

The ecological fallacy and the gender ratio of suicide in China

PAUL S. F. YIP and KA Y. LIU

Summary China is the only country in which the suicide rate is higher among women than men. We provide a demographic perspective on the gender differential in suicide in China. This shows that the male/female ratio of suicide increased between 1991 and 2001 and there is reason to believe this trend will continue. Among the population subgroups, only young women living in rural areas had much higher suicide rates than their male counterparts. It is argued that consideration of the gender ratio of suicide in China must take age-, gender- and region-specific suicide patterns and the population structure into account. The increasing urbanisation of China is likely to be associated with more male suicides and we predict that before long the male suicide rate will overtake that of females.

Declaration of interest None.

The male/female ratio of suicide is about 4 in Western countries such as Australia, the USA and the UK. In Asian countries, for example India and Hong Kong (Yip *et al*, 2000), this ratio is often less than 2 (Mayer & Ziaian, 2002; World Health Organization, 2002). China is reportedly the only country in the world in which the suicide rate is higher among women than men (Pritchard, 1996). This unique pattern has attracted much attention, but little is known about its underlying causes (Yip, 1996). We suggest that a demographic perspective could shed light on the low male/female ratio of suicide in China. In particular, we examine whether Chinese women in different population subgroups have uniformly higher risk than their male counterparts, and discuss how the national male/female ratio of suicide may be affected by the demographic changes taking place in China.

METHOD

We examined the gender ratio of suicides in China using the most recent mortality statistics (1991–2001) provided by China's Ministry of Health. The Ministry's mortality registry is based on a 10% sample of the Chinese population, and it is the only system in China to record causes of deaths annually for a population of 1.3 billion. In 2000 over 60% of the population lived in rural areas (Zhou & Ma, 2003) and the rural regions are economically deprived in comparison with their urban counterparts. We projected the data on suicide rates from the Ministry of Health to the age-, gender- and region-specific population statistics of the Chinese Bureau of Statistics to adjust for the effect of the population distribution on the overall male/female ratio of suicide (for further details of the suicide rates and our projection method, see Yip *et al*, 2005a).

RESULTS

We found that the male/female ratio of suicide had been increasing from 1991 to 2001; in 1991 the ratio was 0.78 and in 2001 it was 0.91. The upper panel of Fig. 1 gives suicide rates by age, gender and region for China in 2001. It shows that suicide rates increased with age; a distinct peak was observed among women living in rural areas in the age range 25–34 years; and rural suicide rates were higher than urban rates across all age-groups.

Although China's overall male/female ratio of suicide was still less than 1 in 2001, closer examination revealed that this was mostly the result of the high suicide rate in one particular population subgroup, namely young women aged 20–34 years living in rural areas. The Woolf test (Woolf, 1955), which is essentially a χ^2 test, was used to test the homogeneity of the male/female ratios across all age-groups for the

urban and rural populations. The values of the test statistics for assessing the homogeneity were 186.48 and 3070.10 (compared with a critical value of 5.226, d.f.=12) for the age-specific urban and rural gender ratios respectively. The very small probability value is in contradiction to the homogeneity assumption among the ratios for age-groups and region. The lower panel of Fig. 1 shows the age-specific male/female ratios of suicide in urban and rural areas: in urban areas the suicide rates among those under 30 years old were slightly higher among women than men, but among the middle-aged and elderly groups the male/female ratios were close to or larger than 1. In rural areas, women also did not universally have higher suicide rates across all age-groups. Male suicides were more prevalent among those over 60 years old, and across the age-groups only women in rural areas aged 20–34 years had higher suicide rates than their male counterparts.

DISCUSSION

The 'ecological fallacy' refers to the thinking that what is true at the aggregate level must be true at the individual level. One simple explanation of international differences in suicide rates, as stated in Moksony's composition theory (Moksony, 1990), is that the countries' populations differ in the proportions of those at risk of suicide. China's population is still skewed towards the younger cohorts: men and women aged below 40 years accounted for 68% of the total population in 2001. Over 60% of the population lives in rural areas (Zhou & Ma, 2003). Our results have shown that the male/female ratios of suicide were not uniform across the population subgroups. It was this population structure and the high suicide rates among young women in rural areas that led to a male/female ratio of less than 1 at the national level. Such unique patterns of suicide rates and demographic characteristics must be taken into account when interpreting the male/female ratio of suicide in China. Otherwise, it may be misleading to suggest that women are more likely to die by suicide than men in China by referring to the low male/female ratio of suicide at the national level.

China has undergone rapid demographic changes in the past two decades and these changes would affect the overall

male/female ratio of suicide. First, probably because of the 'one child' policy which has been enforced since 1980, China is facing an acute problem of ageing. According to the Chinese Bureau of Statistics, the total fertility rate has fallen from more than 3 before 1980 to 1.8 in 2002, which is below the replacement level of 2.1 (Chan *et al*, 2002). The proportion of the population over 65 will rise to the levels of most Western countries by 2025 (Hesketh & Zhu, 1997). Second, the gender imbalance at birth is now amounting to a male/female ratio of 1.15 in some districts, deviating substantially from the norm of 1.05 (Hesketh & Zhu, 1997). The effects of the 'one child' policy are beginning to have a severe impact on the population distribution: the proportion in the age-group 20–39 years will shrink (Chan *et al*, 2002). Third, urbanisation is rapidly taking place: Zhou & Ma (2003) estimated that China's urbanisation level rose from 26% to 36% between 1990 and 2000. Owing to these demographic changes, the size of the female population in the 20–39 age range living in rural areas will decline rapidly in the next few decades. This is expected to increase the male/female ratio of suicide at the national level, which will

PAUL S. F. YIP, PhD, Hong Kong Jockey Club Centre for Suicide Research and Prevention and Department of Statistics and Actuarial Science, University of Hong Kong, Hong Kong; KA Y. LIU, MPhil, Hong Kong Jockey Club Centre for Suicide Research and Prevention, University of Hong Kong, Hong Kong and Nuffield College, University of Oxford, UK

Correspondence: Paul S. F. Yip, Hong Kong Jockey Club Centre for Suicide Research and Prevention, University of Hong Kong, Hong Kong. Tel: +852 2241 6013; fax: +852 2549 7161; email: sfpyp@hku.hk

(First received 19 January 2006, final revision 15 April 2006, accepted 2 May 2006)

come to resemble more those ratios of Western countries.

What is left unanswered is how other between-country differences may explain the gender patterns of suicide in East and West. One such difference may lie in the availability of pesticides. Young women in most countries tend to have high rates of attempting suicide, but easy access to pesticide and rat poison in rural areas of China may account for the high fatality rate. In fact, 62% of suicide deaths in China resulted from ingestion of pesticide or rat poison (Phillips *et al*, 2002). Such easy availability of highly lethal substances may explain the high suicide rates among rural women. However, the rapid increase of charcoal-burning suicides among middle-aged men in Hong Kong has led to a higher male/female ratio of suicide

(Chan *et al*, 2005; Yip *et al*, 2005b); it remains to be seen whether the rate of suicide by charcoal burning will increase in mainland China and change the pattern of suicide there. Further research is needed to explore other possible explanations, such as cultural attitudes towards gender roles, the meaning of suicide and the prevalence of mental illness among both men and women in rural and urban communities.

REFERENCES

- Chan, C. L., Yip, P. S. F., Ng, E. H., *et al* (2002) Gender selection in China: its meanings and implications. *Journal of Assisted Reproduction and Genetics*, **19**, 426–430.
- Chan, K. P. M., Yip, P. S. F., Au, J., *et al* (2005) Charcoal-burning suicide in post-transition Hong Kong. *British Journal of Psychiatry*, **186**, 67–73.
- Hesketh, T. & Zhu, W. X. (1997) Health in China. The one child family policy: the good, the bad, and the ugly. *BMJ*, **314**, 1685–1687.
- Mayer, P. & Ziaian, T. (2002) Suicide, gender, and age variations in India: are women in Indian society protected from suicide? *Crisis*, **23**, 98–103.
- Moksony, F. (1990) Ecological analysis of suicide. In *Current Concepts of Suicide* (ed. D. Lester), pp. 121–138. Philadelphia: Charles Press.
- Phillips, M. R., Yang, G., Zhang, Y., *et al* (2002) Risk factors for suicide in China: a national case-control psychological autopsy study. *Lancet*, **360**, 1728–1736.
- Pritchard, C. (1996) Suicide in the People's Republic of China categorized by age and gender: evidence of the influence of culture on suicide. *Acta Psychiatrica Scandinavica*, **93**, 362–367.
- Woolf, B. (1955) On estimating the relation between blood and disease. *Annals of Human Genetics*, **19**, 251–253.
- World Health Organization (2002) *World Report on Violence and Health*. Geneva: WHO.
- Yip, P. S. (1996) Suicides in Hong Kong, Taiwan and Beijing. *British Journal of Psychiatry*, **169**, 495–500.
- Yip, P. S., Callanan, C. & Yuen, H. P. (2000) Urban/rural and gender differentials in suicide rates: East and West. *Journal of Affective Disorders*, **57**, 99–106.
- Yip, P. S. F., Liu, K. Y., Hu, J., *et al* (2005a) Suicide rates in China during a decade of rapid social changes. *Social Psychiatry and Psychiatric Epidemiology*, **40**, 792–798.
- Yip, P. S. F., Liu, K. Y., Law, C. K., *et al* (2005b) Social and economic burden of suicide in Hong Kong SAR. *Crisis*, **26**, 156–159.
- Zhou, Y. & Ma, L. J. C. (2003) China's urbanization levels: reconstructing a baseline from the Fifth Population Census. *China Quarterly*, **173**, 176–196.

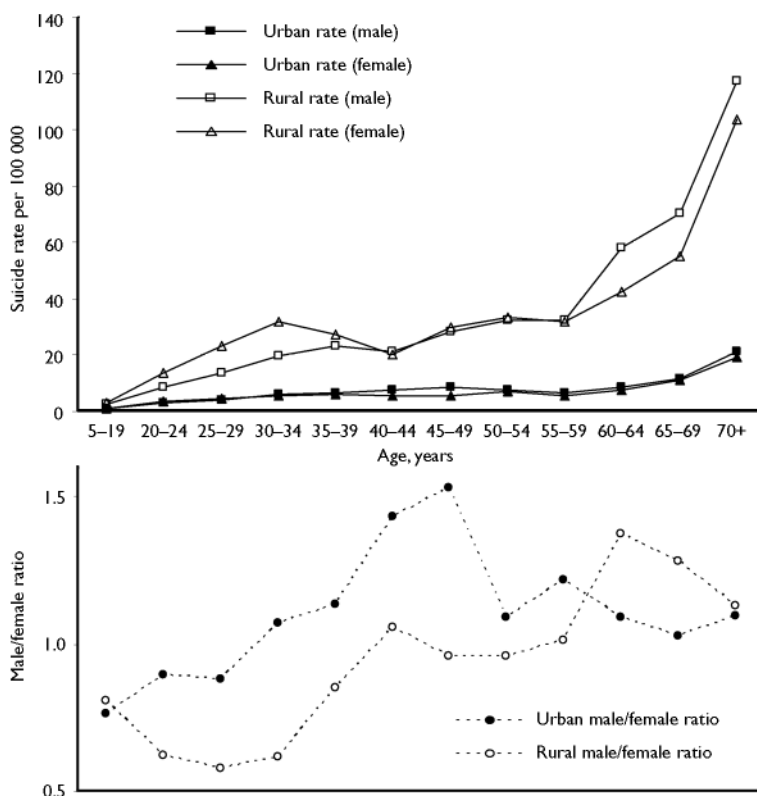


Fig. 1 Region-, age- and gender-specific suicide rates and region-specific male/female ratios of suicide: China, 2001.