



Seasonal influenza vaccination in China: Landscape of diverse regional reimbursement policy, and budget impact analysis



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ABSTRACT

Background: To explore the current landscape of seasonal influenza vaccination across China, and estimate the budget of implementing a national “free-at-the-point-of-care” vaccination program for priority populations recommended by the World Health Organization.

Methods: In 2014 and 2016, we conducted a survey across provincial Centers for Disease Control and Prevention to collect information on regional reimbursement policies for influenza vaccination, estimated the national uptake using distributed doses of influenza vaccines, and evaluated the budget using population size and vaccine cost obtained from official websites and literatures.

Results: Regular reimbursement policies for influenza vaccination are available in 61 mutually exclusive regions, comprising 8 provinces, 45 prefectures, and 8 counties, which were reimbursed by the local Government Financial Department or Basic Social Medical Insurance (BSMI). Finance-reimbursed vaccination was offered mainly for the elderly, and school children for free in Beijing, Dongli district in Tianjin, Karamay, Shenzhen and Xinxiang cities. BSMI-reimbursement policies were limited to specific medical insurance beneficiaries with distinct differences in the reimbursement fractions. The average national vaccination coverage was just 1.5–2.2% between 2004 and 2014. A free national vaccination program for priority populations (n = 416 million), would cost government US\$ 757 million (95% CI 726–789) annually (uptake rate = 20%).

Conclusions: An increasing number of regional governments have begun to pay, partially or fully, for influenza vaccination for selected groups. However, this small-scale policy approach has failed to increase national uptake. A free, nationwide vaccination program would require a substantial annual investment. A cost-effectiveness analysis is needed to identify the most efficient methods to improve coverage.

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1. Introduction

Annual seasonal influenza epidemics represent a major disease burden globally, with 3–5 million cases of severe illness that result

in over a quarter of a million deaths every year [1]. Influenza vaccination is the most effective way to prevent disease, and the World Health Organization (WHO) recommends annual seasonal influenza vaccination for pregnant women, children aged six to 59 months, the elderly, persons with specific chronic medical conditions, and health-care workers (hereafter called the “priority populations”) [2]. As of 2014, over 100 countries worldwide already have seasonal influenza vaccination policies that recommend vaccination of at least one of the risk groups [3]. Over 40% of countries list seasonal influenza vaccination on their National Immunization Schedule, including most countries across North

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and South America, Europe, and some countries in African, South-East Asia, and the West Pacific Region [4–8].

Despite seasonal influenza being associated with between 67,000 and 430,000 annual excess respiratory and circulatory deaths on average for five pre-pandemic influenza seasons 2004–2005 through 2008–2009 [9], influenza vaccination is not included on the National Immunization Program (NIP) in China. Therefore, there are no national guidelines for alleviating the cost burden on individuals who wish to receive the vaccine, which may contribute to low vaccine uptake of 1.9% for the entire population in China and 4.3% for the urban residents aged above 60 years old in 9 cities, recorded during the 2008–2009 and 2011–2012 influenza season, respectively [10,11]. Thus, vaccine uptake in China falls substantially below the World Health Assembly (WHA) target of 75% in the elderly by 2010 [12], and also below that of other upper-middle income countries such as Brazil where coverage is over 70% in the elderly [6].

In countries where vaccination costs are subsidized by the respective governments, there is higher national vaccine uptake [13,14]. To our knowledge, only a handful of large cities in China currently provide reimbursement for influenza vaccination. For example, since 2007, Beijing has provided free seasonal influenza vaccination to the elderly and school children, and since 2004, Xi'an city in Shaanxi province has provided free vaccination to those covered by Medicare insurance [10]. Unlike NIP vaccines funded by the central government, there is a diverse patchwork of reimbursement policies that exist at the provincial, prefecture and county levels for influenza vaccination.

WHO has called upon China to include more vaccines in NIP, following a recent vaccine scandal with improperly refrigerated or transported vaccines sold nationwide [15]. To inform a future national government-funded free seasonal influenza vaccination program for China that harnesses the advantages of regionally administrated schemes and provides a sustainable public health strategy, we conducted a survey to explore the current landscape of influenza vaccination, including reimbursement policies, eligible subgroup sizes, and influenza vaccine uptake across China. We then estimate the budget needed to implement a nationwide “free-at-the-point-of-care” vaccination program by conducting a budget impact analysis parameterized with province-level data for the size of the subgroups—delineated by age and risk group—eligible to receive an influenza vaccine.

2. Methods

2.1. Landscape of influenza vaccination across China

2.1.1. Regional reimbursement policies for influenza vaccination

Between August and November, 2014, we conducted a survey across all 31 provincial Centers for Disease Control and Prevention (CDCs) to collect information on provincial-level reimbursement policies for influenza vaccination (and at the prefecture- and county-level if applicable), and performed a web search of below official websites to validate the responses: (1) all 31 provincial-level and 333 prefecture-level governments, (2) the Bureau of Human Resources and Social Security, (3) the Commission of Health and Family Planning, and (4) the provincial CDCs (see questionnaire in [supplementary 1](#)). Nearly two years have passed since our initial survey mentioned above. To check whether there were major new vaccination policies implemented across China between December 2014 and September 2016, we re-searched all the aforementioned official websites.

2.1.2. Eligible subgroup size of regional reimbursement policies

For the regions where reimbursement policies are available for influenza vaccination, the eligible population mainly include

subgroups at a certain age, school children, health-care workers, and/or insured persons of Basic Social Medical Insurance (BSMI) (including New Rural Cooperative Medical Insurance for Rural Residents (NRCMI), Basic Social Medical Insurance for Urban Employees (BSMIUE), and Basic Social Medical Insurance for Urban Residents (BSMIUR)) (see details for the introduction to BSMI in [supplementary 2](#)). To estimate the size of subgroups eligible for reimbursement, local age-specific population data and the number of school children were obtained from National Bureau of Statistics [16], the number of health-care workers was gained from local Health Statistics Yearbook, and the number of insured persons was collected from the four official websites described above.

2.1.3. Influenza vaccine coverage

We estimated the national yearly influenza vaccine uptake rate in China using the annual number of doses of seasonal influenza vaccine released between 2004 and 2014 from the website of the National Institutes for Food and Drug Control. In China, all unsold influenza vaccines are returned to the manufacturers at the end of each season for disposal. We used a 14–31% return rate [10], and 1–10% vaccine wastage rate, resulting from physical damage, expiration, losses in transit, consistent with the wastage of single dose vaccines in 7 GAVI-eligible countries [17–19].

2.2. Budget impact analysis under a free national vaccination program for priority populations

2.2.1. The size of priority populations

We used 2013 National Bureau of Statistics age-specific population data to estimate the size of priority populations stratified by provinces [16]. According to the latest guidelines of influenza vaccination issued by China CDC [20], the priority populations for influenza vaccination in China includes those recommended by WHO [2], and family members and caregivers of infants younger than 6 months. For global comparisons, we used the WHO definition of priority populations. The detailed calculation of priority populations size was provided below.

We estimated the number of pregnant women as the sum of number of live births, still births, fetus deaths and abortions. The number of live births was obtained from China Health Statistical Yearbook (CHSY) in 2013 [21]. The number of still birth and fetus deaths were estimated as the product of the number of perinatal deaths [21] and the fraction of those deaths which are still births and fetus deaths (68.59%) [22]. We estimated the number of abortions by dividing the number of induced abortions [21] by the proportion of induced abortions (88.54%) [23]. The number of health-care workers was obtained from the CHSY in 2013 [21]. To minimize the overlap among persons with specific chronic medical conditions, children aged six to 59 months and the elderly, we estimated the number of persons with chronic illness only in those aged 5–59 years, multiplying the age-specific population size by the age-specific prevalence of chronic conditions.

We performed a literature review to obtain the prevalence of underlying medical conditions in China which are related to increased risk of hospitalization and mortality if infected with influenza. We searched articles published in PubMed, Wanfang and CNKI during 2000–2014, with terms including above specific disease as “asthma” and “China”, and “prevalence”/“disease burden”/“epidemic”/“epidemiological”/“epidemiology”. All identified papers were reviewed, and the most recent national representative studies were included [21–39]. We summed the prevalence of each chronic disease to get the prevalence by diseases (e.g., a person with three chronic diseases was counted three times) ([Table 1](#)). To get the prevalence by cases (e.g., a person with more than one chronic diseases was counted only one

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