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# The Strategy to Further Control and Elimination Measles in China Based on the Analysis of 10 Years Measles Suspects Accumulation in Guangxi

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## Abstract

**Objective:** Trying to find the strategy to further control and elimination measles in China.

**Method:** Calculated the measles suspects accumulated in Guangxi from 1995-2004 based on estimate coverage with the provincial birth rate and the reported registered newborn in the EPI system, and the antibody positive rate of measles vaccine in 1999, while analyzing the measles rebounds interval years and its reasons in Guangxi, forming the further control and elimination strategy recommendation for the whole China.

**Results:** Measles rebounds with the interval of 3 years in Guangxi for the 230,000 newborn as suspects every year since the coverage and the antibody positive rate is not high enough of the routine vaccination, and the accumulation of the suspects of 3 years met the newborn cohort of 700,000 a year meanwhile causing the measles bound up in Guangxi. It can also explain why the measles rebound in 1997, 2001 and 2005 in China, typically with the interval of very 3 years.

**Conclusion:** In order to get the elimination of measles done in China in 2012, the strategies have to be taken including strengthening the routine immunization similarly in Guangxi with the poor performance warning mechanism; identifying the high risk area of outbreak or poor coverage to take mass campaign before the outbreak happen, and making sensitive surveillance from the provincial to township hospital to find out the beginning outbreak and contain it timely.

**Keywords:** Suspects; Accumulating ; Measles rebound; Strategy

## Introduction

Measles is a contagious children's disease of respiration. About 2.5 million death with measles or measles related disease before vaccine available [1], even vaccine available today, still measles cause 43 million cases annually, and it is the main death of the developing countries [2].

The measles outbreak still happened for the poor routine coverage and people migration from the rural in the undeveloped area though the vaccine is highly efficacy for measles [3,4] which lead the measles incidence increasing in the whole China [5,6]. This paper analyzing measles suspects accumulation 10 years in Guangxi to illustrate reason of measles rebound and its control and elimination strategy in China.

## Material and Methodology

### Estimating routine coverage

The coverage is estimated by the formula of numerator / Denominator as: the numerator is the number of the target children registered in the EPI system and Denominator is the birth rate of the Statistic Bureau annually announced times the provincial population [7].

### The seroconversion rate of vaccination

Seroconversion rate of vaccination is 83% [8] by sampling survey of 8 months to 4 years old children in 1999.

### The epidemic curve with the historic surveillance data since 1950

The historic surveillance data was entered computer since 1950 and the epidemic curve was drawn with the excel in which the epidemic curve was showed .

The suspected accumulated rate was calculated by the Seroconversion rate of vaccination and the estimated coverage, and generated the regulation of measles rebound and its control strategy in China.

## Results

### The regulation of the measles epidemic in Guangxi

The regulation of the measles in Guangxi was rebound with the interval of 3 years before the vaccine available. When beginning of the introducing of vaccine in 1966, the incidence of the measles was decreased in certain degree, however it rebound again quickly with the shorter interval Figure 1). When 1978 the expanded program of immunization introduced, the rebound interval was 4 years, and have a lower peak of the epidemic in 1985, then had a stronger rebound in the next rebound peak in 1993. For 1993/1994 the national massive campaign for polio free meanwhile the routine coverage of the measles also improved, that made the rebound peak in 1997 not so remarkable. The high risk measles outbreak counties prediction and the massive campaign for measles in these counties conducted since 1999 [9,10], therefore the next peak of the rebound in 2001 also not remarkable, but still with 3 years interval Figure 2).

The suspected herd accumulation in Guangxi last 10 years and the reason of measles rebound in China the coverage is estimated by the formula of numerator / Denominator as: the numerator is the number

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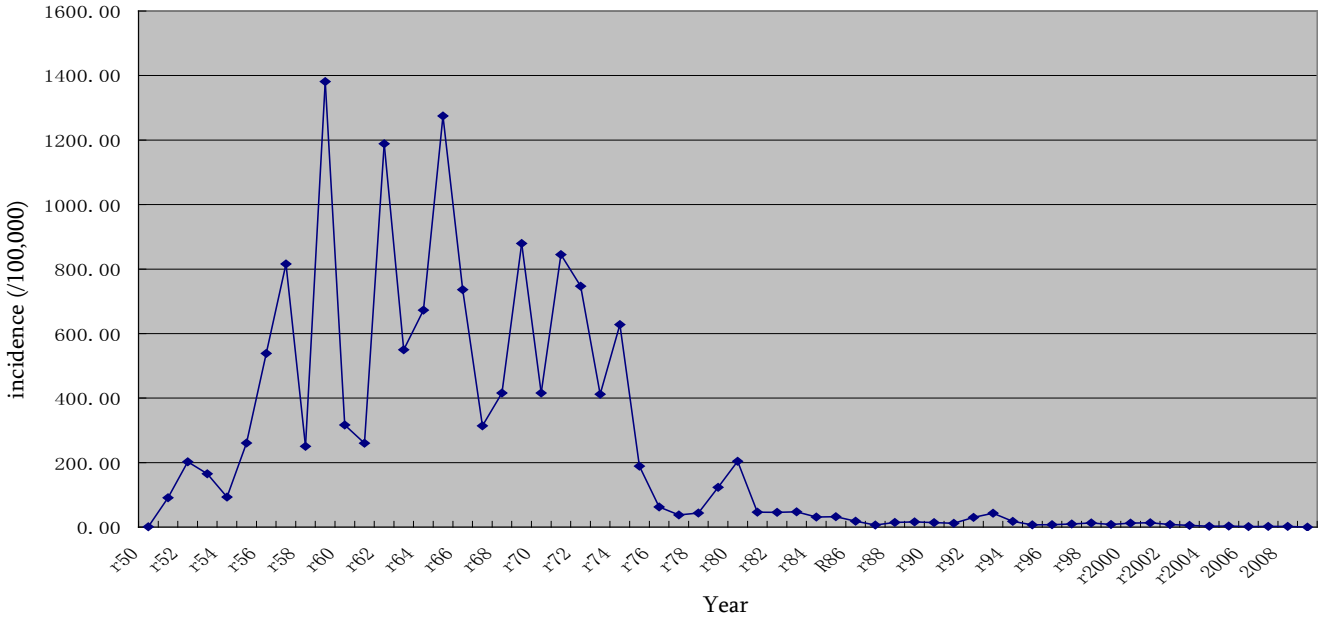


**Figure 1:** Then measles incidence in Guangxi 1950-2009(1/100,000).

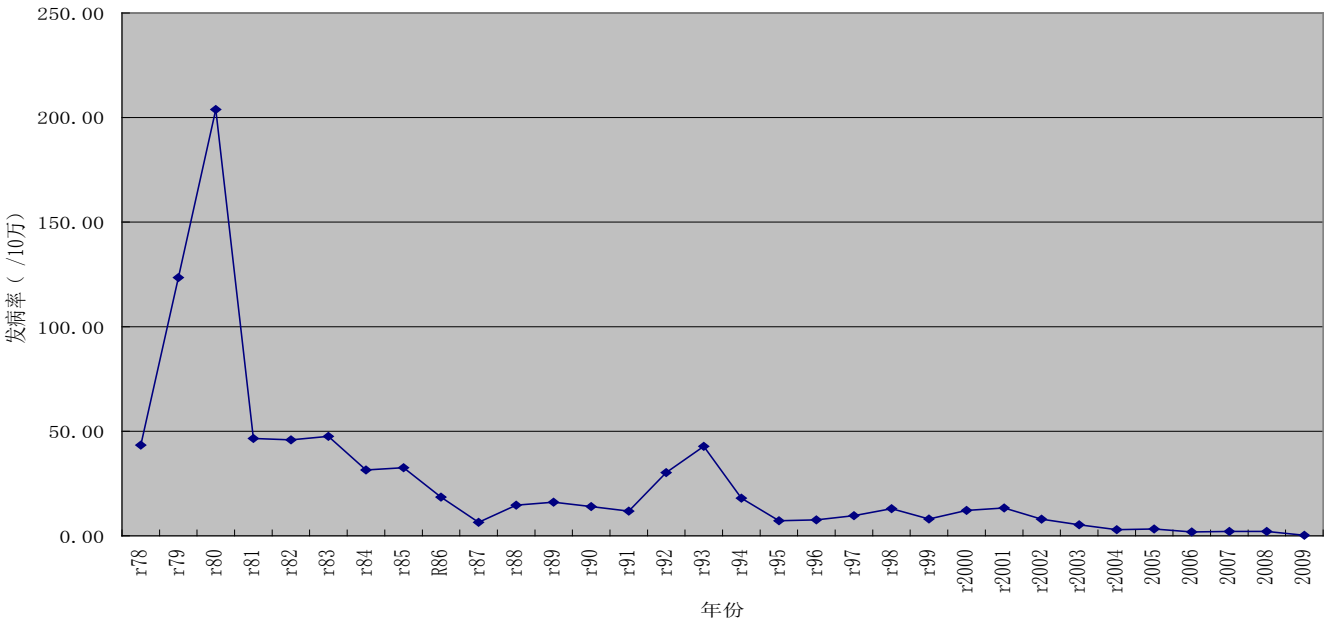


**Figure 2:** Then measles incidence in Guangxi 1978-2009(1/100,000).

of the target children registered in the EPI system and Denominator is the birth rate of the Statistic Bureau annually announced times the provincial population [7]. The estimated coverage of the newborn in Guangxi 1995-2004 as Table 1.

During 1995-2004 the average population was 47.26 million the birth rate is 0.7 million and the new born mortality was 20‰ the annual live birth was 0.685 million, the registered newborn in EPI system was 0.54million thus, the estimated coverage was 70%, based on the positive rate after vaccination was 83% annual newborn with positive antibody after vaccination was 0.45million, thus the total suspected newborn including missing and primary vaccination failure was 0.235 million just 3 years accumulation it equaled to 0.7 million which just is a cohort of a year newborn, when the measles case imported, the outbreak will occur, that is why there is an outbreak or rebound in Guangxi every 3 year interval.

There also measles rebounded in China of 1997 - 2001and 2005respectively [5]with the 3 years interval, typically with the regular interval which indicated both the coverage for the newborn and the

positive rate after vaccination is not high enough [5,6], that's the reason of measles rebound in the whole China.

### The strategy of measles elimination in China

As the country of West Pacific Region, China has committed elimination of measles in 2012. To get done the goal China launched the supplement campaign of measles for 8 months to 14 years old children [5,6] and made the incidence decreased from 10/100,000 in 2008 to 3.9/100,000 in 2009 Figure 3. However, this incidence still is more than 100 times higher than the criteria of less than 1/million of the elimination. To accelerate it, strategies of the first should be take as the similar Yellow Card Warning in Guangxi for enhancement of the routine immunization [12], and making catch up to register those missing floating children no matter they migrate out or in with their parents to vaccinate measles vaccine when their age is 8 months or over, thus reaching the high coverage over 95%. The second should be identify those weak county/ weak township /weak village in the percentage about 10% and then carry out the catch up immunization, to eliminate those poor immunization area. The third should be strengthen the surveillance to find /investigate suspected measles case and contain that outbreak in time.

## Discussion

The population of Guangxi is 50 million, there are 22 national poverty counties and another 28 are the provincial poverty counties among total 100 counties. And the transportation condition is poor, sub-tropic area make it humid /warmer and hotter. All above makes Gaungxi used to be an endemic high incidence of measles place. The incidence in 1960s was 630/100,000 1970s 323/100,000 1980s 44/100,000 1990s 16/100,000 respectively. Based on the situation of Guangxi's economy is not strong enough to be able to buy the about 15 million doses measles vaccine and the same amount sets of syringes for the massive immunization of the target children under 15 years old, And if take one part of the four to doing the massive immunization from 8 moth to those under 15, while divided Guangxi into four parts, another three parts without mass campaign still have the measles outbreak occur, so Guangxi began to identify the measles high risk outbreak counties with method of the historic epidemic curve interval and carried out mass campaign in February before the

| year | Population (million) | birth rate of the Statistic Bureau(‰) | Newborn of the Statistic Bureau (100,000) | Newborn of the EPI system (10,000) | estimated coverage(%) |
|---|---|---|---|---|---|
| 1995 | 45.43 | 0.01754 | 7.968 | 59 | 74.04 |
| 1996 | 45.89 | 0.01683 | 7.723 | 52.4 | 67.84 |
| 1997 | 46.33 | 0.01593 | 7.380 | 48.6 | 65.85 |
| 1998 | 46.75 | 0.01587 | 7.419 | 48.55 | 65.4 |
| 1999 | 47.13 | 0.01496 | 7.050 | 49.46 | 70.14 |
| 2000 | 47.51 | 0.0136 | 6.461 | 52.94 | 81.93 |
| 2001 | 47.88 | 0.0138 | 6.607 | 53.63 | 81.16 |
| 2002 | 48.22 | 0.0133 | 6.413 | 55.16 | 86.00 |
| 2003 | 48.57 | 0.01386 | 6.731 | 59.4 | 88.23 |
| 2004 | 4.89 | 0.01332 | 6.512 | 64.7 | 99.35 |
| average | 47.26 | | 7.0 | 54 | 77.14 |

**Table 1:** The estimated coverage of the newborn in Guangxi 1995-2004 as table 1.

| Year | population (million) | statistical bureau birth rate ‰ | statistical bureau new born (100,000) | EPI registered new born (100,000) | estimated coverage % | measles incidence /100,000 |
|---|---|---|---|---|---|---|
| 1995 | 45.43 | 0.01754 | 7.968 | 5.9 | 74.04 | 7.21 |
| 1996 | 45.89 | 0.01683 | 7.723 | 5.24 | 67.84 | 7.63 |
| 1997 | 46.33 | 0.01593 | 7.380 | 5.24 | 70.99 | 9.64 |
| 1998 | 46.75 | 0.01587 | 7.419 | 5.27 | 71.03 | 13.00 |
| 1999 | 47.13 | 0.01496 | 7.050 | 5.26 | 74.60 | 8.00 |
| 2000 | 47.51 | 0.0136 | 6.461 | 5.294 | 81.93 | 12.12 |
| 2001 | 47.88 | 0.0138 | 6.607 | 5.363 | 81.16 | 13.32 |
| 2002 | 48.22 | 0.0133 | 6.413 | 5.516 | 86.00 | 7.96 |
| 2003 | 48.57 | 0.01386 | 6.731 | 5.94 | 88.23 | 5.27 |
| 2004 | 48.89 | 0.01332 | 6.512 | 6.47 | 99.35 | 2.91 |
| 2005 | 49.25 | 0.01426 | 7.023 | 6.9 | 98.24 | 3.23 |
| 2006 | 49.61 | 0.01444 | 7.163 | 7.1 | 99.11 | 1.87 |
| 2007 | 50.02 | 0.01419 | 7.097 | 7.1 | 100 | 2.10 |
| 2008 | 50.49 | 0.0144 | 7.270 | 7.24 | 99.57 | 2.11 |

**Table 2:** The population, statistical bureau new born, EPI registered new born, the estimated coverage and the measles incidence in Guangxi 1 995-2008.

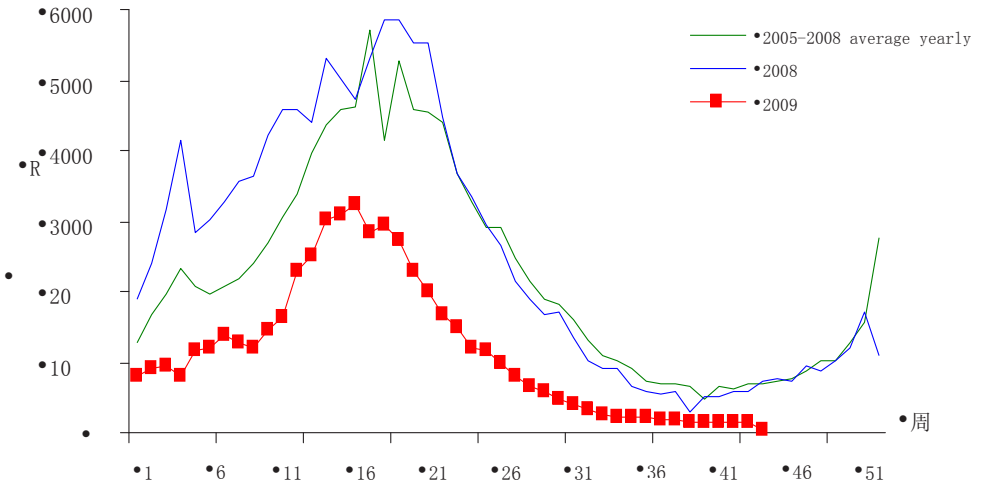


**Figure 3:** The measles weekly distribution in cases reported in 2008 and 2009 from first week to 44th week in Chian (Dr. Liang Xiaofeng' the Seminar on EPI of the Health Ministry, China, in Tianjin 2009.11.20).

outbreak season for the children 8 moth to those under 15 annually sine 1999. And the Yellow Card Warning for those counties poor performance in government support, management of the program and the professional supervision to strengthen the routine Immunization to get the coverage high enough. The last is to surveillance the new suspect measles case and to monitor the investigation and containment in the grass-root, if 2 cases suspected cases reported confirmed in a week, the provincial CDC will give the local CDC a call to instruct them to the spots management, if the counties technically not strong enough, the staff in the Provincial CDC will be sent to the place for the containment to prevent the epidemic in time. With the experience of identifying high risk counties with the mass campaign/Yellow Card Warning to promote the routine coverage and the surveillance of the measles suspected cases and contain the spot timely, the measles incidence gradually becoming lower and lower, just 9.4/100,000 in 2000~2003, 2.3/100,000 in 2004~2008 (Table 2), only 0.23/100,000 in 2009 and 0.5/1 million in 2010.

Measles incidence is the indicator of the routine coverage of the immunization. The time to reach the goal of measles elimination is so limited for China. Based on about 15% of the missing children and a 15% of the failure after vaccination are not be accepted, the new strategy should be taken in China to make the measles elimination possible in 2012: except carrying out the mass campaign arranged by the MOH, the routine coverage should be enhanced by warning those poor performed counties, identified those poor township about 10% in the counties to carry out mass campaign target to 8 month to 14 years old children in every county, the last one is to strengthening surveillance, reported suspected measles cases and doing the investigation and containment on time.

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