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Research paper

Rates and characteristics of elderly suicide in China, 2013–14

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ABSTRACT

Background: The number of older adults (OAs) is growing rapidly and the elderly suicide rate (ESR) is highest among all age-groups in China. Examining the epidemiology of elderly suicide (ES) may facilitate population-specific suicide prevention efforts, however, little is known about the patterns of ES in China.
Objective: To describe the rates and characteristics of ES in China during 2013-14.
Methods: Suicide mortality data by gender, quinquennial age-group, residence (urban/rural) and geographic location (east/central/west) were obtained from China's Integrated National Mortality Surveillance System for 2013–14. Crude ESRs of OAs aged 65 years or above were standardized to the 2010 China's Census population and adjusted for under-reporting.
Results: While OAs comprised 8.9% of the Chinese population, they represented 38.2% of suicide deaths. The average annual ESR in China was 34.5 per 100000 in 2013-14. ESRs varied widely across OA subgroups, with the highest rates in central rural men (67.1) and women (53.1), and the lowest rate in eastern urban women (13.6). Male gender (incident rate ratio [IRR] = 1.47), every five-year increase in age (IRR = 1.33), rural residence (IRR = 1.83), and geographic location of central China (IRR = 1.93) were significantly associated with increased number of ESs.
Limitations: Information on means of ES are lacking in the data source.
Conclusions: ESs disproportionately account for a large portion of China's current total suicides, and ESR, particularly in central rural OAs, is very high in China. Prevention of ES should be given priority as an important public health issue in China. Central rural OAs are key target population for current ES prevention.

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1. Introduction

Suicide rates generally increase with age and the risk of suicide is higher in the elderly than in younger people in most countries worldwide (Sachs-Ericsson et al., 2016; Shah, 2007), including China. In fact, since 1987, the first year when China's suicide mortality statistics were available from the Ministry of Health (MOH), elderly suicide rates (ESRs) have been always much higher than in young- and middle-aged adults, although numerous studies paid great attention to the well-known peak of suicide in rural young women in 1990s (Liu and Philipps, 1997; Phillips and Cheng, 2012; Phillips et al., 2002a, 1999; Qin and Mortensen, 2001). Since the beginning of the 21st century, the suicide peak in Chinese rural young females had gradually disappeared, leaving an upward-sloping age pattern, in which rate of suicide is progressively higher across the age-range (Liu et al., 2015; Wang et al., 2014).

The past three decades also have witnessed a remarkable demographic transition in China. As early as 1999, China had entered the aging society, and it already has the largest elderly population (137.6 million) in the world today (Zhong et al., 2016). By 2050, it is expected that almost one out of every four Chinese, 336 million people, will be 65 years or older (Zeng, 2012). Because China's first wave of baby boomers born in the 1950–1960s had reached age 65 years in 2014, the elderly population growth rate has been accelerating, with older adults (OAs) aged 80+ being its fastest-growing segment (Zeng, 2012).

Although ESRs still remained higher than any other age-group, recently, dramatic declines in urban and rural suicide rates have been observed for both Chinese men and women of many age-groups, including the over-65 age group (Liu et al., 2015; Sun et al., 2013; Wang et al., 2014; Yip et al., 2005; Zhang et al., 2010a). Nevertheless, the drop in suicide rates over the past decades is less dramatic in the elderly than young rural women (Liu et al., 2015;

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Parry, 2014; Sun et al., 2013; Wang et al., 2014; Yip et al., 2005). Because OAs are a heterogeneous population, the significance and magnitude of reductions in ESRs differ in OA sub-groups characterized by observation period, residence, gender and age-band. For example, the suicide rates of OAs aged 60+ years remained unchanged during the period of 1991–2000 and no significant drop occurred among urban OAs aged 75+ years and rural OAs aged 80+ years over the period 2002-11, even leading to a concern by some researchers that the declining trend in overall ESRs is reversing in 2009-11 (Parry, 2014; Sun et al., 2013; Wang et al., 2014; Yip et al., 2005). Further, because the rate of growth in China's GDP has been on continuous decline since 2010, and had dropped to 6.9% in 2015, reaching the lowest record in 25 years, it is unlikely that the downward trend in ESRs will be maintained. As a result of the accelerating pace of population ageing and unchanged high ESRs in some subgroups of OAs, there may be quite a large number of OAs who die by suicide nowadays and in the coming years, and ESRs may vary among different OA subpopulations.

Interventions targeted at high-risk groups are an effective strategy for suicide prevention (World Health Organization, 2014), therefore, a greater understanding on variations in the prevalence of suicide within the OA population, which is such a large, rapidly growing, and heterogeneous group, is of particular importance for suicide prevention. However, there is very little information about the epidemiological patterns of elderly suicide in China (e.g., gender and geographic variations in ESRs), because nearly all existing studies focused on suicide of young adults and the general population (Li et al., 2008; Lin et al., 2016; Phillips et al., 2002a, 2002b; Qin and Mortensen, 2001; Sun et al., 2013; Sun and Zhang, 2015; Zhang et al., 2010b). To our knowledge, only one literature review has summarized the prevalence and characteristics of suicide among the elderly in mainland China (Li et al., 2009), but findings from this review are mainly derived from studies on suicide of the general population and a small number of regional studies on ES (published in local journals) (Lv et al., 2003; Xu et al., 2000). More importantly, information from the review and other related papers (Li et al., 2009; Liu and Philipps, 1997; Phillips et al., 2002a; Wang et al., 2014; Yip et al., 2005) is outdated and even might be problematic because nearly all these studies are based on 1990s MOH Vital Registration (MOH-VR) mortality data, which are generated based on an unrepresentative national sample (Yang et al., 2005). Given the significant changes in patterns of suicide in recent years and the increasing importance of ES in China, there is an urgent need to update existing knowledge on the characteristics of ES.

2. Methods

2.1. Data source

China has no a complete nationwide VR system. Before 2013, two sample-based mortality surveillance systems, the MOH-VR and the Chinese Center for Disease Control and Prevention's Disease Surveillance Points system (CDC-DSP), were used to provide national mortality data (Yang et al., 2005). The MOH-VR is the most commonly cited source of China's suicide data in previous studies (Phillips et al., 2002a; Wang et al., 2014; Yip et al., 2005), but statistics from it are not a true reflection of the mortality profile in China because its sample is mainly obtained from eastern and central China with relatively good reporting mechanisms (Liu et al., 2016; Yang et al., 2005). Compared to MOH-VR, mortality statistics from CDC-DSP are generally reliable because its sampling strategy employed ensured a nationally and regionally representative sample (Liu et al., 2016; Yang et al., 2005). Nevertheless, the population covered by CDC-DSP is smaller than MOH-VR, 6% vs. 17% of China's total population.

To provide more accurate cause-specific mortality statistics, the MOH retained almost all surveillance points from DSP and approximately 1/3 of the surveillance sites from MOH-VR, added 334 new points, and finally established the Integrated National Mortality Surveillance System (INMSS) in 2013. The INMSS has both urban and rural surveillance points in all 31 provinces covering 323.8 million people, a roughly 24% of Chinese population (Liu et al., 2016). Because the INMSS data have been publicly available for 2013–14 (Chinese Center for Disease Control and Prevention and National Health and Family Planning Commission, 2015, 2016), its sample representativeness is better than that of any previous system, and its sample size is the largest so far, we used the INMSS suicide mortality figures to examine the epidemiology of ES in China.

Geographic locations of surveillance points in the INMSS are categorized into east, central and west according to criteria of National Bureau of Statistics of China (Supplementary Fig. S1) (National Bureau of Statistics of China, 2015). Causes of mortality in the INMSS are ascertained using a mix of medical death certificates and verbal autopsy approach, and coded according to ICD-10. Procedures for VR, determining and coding of cause of death are adapted from the protocols and guidelines specifically developed for CDC-DSP. Details of these procedures, sampling strategy, quality control measures, and data quality check have been described elsewhere (Liu et al., 2016; Chinese Center for Disease Control and Prevention and National Health and Family Planning Commision, 2015).

It is important to acknowledge that recording all deaths from routine surveillance is very difficult for a vast country like China, due to its limited resources. Further, because health workers of the newly included surveillance points have less experiences in disease surveillance, underreporting of mortality counts is a major challenge for the INMSS. To ensure the data integrity, previously, China CDC conducted under-reporting surveys every 3 years to adjust DSP death rates. Results from these surveys indicated that the reporting of deaths in DSP was improving in recent years and under-reporting rates of over-65 age group had decreased to 12.2% in 2009-11 (Guo et al., 2015; Wang et al., 2011). Unfortunately, to date, an up-to-date under-reporting rate of the INMSS has not been published. Further, because the counts of suicides identified in under-reporting surveys are very small due to their limited sample sizes, suicide-specific under-reporting rate is not routinely specified. We speculate the INMSS under-reporting rate would be higher than 12.2% because of the possible unsatisfactory data quality of newly included surveillance points. In addition, although 12.2% is an overall under-reporting rate of all-cause mortality of OAs, not suicide, and there is evidence that the under-reporting rates differ among causes of deaths (Guo et al., 2015), it is very likely that the true under-reporting rate of ES in the INMSS should be higher than 12.2% owing to the sensitive nature of suicide in Chinese culture, especially OA suicide (Li et al., 2009). We also believe that the DSP under-reporting rate could be directly used as reference for the INMSS, because, to a great extent, the INMSS is an expanded DSP. For these reasons, 12.2% was used as a conservative estimate of under-reporting rate for the correction of the ESR in the INMSS.

2.2. Statistical analysis

Suicide counts and rates by gender, quinquennial age-group ($\geq$65years), residence (urban/rural), and geographic location (east/central/west), as well as population sizes of corresponding strata reported in the INMSS for 2013-14 were used. Because data from several points were excluded due to failure to pass quality

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