Breast cancer control in China: challenges and opportunities of the use of population-based routine data studies

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Breast cancer is a major global public health problem, representing the first or second most common malignancy in the female population all over the world (1), accounting for about 1.4 million new cases annually (2). The worldwide trends are for an increase in breast cancer incidence and a decrease in mortality rates, although the latter is mostly seen only in the wealthier countries (3). Numerous efforts have been made to periodically assess cancer incidence and mortality rates for several cancers throughout the world, namely by the World Health Organization (WHO) and the International Agency for Research on Cancer (IARC) (4). Nevertheless, 5-year survival data of good quality with proper long-term follow-up are not widely available (4). One of the main reasons pertains to varying methods of estimating incidence and mortality across different countries, on one hand, and to shortcomings observed in national population-based cancer registries of some countries, on the other (4). Breast cancer 5-year survival rates vary geographically with lower rates noted in the most deprived areas, as shown in a worldwide population-based study using cancer registries' data (5). Moreover, disparities in mortality and survival seen worldwide highlight not only the inequities in accessing healthcare but also the existent gap in developing countries between cancer burden and ability to put in place effective cancer control measures (6).

China is the third largest country in the world, with an emerging economy (7). The reporting of breast cancer epidemiology in the Chinese female population is of utmost importance, since it relates to the highest number of new malignant cases per year in the female population (highest incidence) of the most populous country in the world (8). However, the exact incidence and mortality rates are unknown due to the inexistence or poor quality of cancer registries before 2002. Acknowledging this, the Chinese National Central Cancer Registry (NCCR) was established in 2002 and has published annual reports since 2008 (7). Zeng *et al.* (9) reported estimates of incidence and mortality in 2010 in China based on population-level data extracted from 145 regional cancer registries. The number of registered new cases was 30,819 and the one of new deaths 7,615, accounting for a mortality to incidence ratio (M/I) of 0.25. The M/I ratio was highest in the Western area of China (0.35) and lowest in the Eastern area of the country (0.23). The proportion of morphological verification was 89.88% overall, being higher in urban than rural areas and in Eastern compared to Western China. Death certificate verification was very low in the whole country, with percentages varying between 0.49 (Eastern area) and 1.81 (Western area). The authors estimated that the number of female breast cancer cases in China in 2010 was roughly 208,192, with a crude incidence of 32.43 per 100,000 inhabitants. Both the crude and age-standardised rate were higher in urban than rural areas. The Eastern and Middle area's incidence rates were quite similar (35.57 and 35.58 per 100,000, respectively) but much higher than in the Western region (23.47). Regarding mortality, a total of 55,500 deaths due to breast cancer were reported in Chinese females in 2010. Breast cancer accounted for 7.90% of all cancer deaths, ranking fifth among them. Concerning geographical distribution, the same trends observed for incidence apply.

The geographical differences illustrated by Zeng *et al.* in breast cancer incidence between urban and rural areas need to be understood taking into account the socio-demographic

trends in China and the recent westernised urban life style. Although the Chinese population is increasingly older, there was no pairwise development of the social security system (7). Moreover, healthcare is not equally accessible throughout the country with the population living in rural areas and with lower socio-economic status often receiving suboptimal care (7). The economic growth and urbanisation, on the other side, account for new modifiable risk factors for breast cancer such as obesity and sedentariness. As result of the established one-child-per-family policy, pregnancy and childbearing patterns have changed concomitantly with an increasing rate of abortion and oral contraception intake. Although this was not the scope of the work of Zeng *et al.*, combining cancer registries' information with other sources of data (e.g., hormonal intake, induced abortions rate, obesity) could yield important findings regarding priority areas for prevention and screening of breast cancer.

When comparing age-standardised incidence (ASI) and age-standardised mortality (ASM) to those estimated for European countries (10), both ASI and ASM are inferior in China (ASI of 94 per 100,000 in Europe versus 25.89 per 100,000; ASM of 23 per 100,000 in Europe versus 6.56 per 100,000). Chinese estimates were lower than the lowest ones in Europe (Bosnia-Herzegovina). Zeng *et al.* estimates were based on data from 145 cancer registries that fulfilled quality criteria defined by the Chinese Ministry of Health and international guidance from IARC, out of a total of 219. The authors of this work have also published global estimates of cancer burden for the same time-period using the same method (11). The female population covered by eligible cancer registration areas in 2010 was 12.96% of the target population, which is very low when compared with cancer registries with nearly full coverage, like those of the United Kingdom (7). The authors of the present paper state the incompleteness of cancer registration on their country and present extremely low numbers of death certification records, reflecting the sparse availability of vital registration records in China, which are an important source for epidemiological studies of the kind (4). Nevertheless, coverage is only one item that needs to be taken into account when extrapolating data from cancer registries for the general population. The quality of cancer registry data must be assessed for its completeness, validity and timeliness (12) and, therefore, constitute a representative capture of the whole country ethnic, socio-economic and demographic heterogeneity while adequately respecting the report of cancer cases. In China, the piecemeal development of cancer registries throughout the country resulted in a

higher number being created in rural areas with increased risk for specific kinds of cancer, such as gastric tumours (13), which might contribute to underestimation of the real burden of breast cancer. Moreover, the definition of cancer case and its coding also often poses problems (12), which apply to breast cancer (e.g., non-invasive or multifocal tumours).

Having access to accurate and reliable epidemiological data is crucial for adequate healthcare needs' assessment and, subsequently, for healthcare planning. Epidemiologic surveillance systems and other sources of data routinely collected, such as census data, offer a time and cost-saving alternative for primary data collection that can be used to improve healthcare worldwide. Systems to collect data routinely may be found worldwide but their degree of development is widely variable. Systems to obtain data on demographic characteristics are almost ubiquitous, e.g., census data. Mortality data might not be available and when it is, the accuracy diverges according to the death certification process and its coding systems, especially in developing countries (14). Important reasons for the low death certification pertain to the fact that this is voluntary in China (13). When comparing breast cancer mortality data from the Chinese Cancer Registries (2008 Report) with those from the National Death Survey conducted in 2006 in China at 160 surveillance points, there were differences in the estimated mortality, with a statistically significant underestimation from cancer registries (13). However, this difference lost significance when taking into account the registry area (urban versus rural).

Breast cancer burden in China seems to follow global trends, despite the limitations inherent to the low coverage of the cancer registry network and the statistical model used for rates' estimation. However, reported estimates are lower than those known for Europe which might reflect some degree of underestimation. Disparities seen among the different regions in what concerns modifiable risk factors and differential access to health care, as well as inherent limitations of the cancer registry coverage and death certification, might account for these results. National emphasis must be placed on improving epidemiological surveillance systems such as cancer registries, to be used alone or in combination with other sources of routine data collection, in order to enhance the country's capacity to monitor the disease impact. Major limitations concerning the type and quality of data gathered might be overcome by improving staff training, motivation levels and establishing mandatory registry and standardisation of

death certification. Improving epidemiologic surveillance with robust, reliable and continuous population data is paramount to develop and evaluate effectiveness and cost-effectiveness of health care services and interventions to control breast cancer in China.

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