-2019	4.58 (-9.79, 21.24)	0.57
60-69 years	2010-2019	9.65 (5.76, 13.69)	<0.001
70-79 years	2010-2019	2.51 (-0.33, 5.43)	0.12
≥80 years	2010-2019	9.26 (6.64, 11.96)	<0.001
Total	2010-2019	5.56 (4.72, 6.40)	<0.001
YLL rate			
Male	2010-2019	0.65 (-0.44, 1.76)	0.36
Female	2010-2019	1.02 (0.31, 1.73)	0.02
30-44 years	2010-2019	-3.06 (-8.58, 2.79)	0.27
45-59 years	2010-2019	12.61 (5.50, 20.20)	<0.001
60-69 years	2010-2019	2.64 (-1.35, 6.79)	0.23
70-79 years	2010-2019	-0.04 (-0.98, 0.91)	0.56
≥80 years	2010-2019	0.25 (-3.07, 3.67)	0.99
Total	2010-2019	0.72 (0.12, 1.32)	0.07

AAPC, average annual percent change; ASMRW, age-standardized mortality rate by Segi's world standard population; CI, confidence interval; CMR, crude mortality rate.

tion, and when we pooled the results over the last ten years, the YLL rate increased by 5.56 (95% CI = 4.72%~6.40%, P<0.001). This has implications for the field. In our analysis, the rise in the YLL rate was closely related to the following two aspects: the first is that with the improvement in living standards, the average life expectancy of Chinese people has increased [17], while the mortality rate of DMSCT has not decreased significantly. The deeper reason behind this may be that society has paid little attention to this field in recent years.

Deaths are affected by both demographic factors and non-demographic factors. With changes in non-demographic factors, including the human economy, medical treatment, environment, behaviour, and other aspects [18, 19], large-scale changes have taken place. In this study on the death of patients caused by DMSCT, we found that the death rate caused by demographic factors showed an upward trend, while the change related to non-demographic factors showed a significant downward trend. This suggests that older women are still predominantly affected by these diseases. In contrast, the negative correlation between non-population factors and the death rate declined from 2014 to 2019. This also indicates that factors such as economic, medical, environmental and normal factors have recently played a role. Therefore, more attention should be given to the changes in non-population factors in the future.

Although there are some shortcomings in our study, such as relying on a single data source and not accounting for changes in the sex and age of the population, this sample still provides a reasonable explanation for the death of patients caused by these diseases to a certain extent, which is helpful for the diagnosis, prevention and treatment of these diseases in the future, contributing to improvements in health.

Conclusions

Our results suggest that older women were more vulnerable to DMSCT, and in the last half century, there has been no significant change in the CMR or ASMRW of these diseases. However, in the past ten years, YLL has increased significantly, and the mortality rate caused by demographic factors increased, while the mortality rate caused by non-demographic factors decreased. However, the correlation between non-demographic factors and mortality has rebounded in the last five years, so DMSCT remains as a challenge.

Acknowledgements

We thank all the participants in the Vital Statistics System of Pudong New Area from

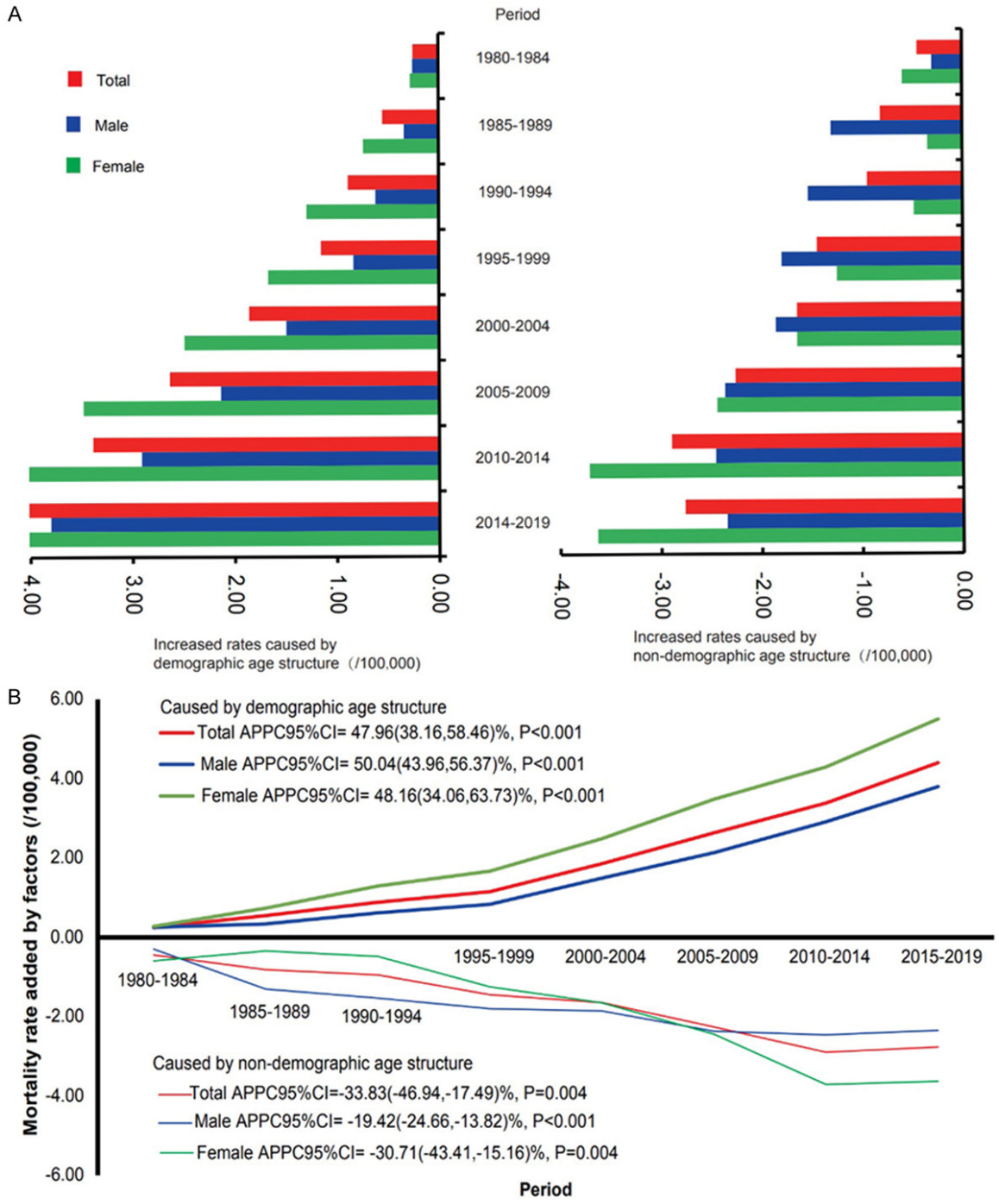

Figure 2. The increased rates caused by demographic and non-demographic factors and their proportion during the period from 1980 to 2019 compared with the crude mortality rate of DMSCT during 1973-1979 in Pudong New Area, Shanghai, China. A. The increased rates caused by demographic and non-demographic factors. B. The trends of changing values of crude mortality rate caused by demographic and non-demographic factors by sex. APPC, average period percent change; CI, confidence interval.

1973 to 2019 for their work in data collection and quality assurance. This study was funded by the Shanghai Science and Technology Commission Funds (No. 19441901500 to SX), the Special Disease Construction Project of Pudong Health and Family Planning Commission of Shanghai (Grant No. PWZzb2022-20 to ZL), the General Program of the Health Bureau of

the Shanghai Pudong New Area (PW2021A-68 to ZL), the Shanghai Health Medical College Faculty Teaching Project (ZPJXKT-21-11 to ZL), the General Program of the Health Bureau of Shanghai (202150015 to ZL), the Key Discipline Construction Project of Pudong Health and Family Planning Commission of Shanghai (Grant No. PWYts2021-02 to ZL), a grant from the Shanghai Public Health System Construction Three-year Action Plan Outstanding Youth Talent Training Program (GWV-10.2-YQ43 to YC), and the National Natural Science Foundation of China (Grant No. 81803294 to JX).

Disclosure of conflict of interest

None.

Address correspondence to: Shuogui Xu, Department of Orthopedics, First Affiliated Hospital of Naval Medical University, No. 168 Changhai Road, Yangpu District, Shanghai 200433, China. E-mail: bonexu@139.com; Xiaopan Li, Department of Health Management Center, Zhongshan Hospital, Shanghai Medical College of Fudan University, No. 180 Fenlin Road, Xuhui District, Shanghai 200032, China. E-mail: xiaopanli0224@126.com

References

[1] The architecture of connective tissue in the musculoskeletal system-often overlooked functional parameter as to the proprioception of the locomotor apparatus. Int J Ther Massage Bodywork 2020; 13: 38-39.

[2] Kochubey AV, Konanykhina AK and Burtsev AK. The tendencies of prevalence of diseases of musculoskeletal system and connective tissue in Moscow adult population. Probl Sotsialnoi Gig Zdravookhranenniiai Istor Med 2018; 26: 72-77.

[3] Salinas Fredricson A, Naimi-Akbar A, Adami J, Lund B, Rosén A, Hedenberg-Magnusson B, Fredriksson L and Krüger Weiner C. Diseases of the musculoskeletal system and connective tissue in relation to temporomandibular disorders-A SWEREG-TMD nationwide case-control study. PLoS One 2022; 17: e0275930.

[4] Drosos GC, Vedder D, Houben E, Boekel L, Atzeni F, Badreh S, Boumpas DT, Brodin N, Bruce IN, González-Gay MÁ, Jacobsen S, Kerekes G, Marchiori F, Mukhtyar C, Ramos-Casals M, Sattar N, Schreiber K, Sciascia S, Svenungsson E, Szekanecz Z, Tausche AK, Tyndall A, van Halm V, Voskuyl A, Macfarlane GJ, Ward MM, Nurmohamed MT and Tektonidou MG. EULAR recommendations for cardiovascular risk management in rheumatic and musculoskeletal diseases, including systemic lupus erythematosus and antiphospholipid syndrome. Ann Rheum Dis 2022; 81: 768-779.

[5] Li X, Deng Y, Tang W, Sun Q, Chen Y, Yang C, Yan B, Wang Y, Wang J, Wang S, Yang F, Ding Y, Zhao G and Cao G. Urban-rural disparity in cancer incidence, mortality, and survivals in Shanghai, China, during 2002 and 2015. Front Oncol 2018; 8: 579.

[6] Ma GF, Bao QY, Zhang HY, Chen YC, Zhang Y, Jiang ZY, Li XP and Zhang JH. Patterns and trends of the mortality from bone cancer in Pudong, Shanghai: a population-based study. Front Oncol 2022; 12: 873918.

[7] Chen H, Zhou Y, Sun L, Chen Y, Qu X, Chen H, Rajbhandari-Thapa J and Xiao S. Non-communicable diseases are key to further narrow gender gap in life expectancy in Shanghai, China. BMC Public Health 2020; 20: 839.

[8] Luo Z, Zou Y, Xie J, Cao H, Chen Y, Ding Y, Li X, Deng Y and Wu L. Influence of demographic factors on long-term trends of premature mortality and burden due to liver cancer: findings from a population-based study in Shanghai, China, 1973-2019. Front Public Health 2022; 10: 808917.

[9] Luo Z, Lv H, Chen Y, Xu X, Liu K, Li X, Deng Y and Zhou Y. Years of life lost due to premature death and their trends in people with selected neurological disorders in Shanghai, China, 1995-2018: a population-based study. Front Neurol 2021; 12: 625042.

[10] Qiu H, Cao S and Xu R. Cancer incidence, mortality, and burden in China: a time-trend analysis and comparison with the United States and United Kingdom based on the global epidemiological data released in 2020. Cancer Commun (Lond) 2021; 41: 1037-1048.

[11] Ferris M, Quan S, Kaplan BS, Molodecky N, Ball CG, Chernoff GW, Bhala N, Ghosh S, Dixon E, Ng S and Kaplan GG. The global incidence of appendicitis: a systematic review of population-based studies. Ann Surg 2017; 266: 237-241.

[12] Wen H, Xu T, Huang Q, Zhang C, Zhang Q and Chen H. Nonpalpable breast masses: one-year ultrasound follow-up and morbidity outcomes in Shanghai. Medicine (Baltimore) 2020; 99: e23556.

[13] Draper MW. Sex hormones and the connective tissue diseases II: the pros and cons of estrogens and estrogen receptor modulators in patients with connective tissue diseases. Lupus 2002; 11: 668-669.

[14] Roubille C, Coste J, Sellam J, Rat AC, Guillemin F and Roux CH. Association of baseline cardiovascular diseases with 5-year knee and hip osteoarthritis progression in non-obese pa-

tients: data from the KHOALA cohort. J Clin Med 2021; 10: 3353.
[15] Roberts S, Colombier P, Sowman A, Mennan C, Rölfing JH, Guicheux J and Edwards JR. Ageing in the musculoskeletal system. Acta Orthop 2016; 87: 15-25.
[16] Laddu D, Ma J, Kaar J, Ozemek C, Durant RW, Campbell T, Welsh J and Turrise S. Health behavior change programs in primary care and community practices for cardiovascular disease prevention and risk factor management among midlife and older adults: a scientific statement from the American Heart Association. Circulation 2021; 144: e533-e549.
[17] Wang DZ, Zhang H, Zhang S, Sun K, Wang C, Wang Z, Song GD, Shen CF, Zheng WL and Jiang GH. Study on increase of average life expectancy of residents in Tianjin from 1999 to 2018. Zhonghua Liu Xing Bing Xue Za Zhi 2021; 42: 814-822.
[18] Dayasiri M, Dayasena R, Jayasuriya C, Perera D, Kuruppu KA and Peris M. Quantitative analysis of the effect of the demographic factors on presbyacusis. Australas Med J 2011; 4: 118-122.
[19] Raja SM, Osman ME, Musa AO, Hussien AA and Yusuf K. COVID-19 vaccine acceptance, hesitancy, and associated factors among medical students in Sudan. PLoS One 2022; 17: e0266670.