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Original Research

A population-based study on incidence and economic burden of influenza-like illness in south China, 2007

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SUMMARY

Objectives: The disease burden of influenza-like illness (ILI) in most tropical and subtropical countries has not been described adequately to date. The aim of this study was to determine the epidemiology and incidence of ILI, and to assess the economic burden in south China.

Study design: Prospective study.

Methods: A population-based household survey was conducted quarterly in 2007 in Guangdong Province.

Results: The average number of subjects in each quarterly survey was 13,687. In total, 1002 cases of self-reported ILI were identified in all four surveys, indicating an annual incidence of 7.23 cases of ILI per 100 persons. The second quarter had the highest incidence of ILI (2.83 cases per 100 persons). Children aged 1–4 years, <1 year and 5–9 years had the highest annual incidence rates of ILI (49.87, 35.19 and 21.24 cases per 100 persons, respectively). The incidence of ILI was significantly higher in males than females ($P < 0.001$), and significantly higher in rural residents than urban residents ($P < 0.001$). The individual cost per episode of ILI represented approximately 20% of monthly per-capita income of residents.

Conclusions: The results of this large-scale household study confirm that ILI places a substantial health and economic burden on south China. Ultimately, the results of this study will provide further information for understanding the disease burden of influenza in subtropical areas.

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Introduction

Substantial morbidity, hospitalization and mortality rates of influenza have been well documented in North America, Europe and certain districts in subtropical areas, such as Hong Kong.[1–4] As well as the severe health impact, influenza has an extensive socio-economic burden, mainly due to the indirect loss of productivity that illness and lost work days place on employers and society as a whole.[1,5–8]

Global influenza surveillance is, to a large extent, based on sentinel surveillance of influenza-like illness (ILI). It has been reported that factors such as age, season, degree of latitude and population density could affect the magnitude of influenza activity. However, whole-population data are still scarce,

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with population-based ILI surveillance practiced in certain age groups.[9–14]

It has been hypothesized that south China is an epicentre for influenza,[15,16] close to Hong Kong and Macao Special Administrative Region, Guangdong Province have large transient populations. As such, a collaboration centre was established in 2006 between Guangdong Province and the World Health Organization (WHO) for emerging infectious disease surveillance, research and training. The aim of this collaboration was to share Guangdong's experience in emerging infectious disease surveillance with south China as a whole and neighbouring subtropical countries.

Guangdong Province has conducted routine influenza surveillance since the 1970s. In 1998, it joined the People's Republic of China influenza surveillance network, and has subsequently been conducting year-round influenza surveillance. For years, Guangdong Province has sent influenza-virus-positive specimens to the Chinese National Influenza Centre, which sends viral isolates to WHO. Specimens from Guangdong Province represent a significant proportion of the viral isolates that China shared with the WHO Global Influenza Surveillance Network. Guangdong Province currently maintains a surveillance network that includes 13 national and provincial level cities, 29 sentinel hospitals of all levels and 23 community/school clinics.[17,18]

This sentinel surveillance is useful for monitoring the patterns and circulating strains in Guangdong Province, but is limited in its ability to accurately estimate the burden or cost of disease. This is due, in part, to the fact that a certain proportion of influenza cases may not see a doctor during their illness, and a population-based study is needed to estimate the true incidence in the population. As such, a population-based door-to-door survey of self-reported ILI was conducted in 2007 to determine the incidence and epidemiological features of ILI in the community, and to gather background data to assess of the burden of influenza. Furthermore, investigations were made into medical care costs and days lost due to illness in order to understand the economic burden of ILI on residents in the community.

Methods

Study population and sampling method

Guangdong Province is one of the largest provinces in south China, with a total area of 177,900 km^2. It has a typical tropical humid monsoon climate, with average annual temperature of 22 °C and average rainfall of 1500–2000 mm. Guangdong Province has a population of 91,940,000 according to a population sampling survey in 2005.

Based on multiple factors including geographic location, per-capita gross national product and compliance with influenza surveillance work in recent years, Zhuhai and Zhaoqing Prefectures were selected as the two survey cities. The multistage stratified cluster sampling method[19] was used to select one urban district and one rural county at random from each city. Two community residents committees were selected for each selected urban district. For each selected rural county, three towns were chosen, from which two administrative villages were drawn. In total, eight urban community committees and 12 rural villages were selected at random. The door-to-door survey was conducted with each household as a survey unit.

Case definitions

In this study, self-reported ILI was defined as fever with a measured body temperature >38.0 °C and symptoms of either cough or sore throat. As a small number of subjects did not use thermometers, those who believed that they had a fever with a cough or sore throat were also considered as cases. New onset of ILI was defined as absence of the symptoms for at least 7 days prior to the onset of ILI.

Sample size calculation and sample assignment

The sample size was calculated using a simple random sampling formula. The urban and rural groups were stratified. With a predicted ILI incidence rate per quarter (P) of 5% and allowable error (δ) of 15%*P,[20] a sample size of 3400 persons for each group was calculated. The sample size was increased by a factor of 1.1 to allow for lack of follow-up and non-response. The sample size was further enlarged by a factor of 1.5, to allow for case clustering. As such, a sample size of 5600 for each group (urban and rural) was determined. In total, it was anticipated that 11,200 persons would be surveyed each quarter. In accordance with the reported mean household population of 3.2 persons per household in the urban areas and 3.7 persons per household in the rural areas,[21] 220 households per urban community committee and 130 households per rural village were surveyed.

Data collection method

Standardized questionnaires were designed. The household survey was administered by a researcher with a health background who received training. For each selected household, the head of the household was interviewed on behalf of all family members; if the head of the household was absent, another family member aged >18 years was interviewed.

All subjects were enrolled in December 2006, and completed a registration form with demographic information. A mercurial thermometer for measuring axillary temperature and a notification letter was left for each family. The household survey was subsequently undertaken among the same cohort between 15 and 30 March, June, September and December of 2007. The effect of loss to follow-up (ranged from 2.4% to 4.1% in this study) was reduced by recruiting a number of subjects with the same demographic information to guarantee stability of the survey cohort.

Interviews were conducted with each detected case of ILI by a trained surveyor, collecting information such as clinical characteristics, onset of illness within 3 months, medical care costs and days lost due to illness.

Calculation for incidence of ILI and epidemiological analysis

This population-based year-round household survey investigated the incidence of ILI for the entire population (different genders, ages, occupations and education levels) living in

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